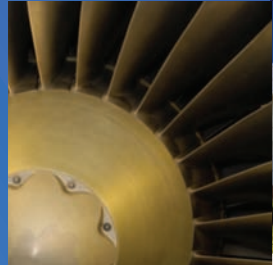


2008 - 2009

Undergraduate and Graduate Catalog

Daytona Beach, Florida Campus



EMBRY-RIDDLE
AERONAUTICAL UNIVERSITY



EMBRY-RIDDLE

AERONAUTICAL UNIVERSITY

Leading the World in Aviation and Aerospace Education

DAYTONA BEACH, FLORIDA, CAMPUS

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

(386) 226-6000

Admissions: (386) 226-6100 or (800) 862-2416

Financial Aid: (800) 943-6279

E-mail (Admissions): dbadmit@erau.edu

PRESCOTT, ARIZONA, CAMPUS

Embry-Riddle Aeronautical University

3700 Willow Creek Road

Prescott, AZ 86301-3720

(928) 777-3728

Admissions: (928) 777-6600 or (800) 888-3728

Financial Aid: (928) 777-3765

E-mail (Admissions): pradmit@erau.edu

WORLDWIDE CAMPUSES AND ONLINE

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

(386) 226-6910

Admissions: (866) 509-0743 or (800) 522-6787

Financial Aid: (866) 567-7202

E-mail (Admissions): wwem@erau.edu

www.embryriddle.edu/worldwide

<http://www.erau.edu>

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2008 - 2010 ACADEMIC CALENDAR

Fall Semester 2008

(August 25 - December 15)

August 20-24	Orientation and Registration
August 25	Classes begin
September 1	Holiday - Labor Day
November 7	University Day
November 11	Holiday - Veterans Day
November 26-28	Holiday - Thanksgiving
December 4	Last day of classes
December 5	Study Day
December 6, 8-10	Final Examinations
December 15	Commencement

Spring Semester 2009

(January 7 - May*)

January 5-6	Orientation and Registration
January 7	Classes begin
January 19	Holiday - Martin Luther King Day
February 16	Holiday - Presidents Day
March 16-20	Holiday - Spring Break
April 23	Last day of classes
April 24	Study Day
April 25, 27-29	Final Examinations
May 5	Commencement

Summer Semester (Term A) 2009

(May 7 - June 22)

May 5-6	Orientation and Registration
May 7	Classes begin
May 25	Holiday - Memorial Day
June 18	Last day of classes
June 19	Study Day
June 20, 22	Final Examinations

Summer Semester (Term B) 2009

(June 25 - August 10)

June 23-24	Orientation and Registration
June 25	Classes begin
July 2	Holiday - Independence Day
August 6	Last day of classes
August 7	Study Day
August 8, 10	Final Examinations

* Commencement dates are subject to change.

Fall Semester 2009

(August 24 - December*)

August 19 - 23	Orientation and Registration
August 24	Classes begin
September 7	Holiday - Labor Day
November 6	University Day
November 11	Holiday - Veterans Day
November 25 - 27	Holiday - Thanksgiving
December 3	Last day of classes
December 4	Study Day
December 5, 7-9	Final Examinations
December*	Commencement

Spring Semester 2010

(January 13 - May*)

January 11-12	Orientation and Registration
January 13	Classes begin
January 18	Holiday - Martin Luther King Day
February 15	Holiday - Presidents Day
March 15-19	Holiday - Spring Break
April 29	Last day of classes
April 30	Study Day
May 1, 3-5	Final Examinations
May*	Commencement

Summer Semester (Term A) 2010

(May 13 - June 28)

May 11-12	Orientation and Registration
May 13	Classes begin
May 31	Holiday - Memorial Day
June 24	Last day of classes
June 25	Study Day
June 26, 28	Final Examinations

Summer Semester (Term B) 2010

(June 1 - August 16)

June 29-30	Orientation and Registration
July 1	Classes begin
July 5	Holiday - Independence Day
August 12	Last day of classes
August 13	Study Day
August 14, 16	Final Examinations

* Commencement dates are subject to change.

**This catalog becomes effective
July 1, 2008.**

The 2008-2010 academic calendar applies to the Daytona Beach campus. Worldwide Campus students should contact the local Embry-Riddle center director for the academic calendar applicable to their specific location. This calendar is currently under review and is subject to change.

Orientation programs for all new Daytona Beach students are planned, scheduled, and conducted before registration each semester. A special orientation program for new international students is held prior to the general orientation required for all new students. New students will receive special information regarding the date, time, and place of orientation activities from Admissions approximately 30 calendar days in advance of the activities.

In compliance with federal laws and regulations, Embry-Riddle Aeronautical University does not discriminate on the basis of race, color, gender, creed, national and ethnic origin, age, or disability in any of its policies, procedures, or practices. An Equal Opportunity institution, the University does not discriminate in the recruitment and admission of students, in the recruitment and employment of faculty and staff, or in the operations of any programs and activities.

Designed for use during the period stated on the cover, this catalog gives a general description of Embry-Riddle Aeronautical University and provides

detailed information regarding the departments in the institution and curricula offered by the University. The provisions of the catalog do not constitute a contract between the student and the University. The faculty and trustees of Embry-Riddle Aeronautical University reserve the right to change, without prior notice, any provision, offering, or requirement in the catalog. This includes the right to adjust tuition and fees, as necessary. The University further reserves the right at all times to require a student to withdraw for cause.

Official University Photography

Embry-Riddle Aeronautical University reserves the right to photograph members of the University community, including, but not limited to, its students and faculty, in situations appropriate to the image of the academic institution, and to publish likenesses in Embry-Riddle Aeronautical University publications, videos, or other recruitment or promotional materials. However, the University will, to the extent feasible, honor requests of constituents who do not wish their images photographed or published.

2008-2009 GRADUATE PROGRAM CALENDAR

Deadlines for Daytona Beach Campus

Admission	Fall Semester 2008	Spring Semester 2009	Summer Semesters 2009
For U.S. Students	7/01/08	11/01/08	3/01/09
For International Students	7/01/08	11/01/08	3/01/09
Graduation Application	10/27/08	3/11/09	7/01/09
Thesis Defense	10/27/08	3/11/09	7/01/09

To be considered a Fall or Spring graduate, thesis defense must take place by specified dates.

To be considered a Summer A or Summer B graduate, students should check with their graduate program coordinator.



MESSAGE FROM THE PRESIDENT

To Our Students:

Thank you for choosing Embry-Riddle Aeronautical University for one of the most important investments you will make in your future. With thousands of students enrolled in our programs today, and over 85,000 alumni, you are now a member of a worldwide family of leaders in the aviation and aerospace industry.

Our commitment is to provide you with quality programs and faculty, as well as responsive and caring student services. In reviewing this catalog, you will see a broad range of academic opportunities that prepare our graduates for fulfilling careers in our global industry. Many courses include projects where you will work with others as a team to solve real-world challenges.

As you read the history of Embry-Riddle, it will be clear that our University is evolving. In 82 years we have grown from the world's finest aviation institute to an internationally respected comprehensive university, committed to teaching, research, and professional service to the aviation and space community.

I welcome you to an exciting and dynamic University, and to the Embry-Riddle experience.



John P. Johnson, Ph.D.
President



MISSION OF THE UNIVERSITY

Embry-Riddle Aeronautical University is an independent, nonsectarian, nonprofit, coeducational university with a history dating back to the early days of aviation. The University serves culturally diverse students motivated toward careers in aviation and aerospace. Residential campuses in Daytona Beach, Florida, and Prescott, Arizona, provide education in a traditional setting, while an extensive network of campus learning centers throughout the United States and abroad serves civilian and military working adults through ERAU-Worldwide. See: <http://spa.erau.edu/plan/mission2.htm>, for the entire mission.

It is the purpose of Embry-Riddle to provide a comprehensive education to prepare graduates for productive careers and responsible citizenship with special emphasis on the needs of aviation, aerospace, engineering, and related fields. To achieve this purpose, the University is dedicated to the following:

To offer undergraduate and graduate degree programs that prepare students for immediate productivity and career growth while providing a broad-based education, with emphasis on communication and analytical skills.

To emphasize academic excellence in the teaching of all courses and programs; to recruit and develop excellent faculty and staff; and to pursue research and creative activities that maintain and extend knowledge in aviation,

aerospace, and related disciplines.

To develop mature, responsible graduates capable of examining, evaluating, and appreciating the economic, political, cultural, moral, and technological aspects of humankind and society, and to foster a better understanding of the workings of the free enterprise system and its social and economic benefits, and of the profit motive, as vital forces to the potential of individuals and groups.

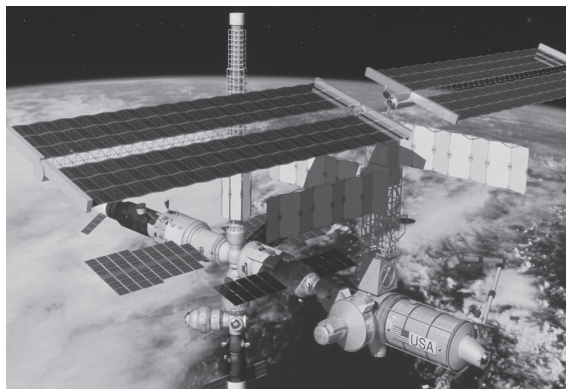
To promote ethical and responsible behavior among its students and graduates in the

local, national, and international aviation and aerospace communities and in the community at large.

To develop and effectively deliver educational programs for the adult student and professional at the undergraduate and graduate levels, including off-campus degree programs, short courses, online learning, noncredit programs, seminars, workshops, and conferences.

To support each student's personal development by encouraging participation in programs and services that offer opportunities for enhanced physical, psychological, social, and spiritual growth; and by complementing the academic experience and contributing to the development of a well-rounded individual prepared for personal and professional success.

To engage in research, consulting services, and related activities that address the needs of aviation, aerospace, and related industries.





EMBRY-RIDDLE AT A GLANCE

Aviation and Embry-Riddle: The Lifelong Partnership

At the beginning of the last century no flying schools existed, much less an aviation university. It was not until 1903 that the Wright brothers achieved sustained, controlled flight by a powered aircraft and, in so doing, changed life on this planet forever.

It did not take long for aviation to come of age. By 1914, regular passenger service had been inaugurated in Florida between St. Petersburg and Tampa. Later that year, war



T. Higbee Embry

came to the European skies. The combined effect of military and commercial demands produced a dynamic new industry.

Unlike many other developments at the end of the Industrial Revolution, aviation

required a special education — learning how to fly, learning about safety and weather, and learning about engines — from skilled maintenance to the outer limits of performance.

This need for trained pilots and mechanics quickly led to the establishment of a new type of school, one focused totally on aviation. In the beginning, these organizations were often a combination of airplane dealership, airmail service, flight training center, and mechanic school. The original Embry-Riddle operations fit that mold precisely.

On December 17, 1925, exactly 22 years after the historic flight of the Wright Flyer, barnstormer John Paul Riddle and entrepreneur T. Higbee Embry founded the Embry-Riddle Company at Lunken Airport in Cincinnati, Ohio. The following spring the



John Paul Riddle

company opened the Embry-Riddle School of Aviation, coinciding with the implementation of the Air Commerce Act of 1926, which required, for the first time, the certification and medical exam-

ination of pilots.

Although it was a volatile time for aviation enterprises, the school prospered. Others came and went regularly, but Embry-Riddle was not affected.

Within three years the school had become a subsidiary of AVCO, the parent of American Airlines. The school remained dormant during most of the 1930s, mirroring the casualties of the Great Depression. By the end of the decade, however, World War II erupted in Europe and the demand for skilled aviators and mechanics grew significantly. Embry-Riddle's second life was about to begin.

The Lunken Airport operation had long since disappeared, but in Florida Embry-Riddle opened several flight training centers and quickly became the world's largest aviation school. Allied nations sent thousands of fledgling airmen to the Embry-Riddle centers at Carlstrom, Dorr, and Chapman airfields to become pilots, mechanics, and aviation technicians. Some 25,000 men were trained by Embry-Riddle during the war years.

After the war, under the leadership of John and Isabel McKay, Embry-Riddle expanded its international outreach while strengthening its academic programs.

In 1965, with Jack R. Hunt as president, Embry-Riddle consolidated its flight, ground school, and technical training programs



Jack R. Hunt

into one location. This move, which proved to be a moment of singular importance, was made possible by Daytona Beach civic leaders who donated time, money, and the use of personal vehicles. The relocation signaled the rebirth of Embry-Riddle and

the start of its odyssey to world-class status in aviation higher education. In June 1970, Embry-Riddle changed its name from “Institute” to “University,” and resident centers were established at U.S. military aviation centers to serve the educational needs of active-duty military personnel. Application for Southern Association of Colleges and Schools accreditation through the Commission on Colleges was initiated in 1970 and received in 1972. The University has participated in the Self-Study process ever since.

Also under President Hunt’s leadership, Embry-Riddle opened a western campus in Prescott, Arizona, on the 511-acre site of a former college. With superb flying weather and expansive grounds, the Prescott campus has been an outstanding companion to the University’s eastern campus in Daytona Beach.

Continuing the legacy left behind by Hunt was Lt. Gen. Kenneth L. Tallman. Tallman was president of Embry-Riddle for five years. He came to the University after a distinguished 35-year military career that included service as superintendent of the U.S. Air Force Academy. Under Tallman’s



Lt. Gen. Kenneth L. Tallman

leadership, a school of graduate studies and the electrical engineering degree program were introduced. He led the University into research with the addition of the engineering physics degree

program. He also developed stronger ties between Embry-Riddle and the aviation/aerospace industry.

Dr. Steven M. Sliwa led the University from 1991 through 1998. Sliwa, the University’s third president, is best known for creating an entrepreneurial environment and for developing strategic partnerships with industry. These partnerships included



Steven M. Sliwa

a joint venture with FlightSafety International; a partnership with Cessna Aircraft Company; a technology alliance with IBM; and an exclusive educational partnership with the Aircraft Owners and Pilots Association. He

also spearheaded a \$100+ million capital expansion program, which included an \$11.5 million congressional line-item appropriation. In addition, new academic and research programs were created at his direction to respond to structural changes in the industry while increasing

Embry-Riddle at a Glance

market share in the University's core programs.

Embry-Riddle's fourth president, Dr. George H. Ebbs, led the University from 1998 through 2005. During his tenure the annual college guide produced by *U.S. News & World Report* consistently ranked Embry-Riddle's aerospace engineering program No. 1 in the nation among schools without doctoral programs. Embry-Riddle's programs in aerospace engineering, aeronautical science, and engineering physics are the largest in the nation.



Dr. George H. Ebbs

Under the leadership of Dr. Ebbs, new graduate degree programs in safety science and space science were introduced, as well as new undergraduate degree programs in computer science, global security and intelligence studies, mechanical engineering, software engineering,

and space physics. In addition, major construction was also initiated at both residential campuses.

Dr. Ebbs presided over three military contracts worth a total of more than \$57 million. Under those contracts Embry-Riddle provides aviation-related degree programs to the U.S. military in Europe, trains Air Force, Air National Guard, and international flight safety officers at Kirtland Air Force Base in Albuquerque, N.M., and trained Air Force pilots at the U.S. Air Force Academy in Colorado Springs, Colo.



Dr. John P. Johnson

Dr. John P. Johnson is the University's fifth president. He previously served as Embry-Riddle's interim president and as provost and chief academic officer. Under his leadership the University has expanded its research activity, has established new degree programs,

and is developing a global strategy to take its aviation and aerospace expertise overseas. Before joining Embry-Riddle, Dr. Johnson was the provost and vice-president for academic affairs at Texas A&M University, Texarkana, and served as dean at the Medical University of South Carolina and at Northern Kentucky University.

Embry-Riddle is a global institution that holds a prominent position in aviation/aerospace education. The University is the world's largest independent aeronautical university and boasts a student body of 34,000 who come from all 50 states and 86 nations. The University offers more than 30 degree programs at the bachelor and master level. Embry-Riddle provides flexible educational services to thousands of working adults through its Worldwide Campus, which has more than 130 campus centers in the United States, Europe, Canada, and the Middle East, and also offers online learning.

REGIONAL ACCREDITATIONS AND AFFILIATIONS

Accrediting Bodies and Affiliations

Embry-Riddle Aeronautical University consists of three campuses: the Daytona Beach campus, the Prescott campus, and the Worldwide Campus. Daytona Beach and Prescott are residential campuses, whereas Worldwide has over 130 campus centers serving adult learners in the United States and abroad. Embry-Riddle Aeronautical University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (1866 Southern Lane, Decatur, GA 30033-4097, Telephone: 404-679-4501) to award degrees at the associate, bachelor, and master levels.

Further Specialized Accreditations

At the Daytona Beach campus: The bachelor degree programs in Aerospace Engineering, Civil Engineering, Computer Engineering, Engineering Physics, Mechanical Engineering and Software Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) (111 Market Place, Suite 1050, Baltimore, MD 21102-4012, Telephone: 410-347-7700). The bachelor degree programs in Aeronautical Science, Aerospace Electronics, Air Traffic Management, Applied Meteorology, Safety

Science, and the Business Administration programs are accredited by the Aviation Accreditation Board, International (AABI). The Aviation Maintenance Science degree is also accredited by AABI for the following two Areas of Concentration: Maintenance Management and Aerospace Electronics. The bachelor degree programs in Business Administration and the Master of Business Administration program are accredited by the Association of Collegiate Business Schools and Programs (ACBSP). The certificate programs in Maintenance Technology (airframe and power plant); Flight (private, commercial, instrument, multi-engine, flight instructor, and instrument flight instructor ratings); and Flight Dispatch are each approved by the Federal Aviation Administration (FAA).

At the Prescott campus: The bachelor degree programs in Aerospace Engineering, Computer Engineering, and Electrical Engineering are accredited by ABET. The bachelor degree programs in Aeronautical Science and Aviation Business Administration are accredited by AABI. Certificate programs in Flight (private, commercial, instrument, multi-engine, flight instructor, and instrument flight instructor ratings) and Flight Dispatch are approved by the FAA.

STATEMENT OF VALUES

Student Success

We understand that students are the lifeblood of Embry-Riddle. We focus and commit ourselves and our resources to the success of current, past, and future students. Our success is gauged by the difference we make in our students' lives.

Learning Environment

We seek intellectual growth through study, research, questioning, listening, and debate. We value the enlightened interchange of ideas as we challenge one another to do more, to study, to learn, to share, and to grow. We expect members of the student body, faculty, and administration to exercise their academic freedoms and to preserve those of others. We commit ourselves to a lifelong endeavor of learning. We are all teachers and we are all students.

Safety

We care deeply about the health and safety of our students and fellow employees. We believe that each one of us, from the administration to the flight instructors, has a responsibility to make our workplaces safer for everyone. We support the open sharing of information on all safety issues and encourage all employees and students to report significant safety hazards or concerns.

Integrity, Honesty, and Trust

Integrity is the most valued employee trait. We believe that honesty is the foundation for interaction in all academic, administrative, and personal matters. The leadership team and each individual bear the responsibility for earning the trust of others.

Diversity

We respect the rights and property of all individuals regardless of gender, race, ethnicity, national origin, age, physical disability, economic background, sexual orientation, or religious belief. We believe in a community where all members are welcome, and individuals or groups are free from harassment.

Communication

We speak candidly and we listen well. We hold that if every involved party has taken part in a decision, then everyone will support the decision. We believe that clear and frequent communication is essential for our safety, our relationships, and our productivity.

Process and Teamwork

We believe that the process of collegial decision-making contributes to the quality of the decisions. We also understand and appreciate that the most successful outcomes occur when organizational units work cooperatively as teams.

Character

We accept responsibility for our actions. When we see a problem, we do not pass it off, we do not complain, we act. We involve others as appropriate to achieve our goals. We prize dedicated, committed, caring, conscientious, and creative individuals who strive for excellence in the performance of their duties and responsibilities.

Change and Growth

We appreciate that great organizations like Embry-Riddle are constantly changing, adapting to external pressures, and growing. All of our work units are constantly improving quality. We realize that our jobs require us to grow professionally and take on more responsibility. Growth requires calculated risk-taking and we empower one another to take appropriate risks and learn from our mistakes. We believe in a willingness to challenge traditions and constantly seek innovative ways to manage and solve problems.

Fiscal Soundness and Investments

We understand we must operate efficiently and effectively so that investments can be made in our capabilities and ourselves. We invest in technology as appropriate, principally to increase the quality and frequency of our interactions in support of our mission.

Attitude

We recognize, endorse, and empower leadership at all levels. We understand the joy of living in harmony with one another and strive to maintain an open, productive environment. We prize an upbeat, can-do attitude. We are members of the Embry-Riddle community because we want to be here, and this positive attitude is reflected in our communications with one another and our students.

EMPLOYEE CREED

Adopted by Jack R. Hunt in 1975

Updated and reaffirmed by President George H. Ebbs, Ph.D., 2003

A STUDENT...

Is the most important person in this university.

A STUDENT...

Is not an interruption of your work, but the purpose of it.

A STUDENT...

Is not a cold statistic, but a flesh-and-blood human being with feelings and emotions like your own.

A STUDENT...

Is not someone to argue or match wits with.

A STUDENT...

Is a person who brings us needs - it is our job to fill those needs.

A STUDENT...

Is deserving of the most courteous and attentive treatment we can provide.

A STUDENT...

Is the person who makes it possible to pay your salary whether you are faculty or staff.

A STUDENT...

Is the lifeblood of this and every university.

A STUDENT...

Is something you once were, REMEMBER?

UNIVERSITY INFORMATION

Embry-Riddle Aeronautical University is the world's oldest and largest fully accredited university specializing in aviation and aerospace. As a global institution, the University educates 34,000 students annually at its residential campuses in Daytona Beach, Florida, and Prescott, Arizona, and through its Worldwide Campus.

There are approximately 4,890 undergraduate and graduate students enrolled at the Daytona Beach campus, 1,630 at the Prescott campus, and 27,400 at the Worldwide Campus.

Our students hail from all 50 states and 86 nations. At the Daytona Beach campus, the top five states of origin in descending order are Florida, New York, Pennsylvania, New Jersey, and Texas. At the Prescott campus, the top five states of origin in descending order are California, Arizona, Texas,

Colorado, and Washington.

International students make up 9 percent of the student body at Daytona Beach and 4 percent at Prescott, with India at the top, followed by Korea and Kenya. At the residential campuses, females constitute 17 percent of the student population.

The 185-acre Daytona Beach campus is located next to Daytona Beach International Airport. High-technology industries in the Daytona Beach and Orlando areas, as well as the Kennedy Space Center, provide the University with an outstanding support base. The campus offers state-of-the-art facilities, including the College of Aviation building, which has air traffic control simulation and research labs and a weather center. The Lehman Engineering and Technology Center houses the technology for online learning, videoconferencing,



University Information

decision support systems, and three-dimensional modeling. The Advanced Flight Simulation Center contains an FAA-certified Level-6 CRJ200 simulator and Level-6 Frasca FTDs that provide a level of on-campus training unique to higher education. In addition, the Daytona Beach campus has just completed a new academic hall for the College of Business, including high-tech classrooms and faculty offices.

The University's 539-acre western campus in Prescott is located 100 miles north of Phoenix. New buildings include the Udvar-Hazy Library and Learning Center, the Academic Complex, the Aerospace Experimental and Fabrication Building, and the Visitors Center. Also of note are the King Engineering and Technology Center, which is electronically linked to the Daytona Beach campus; the Robertson Aviation Safety Center, which is dedicated to the study of human factors, aircraft accident investigation, and aviation safety; and the Robertson Flight Simulation Center, which contains Frasca and Airbus A320 flight-training devices. In support of academic instruction are various laboratories for engineering graphics, materials, aircraft structures and composites, and basic circuits and electronic devices, in addition to a supersonic wind tunnel and shock tube.

The Worldwide Campus provides educational opportunities for civilian and military professionals who are unable to attend classes at one of the University's residential campuses. Its academic programs are offered in the classroom through a network of more than 130 campus centers in the United States, Europe, Canada, and the Middle East and through Web-based online

learning. The Worldwide Campus headquarters is in Daytona Beach.

Embry-Riddle offers the student a choice of more than 30 undergraduate and graduate degree programs in aviation, aerospace, business, engineering, and related high-tech fields. *U.S. News & World Report's* "Best Colleges" guide ranks Embry-Riddle's aerospace engineering program No. 1 in the nation among schools without doctorate programs. Our aerospace engineering program is also the largest in the nation. The University's engineering physics program is the largest of all ABET-accredited engineering physics programs and is considered one of the best in the nation.

Embry-Riddle's undergraduate aeronautical science (professional pilot) program is the largest in the world; it's as large as the other top 10 U.S. collegiate flight programs combined. The program is supported by 99 instructional aircraft and 42 simulators. Embry-Riddle's precision flight teams consistently rank among the top in the nation in the SAFECON competition sponsored by the National Intercollegiate Flying Association.

While pursuing their education, our students gain valuable experience through participation in cooperative education and internship programs. Some 369 students were awarded co-op or intern positions during the 2006-2007 academic year. Students also accrue skills by assisting faculty members in conducting solution-oriented research and consulting projects for the aviation, aerospace, and other industries. In fiscal year 2006-2007, some 171 faculty members were involved in research and other activities with 151 sponsored

projects. The total value of all active awards was more than \$27 million.

Within one year of graduation, 96 percent of Embry-Riddle graduates are either employed or have decided to continue their education. The major airlines hire more alumni from Embry-Riddle than from any other collegiate aviation program, and Embry-Riddle is the nation's largest supplier of air traffic controllers with bachelor degrees to the FAA.

Over the decades, Embry-Riddle has educated and trained thousands of men and women of the U.S. armed forces. The two Air Force ROTC detachments at Embry-Riddle's residential campuses form the largest university-based Air Force commissioning source in the nation. The detachments also produce more commissioned officers and more pilots and other rated officers for the Air Force than any other institution in the nation except the Air Force Academy. The University also hosts Army and Navy ROTC units. Currently Embry-Riddle has a contract with the U.S. Department of Defense that maintains the

University's long-time status as the sole provider of aviation-related degree programs to the U.S. military in Europe. Under another contract, Embry-Riddle provides training to Air Force, Air National Guard, and international flight safety officers at Kirtland Air Force Base in Albuquerque, N.M.

As aviation and aerospace continue to evolve, so does Embry-Riddle. The University is committed to the expansion of opportunities for students to work more closely with the aviation industry in the United States and in other nations. Guiding the process of evolution are dedicated teachers, administrators, alumni, trustees, and advisory board members who share our students' love of aviation and who strive to ensure Embry-Riddle's continued position as the world's premier aviation and aerospace university.

ADMISSION TO THE DAYTONA BEACH CAMPUS

General Procedures

New students are eligible for admission at the beginning of the fall, spring, and summer terms. High school students may apply at the beginning of their senior year. Applications received after the priority filing dates will be processed on a space-available basis.

Term	Filing Priority	Notification	Deposit
Fall	March 1	Rolling	May 1
Spring	November 1	Rolling	November 1
Summer Term A	April 1	Rolling	As requested
Summer Term B	June 1	Rolling	As requested

For more information and to request an application, contact the Admissions Office at:

Embry-Riddle Aeronautical University
Director of Admissions
600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114-3900
(386) 226-6100 or (800) 862-2416
email address: dbadmit@erau.edu
<http://www.embryriddle.edu>

First-Year Applicant

The University defines a first-year candidate as one who is applying for degree status directly from high school. The University offers admission to all applicants who present an academic record that demonstrates their ability to graduate. To reach an admissions decision, the following information is considered: overall academic performance and grades, rank in class (if available), and standardized test scores. The University's Admissions Office implements established academic policies and requirements that define the necessary qualifications for admission.

Entrance requirements to the University include 4 years of English; 3 years mini-

um, 4 years preferred college preparatory mathematics; 3 years of social science; and 2 years of science including a laboratory science, 3 years preferred. Additional courses may be required depending on the major selected. Admitted students usually present more than the minimum requirements. The University reserves the right to change entrance requirements without prior notice.

Standardized Testing

SAT I reasoning test or ACT is strongly recommended for admission for U.S. citizens and permanent residents. International students, please see page 23 for further admission requirements.

English Language Proficiency

Admissions encourages all of our applicants for whom English is not the primary language spoken at home to take the TOEFL exam to supplement their verbal SAT I score. This information will aid the University in accurately assessing verbal skills. For more information about testing dates and locations, contact:

Admission to the Daytona Beach Campus

TOEFL Services

Educational Testing Service
P.O. Box 6151
Princeton, NJ 08541-6151
1-609-771-7100 (worldwide)
1-877-863-3546
<http://www.toefl.org>

-OR-

The College Board

5 Columbus Ave.
New York, NY 10023
(212) 713-8000

-OR-

The College Board

Box 1025
Berkeley, CA 94701
<http://www.collegeboard.com>

For more information, contact the Embry-Riddle Language Institute at:

Daytona Beach Campus
(386) 226-6192
fax: (386) 226-6165
email: erli@erau.edu

Transcripts

The Admissions Office accepts either an official secondary school transcript or the General Education Development Certificate (GED). An official transcript or GED score report must be sent directly from the issuing institution to Embry-Riddle.

Transfer Applicants

The University welcomes applicants who have demonstrated success at other institutions of higher education. For purposes of admission, a transfer student is defined as any student who has earned college credit or military credit after graduating from high school.

In making transfer admission decisions,

the Admissions Office reviews official transcripts of all college-level work attempted and completed. Transfer candidates who have earned under 30 college-level credit hours are also required to submit an official final high school transcript. The minimum grade point average required for admission to Embry-Riddle is a 2.00 from the last institution attended and a combined GPA of 2.00. Most successful transfer applicants present at least a 2.50 (C+) average on a four-point scale. Applicants with grade point averages between a 2.00 and a 2.40 will be reviewed on a case-by-case basis.

The University reserves the right to refuse admission to students who are on probationary status or who were academically dismissed from other colleges or universities. If the University admits such students, they will be admitted with conditional status.

Transfer Credit

1. Transfer credit may be granted under the following conditions:
 - a. Appropriate coursework completed at another accredited institution with a grade of A, B, C, P, or equivalent will be accepted.
 - b. Grades are not transferable.
 - c. Previous flight experience may be accepted in accordance with the Embry-Riddle policy as stated in the Advanced Standing section of this chapter. Credit hours are transferable if earned at institutions accredited by the appropriate agency. Academic credit is accepted without regard to the date the course was completed. It is left to the discretion of the student, in consultation with the student's academic advisor, to determine whether to retake the courses when placement testing

Admission to the Daytona Beach Campus

indicates a deficiency. Embry-Riddle has sole discretion in determining which and how many transfer credit hours will be accepted toward degree requirements.

- d. Embry-Riddle evaluates previous academic credit on a course-by-course basis. Acceptable transfer work will be indicated on the Embry-Riddle transcript. If classes are not applicable to the student's degree program at Embry-Riddle, they will be considered as electives in excess of minimum degree requirements. The level of credit (upper or lower division) is determined by evaluation of the course at Embry-Riddle.
2. Embry-Riddle may, at its discretion, require an evaluation examination for any course submitted for transfer credit if there is doubt concerning the equivalency of the transfer course with a similar course offered at Embry-Riddle. Embry-Riddle cannot guarantee that courses are transferable. Courses are accepted at the discretion of the University.
3. The transfer student's records (transcripts, etc.) will be evaluated according to the rules and regulations as described in this catalog, and in accordance with University policies in effect at the time of the student's admission to a degree program. After evaluation, the student will be sent a course-by-course outline of all transfer credit accepted by the University.

Nontraditional Student Applicants

Embry-Riddle acknowledges that full-time employment experiences often provide the motivation and discipline to be a successful

student in college. If a student's academic career has been interrupted for a minimum of three years due to personal or financial reasons, the care of dependents, or serving time in the U.S. military, Embry-Riddle considers the student a nontraditional applicant and recognizes that his/her high school academic record may not accurately reflect the student's ability. When reviewing the student's application, unique circumstances are taken into account prior to determining whether the applicant should be a first-year or transfer student. If a GED (General Education Development Certificate) has been earned, an official copy of the results must be sent from the issuing agency. The following items must be provided by those wishing to be considered for admission:

1. Completed application form and \$50 application fee (nonrefundable).
2. Official copy of high school transcript or completion of the General Education Development Test (GED scores must be sent directly by the testing agency).
3. Documentation of activities or full-time employment experience (civilian, military, or any combination equaling three years).

Returning Student Applicants

An Embry-Riddle student whose attendance at the University is interrupted may be required to apply for readmission. In such cases, a new application for admission must be filed with the Director of Admissions. For more information, refer to the Continued Enrollment section of the catalog.

Nondegree Seeking Applicants

Embry-Riddle recognizes the needs of work-

Admission to the Daytona Beach Campus

ing adults who are interested in furthering their education for retraining or for enhancing professional skills. Students who meet University admission requirements are permitted to enroll in courses as special students in a nondegree seeking status. These students are permitted to continue their enrollment as long as they maintain satisfactory academic status or until they file a formal application for admission as a degree-seeking student. Persons interested in applying as nondegree seeking students can get more information from the Director of Admissions.

International Applicants

Refers to nonresident, nonimmigrant students planning to study in the United States (typically on an F-1 or a J-1 visa.) The following items must be provided:

1. Completed application form and \$50 application fee (nonrefundable).
2. Official copy of upper secondary school academic records (must be sent directly from the school to Embry-Riddle). These records must arrive in the Admissions Office in the original envelope with an unbroken seal to be considered official. Both original language documents and English translations are required.
3. Standardized Test Scores
The SAT I: Reasoning Test or the ACT is strongly recommended for admission. Standardized test results are always reviewed in conjunction with your academic record and are never the sole factor used to determine eligibility. For information about the SAT/ACT test dates and locations please contact:

The College Board
5 Columbus Ave.
New York, NY 10023
(212) 713-8000

-OR-

The College Board

Box 1025
Berkeley, CA 94701
<http://www.collegeboard.com>

-OR-

ACT

500 ACT Drive
P.O. Box 168
Iowa City, IA 52243-0168
(319) 337-1270
<http://www.act.org>

4. TOEFL Scores

To be admitted into a degree program, international students who will not be graduating from an English educational system or for whom English is not the primary language must submit official TOEFL scores. The preferred score for admissions is a 213 (computer based) or 550 (paper based). Students scoring below the preferred score may be deferred for enrollment to our Embry-Riddle Language Institute (ERLI). Admission to ERLI does not guarantee admission to an Embry-Riddle degree program. Admissions also encourages all applicants for whom English is not the primary language spoken at home to consider taking the SAT I to supplement their TOEFL score. This additional information will aid the University in accurately assessing verbal skills. For more information about testing dates and locations contact:

TOEFL Services

Educational Testing Service
P.O. Box 6151
Princeton, NJ 08541-6151
1-609-771-7100 (worldwide)
1-877-0863-3546
<http://www.toefl.org>

Admission to the Daytona Beach Campus

Additional information about the Embry-Riddle Language Institute is available by contacting the program at:

Daytona Beach Campus
(386) 226-6192
fax: (386) 226-6165
email: erli@erau.edu

5. Transcripts from international postsecondary institutions. An official copy of record of study, grade obtained, examinations passed, and any diplomas, certificates, or degrees received at all secondary, postsecondary, university, and professional schools attended must be sent directly to Embry-Riddle by the school. These records must arrive in the Admissions Office in the original envelope with an unbroken seal to be considered official. Both native documents and English translations are required. In addition, applicants may be required to have these transcripts evaluated by an outside evaluation service. If so required, the applicant will receive specific instructions about obtaining the evaluation during the admission process. The fee charged for this service is the responsibility of the applicant. The service provider must send the evaluation directly to Embry-Riddle. Following is a list of international translation and evaluation providers approved by Embry-Riddle:

American Association of Collegiate Registrars & Admissions Officers (AACRAO).

One Dupont Circle, NW
Suite #520
Washington, DC 20036-1135
(202) 296-3359
fax: (202) 872-8857

Academic Credentials Evaluation Institute Inc.

P.O. Box 6908
Beverly Hills, CA 90212
(310) 275-3530
(Request an evaluation relative to courses in the Embry-Riddle catalog.) (This is the preferred evaluator service for the Prescott campus.)

Educational Credential Evaluators Inc.

P.O. Box 92970
Milwaukee, WI 53202-0970
(414) 289-3400
(Request course-by-course evaluation.)

Foreign Credential Evaluations Inc.

1425 Market Blvd.
Suite 330
PMB #305
Roswell, GA 30338
(770) 642-1108
fax: (770) 641-8381

International Education Research Foundation Inc.

P.O. Box 66940
Los Angeles, CA 90066
(310) 258-9451
(Request a course-by-course evaluation.)

Josef Silny & Associates

P.O. Box 248233
Coral Gables, FL 33124
(305) 666-4133
email: info@jsilny.com
(Request course-by-course evaluation.)

World Education Services (WES)

P.O. Box 745, Old Chelsea Station
New York, NY 10113-0745
(800) 937-3898 -or- (212) 966-6311
fax: (212) 966-6395
email: info@wes.org
(Request course-by-course evaluation.)

Admission to the Daytona Beach Campus

6. I-20 Requirements for International Students. Upon application, international students must submit the following:
 - a. Affidavit of Financial Support for International Students (see application booklet)
 - b. Supporting bank letter verifying appropriate funds on deposit.* This amount will reflect the amount needed to cover tuition, fees, books, health insurance, and living expenses for one year, plus \$3,000 for each accompanying dependent. In the case of sponsored students, an official notification of public or private sponsorship will take the place of a bank letter. A University assistantship contract does not relieve a student from the requirement to provide both a financial affidavit and a supporting bank letter, unless waived by the appropriate University official. International students must be fully prepared upon arrival on campus to meet all normal living expenses and manage their finances for the period of time required to complete the degree.

* See application for specific dollar amount requirement.

- c. At least 30 days prior to matriculation, students accepted for admission must submit a \$200 advance tuition deposit, along with an admitted student enrollment form to confirm enrollment to the University. This form will be provided to accepted students by the Admissions Office. The deposit will be held in the student's account for one year and will be credited toward tuition during the first semester of attendance. After one

year, if the student has not matriculated, the deposit is forfeited.

- d. The I-20 Form must be in the student's possession before departure and presented to the nearest U.S. embassy or consulate to obtain the necessary entry visa before departure to the United States.
 - e. The I-20 will be issued to the student upon acceptance to the University, if all required documentation has been received.
 7. Provide documentation of immunity to vaccine-preventable diseases as described in material sent from the University. At enrollment, all students from areas determined to be endemic or at high risk for tuberculosis will be required to have a tuberculosis skin test (Mantoux test) and additional medical follow-up as needed and directed by the campus Health Services Office.
 8. All flight students must provide an FAA Medical Certificate, Class I or II, at least 60 calendar days before the desired enrollment date. Students who do not have access to an FAA-approved physician may take this exam after arriving in the United States.

International students desiring flight programs will be required to complete federal screening procedures where applicable.*

* Specifics will be provided during application process.

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Admission to the Daytona Beach Campus

SEVIS

SEVIS is the Student and Exchange Visitor Information System, consisting of a governmental computerized system to maintain and manage data related to foreign students and exchange visitors during their stay in the United States. This system allows for real-time access to this information and assists colleges and universities in ensuring that students comply with the terms of their visas. For more information about SEVIS, please refer to the Bureau of Immigration and Customs Enforcement (ICE) Web site at <http://www.ice.gov/sevis/>.

English As A Second Language — Embry-Riddle Language Institute (ERLI)

The Embry-Riddle Language Institute (ERLI) is an intensive English program providing English language instruction and cultural orientation to non-native speakers of English. Most of our students plan to attend Embry-Riddle Aeronautical University, but we also welcome others who want only to improve their English language ability. If you desire to become more proficient in listening, speaking, reading, and writing the English language, this intensive English program is for you. Students benefit from a computer laboratory with up-to-date language-learning software and TOEFL preparation software. Students who wish to attend Embry-Riddle Aeronautical University can be granted conditional acceptance pending completion of our program or a passing TOEFL score, assuming they meet all other University admission requirements. Eligible students are also able to earn a part-time recommendation after successful completion of

a semester at ERLI, which allows them to begin their University studies while continuing their English language studies. Other benefits of our program include field trips, social events, and full access to all Embry-Riddle Aeronautical University facilities.

For more information please contact:
Embry-Riddle Language Institute
600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114-3900
(386) 226-6192
fax: (386) 226-6165
email: erli@erau.edu

Admitted Student Information

Domestic students accepted for admission must submit a \$200 advance tuition deposit by the stated date. This deposit confirms attendance to the University and is credited toward the first semester's tuition.

If you decide to accept our offer of admission for the fall term, you must submit the tuition deposit by the Candidates Common Reply date of May 1. Spring term deposit date is Nov. 1. Summer term deposit dates are April 1 for summer A and May 1 for summer B.

The deposit will be held in the student's account for one year should the student enroll during that year. After one year the deposit is forfeited.

A student who cancels the application at any point in the admissions process may reactivate the application without a fee for one year at any time up to the admissions deadline for the same semester of the following academic year. After one year, a new application, fee, and supporting documents must be submitted.

Advanced Standing

Advanced standing may be awarded for prior learning achieved through postsecondary education, testing, work and/or training experience, or programs completed before enrollment at Embry-Riddle. Students who feel their background warrants consideration for advanced standing not already granted for specific courses may request course equivalency examinations. Flight experience will be evaluated in accordance with procedures outlined later in this section.

It is the student's responsibility to ensure that all documentation is submitted to the University. This information can either be sent with the application for admission or mailed under separate cover. Formal application for advanced standing for flight training must be made before the end of the student's first semester of attendance at the appropriate campus.

All academic evaluations for advanced standing will be completed before the end of the student's first semester of attendance at, or readmission to, the University. The student will be given a copy of the completed official evaluation and have 30 calendar days to question the credit awarded. Advanced standing and transfer credit granted in accordance with these procedures will be authenticated by the Admissions Office and maintained by the campus Records Office. Documentation that may be submitted for consideration toward advanced standing includes military training, FAA certificates, credit for examination scores, and professional experience. Credit may be awarded as follows:

1. The University offers advanced placement credit toward a college degree to those students who present official

College Entrance Examination Board (CEEB) Advanced Placement Test scores of 3 or better on any examination. Up to 30 hours of International Baccalaureate (IB) credit may be earned for official test scores of 4 or higher.

2. Embry-Riddle follows the standards recommended by the American Council on Education for awarding credit for the College Level Examination Program (CLEP) general examinations. To be officially evaluated for credit, the test scores must be submitted before the student's initial enrollment as a degree candidate. The number of credit hours recognized by Embry-Riddle for these examinations in various disciplines are as follows:

Communications	6 credit hours
Humanities	6 credit hours
Social Sciences	6 credit hours
Natural Sciences	6 credit hours
Mathematics	6 credit hours
3. The University has approved certain CLEP subject examinations, Defense Activity for Non-Traditional Educational Support (DANTES) examinations, and Excelsior College Examination (ECE) for award of credit as applicable to the student's program. Scores from these examinations must be submitted before initial enrollment as a degree candidate to be officially evaluated for credit. Credit for these examinations may not be applied toward the last 30 credit hours required for a bachelor degree or the last 15 credit hours required for an associate degree.
4. Training in military service schools will be considered for credit by each curriculum division, based on the recommendation of the American Council on Education.
5. Students who hold a pilot certificate

Admission to the Daytona Beach Campus

may be eligible for advanced standing. Advanced standing based on a pilot certificate may be awarded for the appropriate flight course. A student who received college credit for their flight training may be eligible for advanced standing for certain academic courses. Contact the Aeronautical Science Department for a determination of the exact amount of credit to be awarded. In any case, advanced standing credit must be applied for during the first semester. To obtain credit, the applicable FAA certificate must be presented at the time that the advance standing request is made. All advanced standing credit for flight courses will be recorded on academic transcripts at Embry-Riddle.

6. Students holding a Commercial Pilot Certificate or Airline Transport Pilot Certificate, with significant recent experience beyond the basic certification level, may petition for additional credit. Students may be required to complete a flight evaluation or successfully complete a flight course on campus before becoming eligible to enroll in any off-campus Embry-Riddle affiliated airline training program. All certificate levels refer to U.S. FAA certificates. Foreign certificate holders must convert their licenses to FAA-issued certificates prior to any credit being awarded.
7. Students who hold the FAA Airframe and Powerplant Certificate may receive advanced standing.
8. The Aeronautics degree awards college credit based on an individual's past training and job experience in an aviation-related field. A description of advanced standing applicable to the Aeronautics

degree may be found in the Academic Programs section of the catalog.

9. A student who possesses qualifications not listed above and who believes that his/her background warrants consideration for advanced standing may submit appropriate evidence of credentials for evaluation.

Degree Completion Program/ Active Duty Military Personnel

All branches of the armed services offer various "Bootstrap" and degree completion programs. Embry-Riddle welcomes applications from qualified military personnel seeking to participate in such programs.

Applications must be submitted by established deadlines. Upon receipt of the student's application and supporting documents, the University will evaluate previous college coursework, military education, and work experience to determine eligibility for advanced standing. Each applicant receives a copy of the University evaluation form stating specifically the courses for which credit has been given.

Immunizations

To register for classes, entering students born after Dec. 31, 1956, must submit certified proof of immunization with two doses of MMR (measles/mumps/rubella) vaccine. These immunizations must have been administered after the student's first birthday with live virus vaccines. Students living on campus must also show proof of meningitis and hepatitis B vaccinations or sign and submit a waiver to decline them. For more information, refer to the University's Medical Report Form.

FAA Medical Certificate

Each student who is accepted as a flight student must submit a copy of the FAA Medical Certificate, Class I or II, at least 60 calendar days prior to the desired enrollment date

Graduate Admissions

Embry-Riddle seeks graduate students of good character who have demonstrated scholastic achievement and capacity for future growth. Our admission process is aimed at identifying the best students who show the potential to succeed in one of our graduate programs. We use the guidelines in the next section to determine which applicants are to be granted full admission to a graduate program. Students who fail to meet these guidelines but who are judged to have potential for success in a graduate program may be granted conditional admission (subject, of course, to openings in the graduate program). Students admitted under conditional status will have to prove their ability to pursue a graduate program by meeting specific performance criteria after matriculation at the University.

Admission actions are often taken in the anticipation of the applicant successfully completing the baccalaureate or some other admission requirement. **Admission granted by such actions is provisional and is automatically rescinded if the applicant fails to meet the requirement before the specified date for the start of graduate study.**

Specific programs may require that potential degree candidates display a mastery of a number of topical areas critical to the initiation of graduate-level study in their fields. Candidates are informed of these requirements along with their notification of acceptance.

Any questions relating to the criteria or any other aspect of the admissions process should be addressed to the Graduate Admissions Office on the Daytona Beach or Prescott campus.

General Criteria

Applicants must possess an earned baccalaureate degree or equivalent.

If earned in the United States, this degree must be from an appropriately accredited college, university, or program.

If earned outside the United States, the degree must be from an institution that offers a degree program that is equivalent to one in an appropriately accredited college, university, or program in the United States. Applicants educated at foreign schools may be required to submit an evaluation by submitting official certified documentation of their educational achievements to an international education evaluation organization specified by Embry-Riddle.

A well-defined process will be used to determine whether a student is fully qualified for admission to a specific graduate program. Criteria for making this judgment will include academic record, work experience, professional activities, publications, recommendations, written statements, and interviews, as appropriate.

Articulation of applicable courses to meet program requirements or course prerequisites may be required as a condition of admission.

In most cases, students required to complete undergraduate prerequisites as conditions of their admission will receive conditional status admission. Upon successful completion of the appropriate undergraduate prerequisite courses, these students will transition to full graduate student status.

Admission to the Daytona Beach Campus

While in conditional status, these students are not eligible for assistantship opportunities.

Program-Specific Criteria

In addition to the general criteria for admission, some of our graduate programs have additional program-specific admission criteria.

Master of Science in Aeronautics (MSA)

Applicants for admission to the MSA program must have prerequisite knowledge in the areas of

- Psychology
- Economics
- Computer Applications
- Mathematics

If they do not possess such knowledge, they may be required to register for undergraduate prerequisite courses in these areas. The student should possess a strong academic record, generally evidenced by a CGPA of 2.50 or higher.

Master of Science in Aerospace Engineering (MSAE) and Master of Aerospace Engineering (MAE)

An applicant's degree should be a Bachelor of Science degree in Aeronautical or Aerospace Engineering, or equivalent. If earned in the United States, the degree must be from an ABET-accredited program. The student should possess a strong academic record, generally evidenced by a CGPA of 3.00 or higher. During the course of study the student will not be permitted more than three C's in order to continue in the program. Furthermore, if the student fails a course during the course of study he/she will be

dismissed from the program. The GRE exam, although not required, will be considered for scholarship/assistantship purposes if scores are submitted.

Students with a Bachelor of Science or equivalent degree in other engineering disciplines, mathematics, or physical science, who otherwise meet the requirements for full admission, may also be admitted to the MSAE or MAE program.

Master of Business Administration (MBA)

Applicants for admission to the MBA program are required to take the Graduate Management Admission Test (GMAT) prior to matriculation. Students who have not taken the GMAT and/or achieved the minimum score will not be permitted to register for MBA classes regardless of their status. Coordinators may waive the requirement if another master degree has been completed. The student should possess a strong academic record, generally evidenced by a CGPA of 3.00 or higher.

Applicants must have prerequisite knowledge in the areas of

- Management
- Quantitative Methods
- Accounting
- Marketing
- Finance
- Economics

If they do not possess such knowledge, they may be required to register for modules or undergraduate business courses in these areas.

For information on GMAT Administration, see <http://www.mba.com>.

Master of Science in Human Factors and Systems (MSHFS)

Applicants for admission to the MSHFS program must have prerequisite knowledge in the areas of

- Psychology
- Statistics

If they do not possess such knowledge, they may be required to register for undergraduate prerequisite courses in these areas. The student should possess a strong academic record, generally evidenced by a CGPA of 3.0 or higher.

Applicants to the MSHFS program must submit GRE scores.

Note: The MSHFS program starts new students only in the Fall semester of each academic year. All applications submitted will be processed for a Fall admission date.

Master of Software Engineering (MSE)

Applicants for admission to the MSE program must have prerequisite knowledge in the areas of

- Discrete Mathematics
- Data Structures and Algorithms
- Computing Systems (operating systems, computer architecture)
- Programming involving high-level language (for example, C/C++, JAVA, Ada, Visual Basic)

If they do not possess such knowledge, they may be required to register for undergraduate prerequisite courses in these areas. The student should possess a strong academic record, generally evidenced by a CGPA of 3.00 or higher, along with a creditable background in computing.

The GRE exam, although not required, is strongly encouraged for this degree pro-

gram. For consideration of fellowship and assistantship award programs offered by the Department of Computing, GRE scores are required.

Master of Science in Engineering Physics (MSEP)

Applicants for admission to the MSEP program must possess a baccalaureate degree in engineering, physics, chemistry, or mathematics. The GRE exam, although not required, is strongly encouraged for this degree program. The student must possess a strong academic record, generally evidenced by a CGPA of 3.00 or higher.

Conditional Admission

1. Students who fail to satisfy the guidelines for full admission but are judged to have potential for success in a graduate program may be granted conditional admission. Students admitted under conditional status must prove their ability to pursue a graduate program by meeting specific performance criteria after matriculation at the University.
2. Students admitted on conditional status will be monitored closely as to scholarly performance. Students who are admitted conditionally will be on conditional status until they have completed nine hours of graduate work. During this period, students may receive no grade lower than a B. Students will not be permitted to repeat courses during this period.
3. The conditions of admission will be communicated to applicants in the letter of admission. Students are fully admitted to the program when the conditions have been properly satisfied.

Admission to the Daytona Beach Campus

Procedures for Admission

Applications will not be processed until all required documents are received. Applications received after the submission deadlines stated in the following sections will be processed as quickly as possible, but acceptance for admission may not be early enough for the applicant to begin the program as soon as desired. From the day of the receipt of all application documentation, admission notifications are usually sent within three weeks.

Daytona Beach applicants should submit their applications for admission to

Embry-Riddle Aeronautical University

Graduate Admissions Office

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114

(800) 388-3728 - or - (386) 226-6115

fax: (386) 226-7070

Financial Aid: (800) 943-6279

email: graduate.admissions@erau.edu

<http://www.erau.edu/graduate>

Prescott applicants should submit their application to

Embry-Riddle Aeronautical University

Graduate Admissions Office

3700 Willow Creek Road

Prescott, AZ 86301-3720

(800) 888-3728 - or - (928) 777-6993

fax: (928) 777-6958

email: prmsss@erau.edu

<http://www.erau.edu/graduate>

United States Citizens and Permanent Residents of the United States

All applicants must submit the following items to the Graduate Admissions Office prior to the application deadline:

1. Completed application form and the \$50

application fee. Please note: Permanent residents must provide a photocopy of their ARC (Alien Registration Card).

2. **Transcripts.**
 - a. Official sealed transcripts for all college coursework earned (both graduate and undergraduate). Transcripts must be sent directly from the institutions attended to Embry-Riddle. A minimum of a bachelor degree is required.
 - b. Course descriptions for all graduate coursework to be considered for transfer.
3. **Statement of objectives.** The statement of objectives is an important part of your application. You should give your reasons for wishing to do graduate work in the field you have chosen, incorporating your interests and your background as well as your long-term professional goals, defining how Embry-Riddle's programs support those interests and goals. This should be at least three or four paragraphs.
4. **Three graduate applicant reference forms**, two academic and one professional.
5. **Resume.** A current resume outlining your education, work experience, special activities, and awards.
6. **Assistantships.** If interested in assistantship opportunities, submit an assistantship application declaring your interest in research, teaching, or administrative fields. Indicate any special skills that you feel may qualify you for an assistantship. To be eligible for an assistantship, a student must have a minimum 3.00 GPA in their undergraduate degree and have full graduate status (conditional admission eliminates a student from eligibility until all conditions are removed). Additional

Admission to the Daytona Beach Campus

departmental restrictions and test scores are required for some positions.

7. Test Scores.

- a. MBA applicants should have GMAT scores sent directly to Embry-Riddle by the testing agency. For more information on the GMAT exam, refer to <http://www.mba.com>. Indicate school code number 5190.
- b. GRE scores, although not required by all programs, are desired for review by some program coordinators. See specific requirements under the program of your choice in this section of the catalog. For more information on the GRE exam, refer to www.gre.org. Indicate school code 5190.

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Special Requirements for International Applicants

Embry-Riddle is authorized under federal laws to enroll nonimmigrant alien students. An international applicant is defined as a nonresident, nonimmigrant applicant entering the United States on a nontourist visa.

In addition to the above required documents, **international applicants must also submit the following:**

1. All applicants whose native language is not English, or who were educated at schools where English was not the language of instruction in all disciplines, must submit their official TOEFL scores sent directly from the testing authority. The minimum acceptable score is 550 written/213 computer-based/79 iTOEFL.

2. In addition to official sealed transcripts, for any transcript not in English, a notarized English translation must also be submitted.

SEVIS

SEVIS is the Student and Exchange Visitor Information System consisting of a governmental computerized system to maintain and manage data related to foreign students and exchange visitors during their stay in the United States. This system allows for real-time access to this information and assists colleges and universities in ensuring that students comply with the terms of the visas. For more information about SEVIS and visa requirements, please refer to the U.S. Immigration and Customs Enforcement (ICE) Web site at <http://www.ice.gov/sevis/>.

I-20 Requirements for International Students

Upon application, international students who require an initial or renewed student visa must submit the following:

1. An affidavit of financial support and a supporting bank letter verifying appropriate funds on deposit. Please refer to the student's acceptance packet for the specific dollar amount requirement. This amount will reflect the amount needed to cover tuition, fees, books, health insurance, and living expenses for one year, plus \$3,000 for each accompanying dependent. In the case of sponsored students, an official notification of public or private sponsorship will take the place of a bank letter. A University assistantship contract does not relieve a student

Admission to the Daytona Beach Campus

from the requirement to provide both a financial affidavit and a supporting bank letter, unless waived by the appropriate University official. International students must be fully prepared upon arrival on campus to meet all normal living expenses and manage their finances for the period of time required to complete the degree.

2. The I-20 Form must be in the student's possession before departure and be presented to the nearest U.S. embassy or consulate to obtain the necessary entry visa before departure to the United States.

The I-20 will be issued to the student upon admission to the University, if all required documentation has been received.

These rules and procedures apply equally to international students already studying in the United States who wish to pursue graduate study at Embry-Riddle. The only exception is that they must follow the procedures required by the U.S. Bureau of Immigration and Customs Enforcement to obtain approval for the transfer. Students should seek the assistance of the international student advisor at their current university to assist them with the transfer procedures. Transfer students should contact their current school's International Student Service Office and request that their SEVIS record be released to Embry-Riddle at the end of their last semester at their current school. This will allow our admissions office to issue a new I-20.

Admission Time Limit

Applicants who have been accepted for admission into Embry-Riddle graduate programs must enroll in Embry-Riddle graduate courses in one year from the date of the

semester for which they were accepted. Those who do not enroll in the specified time period must reapply for admission according to the regulations and procedures in effect at the time of reapplication.

A student who cancels the application at any point in the application process may reactivate the application at any time up to one year from the date of application. After one year, a new application, fee, and supporting documents must be submitted.

Admission Deposit

At least 30 calendar days prior to matriculation, admitted students must submit a \$200 tuition deposit, along with an admitted student enrollment form to confirm enrollment at the University. This form is provided to admitted students by the Office of International and Graduate Admissions.

The deposit will be held in the student's account for one year and will be credited toward tuition during the first semester of attendance. After one year, if a student has not matriculated, the deposit is forfeited.

Credit for Prior Academic Work and for Courses Taken at Other Institutions

Students applying prior academic work toward their Embry-Riddle graduate program requirements must submit appropriate documentation for such credit as part of the admission process. The request must be in writing and be accompanied by official transcripts or equivalent evidence of such work. Requests must be approved by the academic department chair or their designee.

Prior academic work and courses taken at other institutions by veteran students and/or other eligible students receiving

Admission to the Daytona Beach Campus

Veterans Education Benefits will be evaluated and credit granted as appropriate and will be reported to the DVA as required by law.

Credit (called transfer credit) may be received for graduate work done at another appropriately accredited college or university.

Credit (called escrow credit) may be received for certain graduate courses taken by Embry-Riddle undergraduates.

Credit may be received for certain graduate courses taken as nondegree graduate work or as part of another (completed or noncompleted) Embry-Riddle graduate degree program. When transferring from one Embry-Riddle graduate program to another this credit may include prior work on a GRP or thesis.

The combined total credit applied to an Embry-Riddle graduate degree may not exceed 12 credit hours.

In order to satisfy a graduate degree program requirement, the academic work for which such credit is sought must be determined to be specifically relevant to the applicant's graduate degree program at Embry-Riddle. The content of the applicable course or other program should be used to determine the nature of the credit to be applied to the student's degree requirement. The appropriate Daytona Beach or Prescott academic department chair or designee shall make these determinations.

Credit will be granted only if the student demonstrated performance expected of a graduate student at Embry-Riddle (in the case of graduate courses, this normally means that the course was completed with a B or better [3.00 on a 4.00 system]).

Credit for academic work used to satisfy the requirements of an undergraduate degree will not be accepted toward the requirements

for a graduate degree.

Credit will generally be accepted only for courses that were completed in the seven-year period immediately preceding the date that the student begins classes.

Permission to obtain graduate credit for courses to be taken outside the University after matriculation must be granted by the academic department chair or designee.

The last nine hours of graduate credit on a degree program must be earned at Embry-Riddle.

A student may not be enrolled in more than one degree program. Upon completion of a Embry-Riddle graduate degree program, a student may elect to apply to another graduate degree program at this university. After meeting admissions requirements and receiving notification of acceptance, a student may request that up to 12 hours of credit be transferred to the new degree program if the hours are applicable to the newly elected degree program. The transfer of these hours is at the discretion of the appropriate college dean or their designee.

Intra-University Transfer

Graduate students who have matriculated on either the Daytona Beach, Prescott, or Worldwide Campuses who are continuously enrolled students, and who have met their financial obligations on the campus where they matriculated, may transfer from one campus to the other. Transfers are not automatic and certain conditions must be met. Additionally, a vacancy must exist in the program to which the student wishes to transfer, either permanently or as a visiting student.

Students are urged to begin this process at least 45 days before the first day of classes in order to avoid any interruption in the progress toward their degree.

ACADEMIC REGULATIONS AND PROCEDURES

Undergraduate Regulations and Procedures

All Embry-Riddle students are responsible for knowing all academic regulations and procedures required for continued attendance at the University. Academic regulations and procedures are presented in University publications such as this catalog, the Student Handbook, the Flight Operations Manual, the Residence Hall Regulations pamphlet, the Curriculum Manual, and the Academic Policies and Procedures Manual. These documents are available for reference at campus records offices, student government offices, and academic departments throughout the University. A student who requires clarification of any policy or regulation should seek help from his/her academic advisor, program coordinator, or the Office of Records and Registration. University regulations will not be waived because a student pleads ignorance of established policies and procedures.

The University reserves the right to change curricula and academic regulations and procedures without notice or obligation. Such changes are published in the next catalog.

Students should consult the graduate section of this catalog for academic policies and regulations for graduate programs.

Academic Advising

Each new student is assigned an academic advisor. Academic advisors help students choose and schedule academic programs that meet their educational goals.

Academic advisors post their scheduled office hours and students should call on them frequently and whenever assistance is needed.

Schedule of Classes and Registration

Students are required to register for each term of enrollment. Most students will be allowed to register via Web registration. However, first-year students and students in academic difficulty will be denied access to Web registration. They must see their academic advisor for approval of course selection prior to registration. Once the schedule is approved the advisor will release their hold allowing them to register on the Web. Registration for flight blocks is conducted one week ahead of regular registration and must be accomplished in person at the flight line. Registration must be completed and payment of all tuition deposits and fees must be made according to instructions published by the campus Records Office. Students are not officially enrolled until they complete all phases of registration, including financial requirements.

Penalties will be charged for late payment of fees. Late registration will be allowed during the first five days if unusual circumstances prevent the student from registering during the scheduled period. Except for flight courses, registration will not be allowed after the last day of late registration. Special circumstances can be appealed through the dean of the college. Due to the scheduling requirements associated with flight training, flight course registration continues throughout the term.

A schedule of classes is prepared for each term at all locations served by the University. The University reserves the right to make necessary and appropriate adjustments to the published schedule to include cancellation or rescheduling of any class.

Class Attendance

Because regular attendance and punctuality are expected in all courses, attendance may be included in the grading criteria of an individual class. Absences are counted from the first scheduled meeting of the class.

Because minimum contact hour requirements have been imposed by the FAA for certain classes leading to FAA certificates, attendance requirements in those courses are rigorously enforced. Explanations for all absences should be given to the instructor in advance whenever possible.

A final examination is normally given in each course at the end of the term. A student who misses a final examination without advance permission from the instructor may be assigned a failing grade (F) for the course. A grade of incomplete (I) may be given if the student has obtained advance permission from the instructor or can provide satisfactory evidence that the absence could not be prevented.

Flight block attendance is mandatory, and missed flight activities (orals, simulators, and flights) will result in loss of letter grades for the flight course. The Embry-Riddle Flight Operations manual explains detailed policies for flight cancellations.

Academic Integrity/Conduct

Embry-Riddle is committed to maintaining and upholding intellectual integrity. All students, faculty, and staff have obligations to prevent violations of academic integrity and take corrective action when they occur. The adjudication process will include the sanction imposed on students who commit the following academic violations, which may include a failing grade on the assignment, a failing grade for the course, suspension, or dismissal from the University:

1. Plagiarism: Presenting as one's own the ideas, words, or products of another. Plagiarism includes use of any source to complete academic assignments without proper acknowledgment of the source.
2. Cheating is a broad term that includes the following:
 - a. Giving or receiving help from unauthorized persons or materials during examinations.
 - b. The unauthorized communication of examination questions prior to, during, or following administration of the examination.
 - c. Collaboration on examinations or assignments expected to be individual work.
 - d. Fraud and deceit, which include knowingly furnishing false or misleading information or failing to furnish appropriate information when requested, such as when applying for admission to the University.

Students exhibiting the following undesirable acts of conduct may be suspended or dismissed from the University. Criminal acts must be reported to the appropriate law enforcement and University authorities.

1. Unauthorized alteration or misuse of one's own or another's academic records or transcripts.
2. Forging, altering, falsifying, destroying, or unauthorized use of a University document, record, or identification. This includes using the logo, stationery, or business cards of the University or otherwise identifying oneself as an agent of the University for personal, non-University business.

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- Misuse of computing facilities and/or security violations, including attempted violations of computing facilities.
- Conduct that disrupts the educational process of the University.

Unit of Credit

Semester credits are used throughout the University system. Transferred quarter hours will be converted to semester credit hours on the following basis: A quarter hour equals two-thirds of a semester hour.

Course Load Status

Twelve credit hours constitute the minimum load for full-time student status during the fall and spring terms. The minimum load for full-time student status during each summer term is six credit hours. Students enrolled in fewer credits than the minimum full-time load are classified as part-time. All audited courses and courses taken for credit are counted in determining the student's load for a term.

The normal maximum load is 16 hours during spring and fall semesters or nine hours during summer terms. A student whose cumulative grade point average (GPA) is 3.00 or higher may register for an overload with advance approval of the appropriate program coordinator/chair.

A student with more than 27 completed credit hours and a cumulative GPA of 3.00 or higher may enroll for up to 18 credit hours, in a fall or spring semester, with no increase in tuition for hours over the block. Completed credit hours and a cumulative GPA at the end of the spring semester will be used for fall semester eligibility. Completed credit hours and a cumulative

GPA at the end of the summer semester will be used for spring eligibility.

Classification of Students

Students are classified at the end of each semester based on the total number of credit hours earned in accordance with the following schedule:

First-Year:	fewer than 28 hours
Sophomore:	28-57 hours
Junior:	58-87 hours
Senior:	88 hours or more

Grading System

The following indicators, used on grade reports and transcripts, signify the quality of a student's academic performance.

Letter Grade	Student Performance	Grade Points Per Credit Hour
A	Superior	4
B	Above average	3
C	Average	2
D	Below average	1
F	Failure	0
WF	Withdrawal from the University-Failing	0
W	Withdrawal from a course	0
AU	Audit	0
I	Passing but incomplete	0
P	Passing grade (credit)	0
S	Satisfactory (noncredit)	0
T	Transfer credit	0
N	No grade submitted by instructor	0

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X	Credit by means other than course equivalency examinations	0
XP	Credit by course equivalency exam	0
IP	In progress	0
NC	No credit awarded	0

Grade Reports

Final grades are issued at the end of each term. Students can access their grades immediately after they are posted, via Student Online Services.

The University is prohibited from releasing grade information without the express written authorization of the student. Such authorization must be granted each term because blanket authorizations are prohibited by law.

Grade Point Averages: GPA, CGPA

A term grade point average (GPA) and cumulative grade point average (CGPA) are computed for each student after every term. The GPA is calculated by dividing the number of grade points earned during the term by the number of hours attempted in that period. The CGPA is determined by dividing the total number of grade points by the total number of hours attempted at the University. Grade points and hours attempted are accrued in courses graded A, B, C, D, F, and WF only.

Dropping a Course

Students may drop a course, with no notation of course enrollment on their transcripts, during the drop period only. The

drop period extends through the third week of spring and fall terms and the second week of summer terms.

Auditing a Course (AU)

Because students audit a course solely to enhance their knowledge, academic credit is not granted toward degree requirements for audited courses. Students may change their registration from audit to credit during the add period only. They may change from credit to audit until the last day of the withdrawal period. When a student auditing a course fails to maintain satisfactory attendance, as determined by the instructor, a grade of W will be assigned.

Withdrawing from a Course (W)

Students receive the grade W if they withdraw from a course by the end of the 10th week of spring and fall terms and the fourth week of summer terms. If they withdraw from a course after this period, they receive an F. If students stop attending their classes and fail to withdraw from the University, an F is assigned for each course in which they were enrolled.

Students may not drop or withdraw from a basic skills course without written permission from the chair of the department offering the course.

Students are not permitted to drop or withdraw from a course while a charge of academic dishonesty is pending. Students who withdraw from a flight course before their initial attempt at the final phase check receive a W.

Withdrawal from the University

Students who leave the University for any

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reason must conduct an exit interview with the Academic Support Center and officially process a withdrawal clearance through the Office of Records and Registration. When a student withdraws from the University after the end of the scheduled withdrawal period, a WF grade will be assigned for all courses in which the student is enrolled unless an exception is granted for medical reasons or other extenuating circumstances.

Incomplete Grades (I)

In exceptional cases, faculty may assign the temporary grade of incomplete (I) if a student is unable to complete the required work in a course because of medical emergency, death in the family, military duty, or other extenuating circumstances. If a student does not complete the course within the specified period of the following term, the grade I automatically converts to an F.

The period to convert an incomplete I grade extends through the fourth week of subsequent term or the third week of the subsequent summer terms.

Incomplete Flight Courses (IP)

Because the length of time required to complete flight courses varies and may not coincide with the end of the academic term, the temporary grade IP is assigned for flight courses in which students are still active. If the course is not subsequently completed the following term or extended further by the department chair, the grade IP automatically converts to an F.

Flight students may receive an F for excessive unexcused no-shows.

Repeating a Course

With the exception of flight courses, which may be repeated only once, a student may repeat any University course. The grade for each attempt will appear on the student's permanent academic record. In determining the student's CGPA, the grade for subsequent attempts at a course replaces the previous grade a maximum of two times.

Course Equivalency Exams

Students who believe they possess sufficient knowledge and who have not previously failed that particular course may apply to take the course equivalency examination for a limited number of courses. Course equivalency examinations must be completed prior to the time the student reaches the last 30 credits for a bachelor degree.

A nonrefundable fee is charged for administering each equivalency exam. Because students may take a course equivalency exam only once for each course, those failing a course equivalency examination must enroll in and complete the course to receive credit. Students submit their applications to the chair of the academic department offering the course.

Dean's List and Honor Roll

To be eligible for term honors, students must have maintained at least a 2.00 CGPA and must not have received a D or F during the term. In addition, students must have achieved a term GPA of 3.50 - 4.00 for inclusion on the Dean's List or 3.20 - 3.49 for inclusion on the Honor Roll. A term is defined as one term (full-time status). Additionally, the appropriate notation is made to the student's academic transcript.

Academic Warning, Probation, Suspension, and Dismissal

Warning

A student whose cumulative grade point average (CGPA) is less than 2.00 for one term is placed on academic warning.

Probation

A student whose CGPA is less than 2.00 for two consecutive terms is placed on academic probation. Students on warning or probation are classified as students not in good standing and may not serve as elected members of the Student Government Association, may not participate in intercollegiate athletics as members of a University team, may not serve on the editorial staff of a campus publication, and will lose eligibility for financial aid programs. The academic programs of students on warning or probation may be restricted. Students who are placed on academic probation will be allowed to complete any flight course in which they are currently enrolled. However, they will not be allowed to enroll in subsequent flight courses until they return to good academic standing. A student who has a term GPA of less than 1.00 may also be placed on academic probation or suspension in accordance with University academic policies.

Suspension

A student whose CGPA is less than 2.00 for three consecutive terms, or a student on academic probation whose CGPA at the end of the subsequent period is below 2.00, is suspended from the University unless the student maintains a term GPA greater than 2.00.

A student who has a term GPA of less than 1.00 may be suspended or placed on academic probation.

Dismissal

A student who has been suspended and readmitted is on probationary status until the CGPA has been raised to 2.00. If the term GPA falls below 2.00 during the probationary period, the student is dismissed. Any previously suspended student who has been restored to good standing but whose academic performance subsequently deteriorates to a level that would qualify for initial suspension is dismissed. Academic dismissal is final and the student will not be readmitted to the University.

When a change of grade or the conversion of the grade I changes a student's academic status, the previous academic status of warning, probation, or suspension is removed and does not become part of the student's permanent record.

Suspension and Dismissal for Cause

The University reserves the right to suspend or dismiss a student at any time and without further reason, if the student exhibits the following undesirable conduct:

1. Actions that pose a risk to the health, safety, or property of members of the University community, including, but not limited to, other students, faculty, staff, administrative officers, or the student himself/herself;
2. Conduct that disrupts the educational process of the University;
3. Any other just cause.

Readmission

A student who has been suspended from the University for any reason must apply for readmission with the same campus to the

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Office of Records and Registration.

A student who has been academically suspended may apply for readmission after 12 calendar months following the suspension or after completing a minimum of 15 hours of academic credit with a CGPA of 2.50 or higher from an accredited institution. If the University readmits such students, they will be admitted with probationary status.

Areas of Concentration and Minor Courses of Study

Areas of concentration give students specialized preparation in a degree program. Minor courses of study are coherent academic programs designed to satisfy students' personal interests and to meet their professional needs. Students may consult with their program coordinators if assistance is needed in choosing areas of concentration or minors. Once a decision is reached, students who wish to declare an area of concentration or minor should contact Records and Registration. Some minor courses of study are not open to students pursuing particular degree programs. A minor must be in a discipline outside the student's major field of study.

The student becomes subject to the requirements of the minor as stated in the catalog in effect at the time of matriculation or the current catalog in effect at the time the minor is declared. The department/program chair responsible for a particular minor determines how students fulfill deficits in credits for a minor and certifies that students are qualified to receive the minor.

Areas of concentration and minor courses of study are posted on the student's academic transcript at the time the student graduates with a baccalaureate degree.

Change of Degree Program

Students may apply to change their degree programs if they meet academic qualifications and if the degree program is not at capacity. The student should contact the program coordinator of the new program to initiate the application. Once the student is accepted into the new degree program they should contact the program coordinator of their current program to complete the process.

When a student elects to change degree programs, the requirements of the catalog in effect at the time the request was approved apply, with certain exceptions. Students considering such changes should contact their academic advisor or department chair to determine how they will be affected.

Two Degrees of the Same Rank

To earn a second baccalaureate degree, students must complete a minimum of 25% of coursework over and above that required for the declared primary degree. At least 60 credit hours must be completed in residence at the University and at least two-thirds additional credit hours must be 300-400 level courses.

Continuous Enrollment

Students are considered to be continuously enrolled, regardless of the number of hours for which they register, unless they:

1. Enroll at another institution without advance written approval.

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2. Fail to enroll in at least one course at Embry-Riddle in any two calendar year period.
3. Have been suspended or dismissed from the University.

Students failing to maintain continuous enrollment for any reason are required to reapply for admission under the catalog in effect at that time.

Catalog Applicability

The catalog in effect at the time of a student's initial matriculation remains applicable as long as the student remains in the original degree program.

If a student does not maintain continuous enrollment at the University, the student must apply for readmission. The provisions of the catalog in effect at the time of readmission then become applicable to the student.

Curricular requirements stated in the applicable catalog will not be affected by later catalogs unless the student elects to graduate under the provisions of a later catalog. Students electing to graduate under the provisions of a later catalog must meet all requirements (admission, transfer, graduation, and so on) contained in that catalog.

Attendance at other Institutions

Once admitted to the University as degree candidates, students are expected to complete all work to be applied toward their degrees with the University unless advance written authorization is granted.

Students in good academic standing must petition to receive credit for courses or training, including flight instruction, outside the University while maintaining enrollment at Embry-Riddle. To initiate this procedure,

students must process a Petition To Take Courses at Another Institution. If Records and Registration has no formal documentation of course equivalency, students must provide adequate evidence to the course-specific department chair that the petitioned courses are equivalent to Embry-Riddle courses or are acceptable as elective credit in their degree program. After the courses are deemed equivalent, the student's program coordinator evaluates the petition, considering such factors as the reasons for petitioning and the availability of the courses in the University curriculum.

Students may not co-enroll at a local institution. When not enrolled at Embry-Riddle, students who are local residents must follow normal petition procedures to enroll in courses at another local institution. A local resident constitutes a student who attended a high school in Volusia County or a student who resided in Volusia County prior to initial matriculation. Under certain circumstances, students may be permitted to take courses in ethnic studies or foreign languages as electives at an approved local institution.

After initial matriculation, students may not earn more than a total of 18 semester hours or the equivalent at another institution.

Graduation Requirements

Students must complete the general graduation requirements as prescribed by the University, as well as all degree requirements specified in the degree being pursued. The following summary of graduation requirements is provided for all students:

1. Students must initiate an application for graduation. The application must be

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received by the Records Office within the time limit established by that office.

2. Students must successfully complete all required courses for a particular degree listed in the applicable catalog.
3. Students must successfully complete the minimum number of credit hours required for the degree as listed in the applicable catalog.
4. Students pursuing a bachelor degree must complete the last 30 credit hours at the University, or the last 15 hours if pursuing an associate degree.
5. Students pursuing a baccalaureate degree must complete a minimum of 40 credit hours in upper-division (300 and 400 level) courses. Credit transferred from other institutions will be accepted at the discretion of Embry-Riddle. Exceptions to the 40-hour upper-division requirement are authorized only when the specified required courses preclude achievement in the minimum credit hour requirements in the catalog listing for the degree. In such cases, all electives taken must be upper-level.
6. For degree completion, at least 25 percent of semester credit hours must be earned through Embry-Riddle instruction.
7. Students pursuing any undergraduate degree must earn a minimum cumulative grade point average (CGPA) of 2.00 for all work completed at the University. Candidates for the B.S. in Aerospace Engineering, B.S. in Civil Engineering, B.S. in Computer Engineering (B.S. in Computer Engineering and Software Engineering candidates must also earn a minimum CGPA of 2.00 in all AE, EE, ES, ET, SE, and CEC courses that fulfill any of the degree requirements), B.S. in Electrical Engineering, and the B.S. in Engineering Physics must also earn a minimum CGPA of 2.00 in all required core courses. Details are specified under the degree requirement headings of the Academic Programs section in this catalog.
8. Students will not be issued a diploma or transcript of their records until all debts or obligations owed to the University have been satisfied.
9. Students will not be issued a diploma unless their behavior is in good standing, according to University policies and regulations. This includes, but is not limited to, not being on disciplinary probation.
10. Students will not be permitted to participate in formal graduation ceremonies conducted at the residential campuses until all the degree requirements listed above have been satisfied. Students anticipating degree completion during the summer terms may be eligible to participate in the spring commencement ceremony if they meet established guidelines.
11. Following the graduation exercise, the diploma will be mailed to the address provided by the student.

Graduation Honors

Graduation honors recognize students who have demonstrated excellent performance throughout their Embry-Riddle academic career. They are only awarded to students who complete baccalaureate degree programs. To be eligible, the student must have completed at least 45 credit hours in residence. The level of graduation honors will be based on the cumulative grade point average for all courses taken at Embry-Riddle. The honors level will appear on

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the student's academic transcript with the degree information.

Graduation honors (baccalaureate only) will be awarded in accordance with the following criteria:

Honors Level	CGPA
Summa Cum Laude	At least 3.90
Magna Cum Laude	At least 3.70 and less than 3.90
Cum Laude	At least 3.50 and less than 3.70

To be recognized for honors at the formal commencement ceremonies, all degree requirements must have been met.

Transcript Requests

A signed request for an official academic transcript, accompanied by a fee, may be submitted by the student to the Office of Records and Registration. Transcripts will not be released to students who have failed to meet their financial obligations to the University.

Privacy of Student Records

The University respects the rights and privacy of students in accordance with the Family Educational Rights and Privacy Act (FERPA). At its discretion, the University may disclose certain items of directory information without the consent of the student, unless the student submits a written non-disclosure request. Students are required to file a request for nondisclosure on an annual basis. Directory information consists of student name, address, telephone number, date and place of birth, major fields of study, dates of attendance, degrees and awards received, most recent previous school attended, photograph, and e-mail address.

The University will obtain written consent from students before disclosing any personally identifiable information from their education records with the exception of the directory information. The receipt of a written request to release an education record via fax satisfies this requirement. Such written consent must specify:

1. The records to be released.
2. The purpose of the disclosure.
3. Identify the party or class of parties to whom disclosure may be made and their address.
4. When transcripts are to be sent by fax, the written request must contain the telephone fax number where the transcript is to be sent. Generally, transcripts should be faxed only if an urgency exists. A faxed transcript may be considered official by the recipient, subject to their policies, security measures, and validation procedures. In addition to the faxed transcript, an official validated transcript will be mailed directly to the recipient.
5. Must be signed and dated by the student or former student.

The law gives students and former students the right to inspect and review information contained in their education records. The student must submit a written request to the Records and Registration Office. The Records and Registration Office must make the records available for inspection and review within 45 days of the request.

FERPA allows disclosure of educational records or their components under certain conditions. Students desiring additional information on FERPA may contact the Records and Registration or the Dean of Students Office.

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Flight Course Related Information

All flight training at Embry-Riddle is done in late-model, fully equipped aircraft. In addition, procedures trainers and flight-training devices give the student a safe, flexible, and cost-effective training environment. The flight-training program operates under all applicable FAA rules, regulations, and requirements. The student is responsible for adhering to those rules, regulations, and requirements, which are contained in the Embry-Riddle Flight Operations Manual and local campus bulletins.

While flight training is an integral part of the Aeronautical Science program, it is also contained in other degree programs, either as an area of concentration, minor course of study, or as elective credit on a space-available basis. Students should investigate the applicability of certain courses to their program along with the necessary prerequisite/corequisite course requirements prior to making any commitment and investment.

Flight Course Scheduling

Students usually begin their initial flight course sometime during their first year in attendance. The exact start date depends on the academic preparation of the student, student desire, weather conditions, and aircraft and instructor availability. The length of time required to complete a course will also vary based on these same factors. All flight-training courses may begin and end at any time during the academic year and may not coincide with the beginning and ending dates of the published semester schedule. Therefore, students who begin a flight course late in the semester should be pre-

pared for training in that course to continue into the next semester.

Flight courses require a minimum block of time and may include flying on weekends. Study, preparation, and some flight lessons may require time outside this block. Students, particularly beginning students, are cautioned not to overload their course schedules when taking a flight course.

See the University Academic Regulations and Procedures section of this catalog for additional information about University policies on flight courses. The Embry-Riddle Flight Operations Manual also contains information on flightline policies and procedures.

Students in degree programs that require flight training to be conducted on campus may be given priority in their initial flight block registration.

Credit For Flight Training After Matriculation

All students desiring to complete off-campus flight training for credit after matriculation must be approved in writing in advance by the Flight Department. The credit that will be awarded (advanced standing) and the procedures for requesting credit when training is completed will be specified in the written approval (Off Campus Authorization Form). The following general rules apply as specified under each heading. Please address any questions to the Flight Department. Credit for AS courses will not be awarded for flight certificates and ratings attained after matriculation (only FA credit).

Aviation Accreditation Board International (AABI) Accredited Programs:

The Aeronautical Science (AS), Business Administration (BSBA), and Aviation Maintenance Science (AMS; All AMS Concentrations except Flight) degrees are accredited by the AABI (formerly Council on Aviation Accreditation; [CAA] and are governed by the following criteria. Students in AABI accredited programs will be awarded credit for FAA certificates held prior to matriculation to Embry-Riddle, and may be approved to complete one certificate or rating if flight training from an appropriately rated instructor was logged prior to matriculation. If FAA certificates are held, this training must have occurred after the attainment of the most recent certificate for which credit is granted. Except as provided above, after a student matriculates, all flight training for credit must be completed at Embry-Riddle or approved at another AABI accredited program. In all cases students must satisfactorily complete at least one FA course on campus after advanced standing is awarded or AABI program courses transferred. These requirements pertain to credit for flight certificates and ratings applied to Flight Minors and open elective credit in AABI programs as well. Students should refer to their catalog to verify if their degree program is AABI accredited.

Flight Minors, Majors, Areas of Concentration or Specialization:

Students who are not in AABI accredited programs who are pursuing flight minors, majors, areas of concentration, or specialization that have a required FA course must satisfactorily complete at least one

FA course on campus after completion of the approved off-campus flight training. If students declare a change of program to an AABI accredited program (see above), the advanced standing credit for flight training after matriculation may not transfer.

Open Elective Credit:

Students who are not in AABI accredited programs, and are not pursuing Flight Minors, Majors, Areas of Concentration, or Specialization (see above), who desire to complete off-campus flight training for credit after matriculation must receive approval by the Flight Department in writing and in advance of the anticipated training. If students declare a change of program to an AABI accredited program (see above), the advanced standing credit for flight training after matriculation may not transfer. Declaring Flight Minors, Majors, Areas of Concentration, or Specialization would necessitate satisfactorily completing at least one FA course on campus after the awarding transfer credit and advanced standing (see above).

Awarding Advanced Standing:

Upon completion of the approved flight training, all students must show their copy of the approved "Off Campus Training Authorization Request" form, in addition to the appropriate documents of their training, to the Flight Department. Approved advanced standing credit will be applied to the student's transcript.

Aviation and Transportation Security Act

The Aviation and Transportation Security Act (ATSA) requires students registered for

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Flight (FA) courses to show acceptable documentation of U.S. citizenship OR to complete background check requirements.

Students enrolled in an FA course must present ONE of the following to the Embry-Riddle Records Office prior to being allowed to start flight training:

1. A valid, unexpired U.S. passport
2. An original birth certificate with raised seal documenting birth in the United States or one of its territories
3. An original U.S. naturalization certificate with raised seal, Form N-550 or Form N-570
4. An original certification of birth abroad, Form FS-545 or Form DS-1350

-OR-

An original certificate of U.S. citizenship, Form N-560 or Form N-561

If using other than a valid passport, a valid driver license with a photo or a government-issued photo ID will also be required. Photocopies of the above are not acceptable, even certified copies. This process needs to be completed only one time for the entire curriculum at Embry-Riddle.

Those unable to complete the above requirements, including international and permanent resident alien students, will be able to register for FA courses but must comply with U.S. Department of Homeland Security (DHS) notification requirements. Before receiving any flight training, they must provide DHS through the Transportation Security Administration (TSA) a set of fingerprints, a photo, a processing fee, and must register online. Once the student is registered and has received authorization from the TSA, the student may begin training. Some advanced flight courses

may require a waiting period of up to 30 days. If Embry-Riddle receives any directive from the DHS or TSA, the student may be administratively withdrawn as appropriate to the DHS or TSA directive. This information and fee, but not the fingerprints, must be sent periodically during flight training and will be coordinated through Embry-Riddle's International Students Office. Please contact the Aeronautical Science Department for more information.

Mandatory Student Drug Testing

Success in the aviation industry requires a commitment to excel and the discipline to avoid unsafe practices. The use of illegal drugs constitutes an unsafe practice and is incompatible with an aviation environment. Therefore, the University reserves the right to immediately suspend or dismiss any student who uses or possesses illegal drugs. In the effort to maintain a work and educational environment that is safe for its employees and students, the University has established a mandatory student drug testing program.

Scope

The drug testing program applies to all students who engage in flight training at the University.

The University tests for marijuana, cocaine, opiates, amphetamines, and phenylcyclidine (PCP) as follows:

1. Random testing of students engaged in flight training.
2. Required post-accident testing for students involved in an aircraft accident. Students are tested for drugs within 32

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hours after an accident. An accident is defined as any occurrence associated with the operation of an aircraft that results in any person suffering death or serious injury, or where the aircraft receives substantial damage as determined by the National Transportation Safety Board. The accident can occur at any point between the time a person boards the aircraft with the intention of flight and the time all have disembarked. In the event that drug testing is required, students who fail to comply with testing procedures, refuse to be tested, or test positive for illegal drugs are subject to the following actions:

3. Students who fail to comply with all University directives concerning the place of testing, the manner in which they are to arrive at the test site, and any other related matters are subject to disciplinary action up to and including dismissal from the University.
4. Students who refuse to be tested after being requested to do so by the University will be dismissed from the flight program and possibly the University.
5. Students whose test results show positive for the use of an illegal or non-prescribed drug, as verified by a medical review officer, will result in dismissal from the Flight program and up to and including dismissal from the University.

Testing

The cost of drug testing is the responsibility of the University. Embry-Riddle has contracted with a professional testing service as the certified laboratory for the collection and

analysis of test specimens. This testing service will adhere to all requirements for chain of custody, test reporting, and specimen retention in accordance with proposed DOT and FAA regulations.

Notification

Students applying to attend the residential campuses are notified of the drug testing requirement through various University publications. The drug testing policy is also explained on appropriate flight course registration forms.

Student Education and Assistance

Embry-Riddle promotes substance abuse awareness by sponsoring educational programs and distributing literature. The University is additionally committed to assisting students in the resolution of problems associated with substance abuse and encourages students to seek additional help through referrals from the University Health Services and Counseling Offices.

GRADUATE ACADEMIC REGULATIONS AND PROCEDURES

All University graduate academic and non-academic procedures and regulations are subject to change. Therefore, all procedures and regulations in effect at a given time may not be reflected in the current catalog. When such changes do occur, notice of the change may be in the form of an addendum or in the next catalog. Catalog addenda are effective on the date published unless otherwise stated.

Student Responsibilities

Students are responsible for being fully informed about all procedures and regulations governing their participation in Embry-Riddle's graduate programs. The necessary information may be found in the current graduate catalog, Student Handbook, orientation and information packets published and distributed by the campuses, and periodic announcements published by the University. A student who requires clarification of any policy or regulation should seek help from his/her academic advisor or the office of Records and Registration. University regulations will not be waived because a student is unaware of established standards and procedures.

Academic Advising

The graduate program coordinator is the student's academic advisor. Academic advisors help students choose and schedule courses that meet their educational goals. The advisor's signature is required on all registration and add/drop forms.

Academic advisors post a schedule of office hours, and students should feel free to call on their advisors when assistance or discussion is needed.

Registration

Students are required to register for each term of enrollment. Tuition deposits, registration, and fee payments must be completed according to instructions published by the office of Records and Registration. Students are not officially enrolled until they complete all phases of registration, including financial requirements.

Late registration will be allowed during the first five days of classes if unusual circumstances prevent the student from registering during the normal registration period. Registration will not be allowed after the last day for late registration, as designated in the academic calendar of this catalog.

Schedule of Classes

A schedule of classes is prepared for each term. The University reserves the right to make necessary and appropriate adjustments to the published schedule to include cancellation or rescheduling of any class.

Academic Integrity

Embry-Riddle is committed to maintaining and upholding intellectual integrity. The faculty, colleges, divisions, or campuses of the University may impose sanctions on students who commit the following academic integrity violations.

1. Cheating: The use of inappropriate sources of information on a test or being a party to obtaining or possessing an examination before the time the examination is scheduled.
2. Plagiarism: Presenting as one's own the

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- ideas, words, or products of another.
3. Forgery and unauthorized alteration or misuse of one's own or another's academic records or transcripts.
 4. Knowingly furnishing fake or misleading information to the University when seeking admission to the University or campus.
 5. Forging, altering, falsifying, destroying, or unauthorized use of a University document, record, or identification. This includes using the logo, stationery, or business cards of the University or otherwise identifying oneself as an agent of the University for personal, non-University business.
 6. Misuse of computing facilities and/or security violations, including attempted violations of computing facilities.

Sanctions may include a failing grade on the assignment, a failing grade for the course, or dismissal from the University.

Exclusion from Courses

A student making no real progress in a course or whose behavior is detracting from the course may be excluded from the course by the appropriate dean with a grade of W or WF. Students have five calendar days following written notification of this exclusion in which to appeal. Until the final disposition of the appeal, the student is considered enrolled in the course.

Course Loads

Full-time graduate students normally take nine semester credit hours. Additional courses above this load require permission from the appropriate department chair. If a

student demonstrates exceptional academic performance, the department chair or designee may approve a maximum one-course overload. A student's enrollment may be restricted when deemed in the best interest of the student.

The Grading System

The following indicators are used on grade reports and transcripts.

Letter Grade	Student Performance	Grade Points Per Credit Hour
A	Excellent	4
B	Satisfactory	3
C	Passing	2
F	Failure	0
WF	Withdrawal from the University-Failing	0
W	Withdrawal from a course	N/A
AU	Audit	N/A
I	Passing but incomplete	N/A
IP	In progress	N/A
N	No grade submitted by instructor	N/A
P	Passing grade (credit)	N/A
S	Satisfactory (noncredit)	N/A
T	Transfer credit	N/A

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Grade Reports

Grade reports are issued at the end of each term. Students are solely responsible for informing the office of address changes.

The University is prohibited from releasing grade information without the express written authorization of the student. Such authorization must be granted each term because blanket authorizations are prohibited by law.

Unit of Credit

Semester credits are used throughout the University system. Transferred quarter hours will be converted to semester credit hours on the following basis: A quarter hour equals two-thirds of a semester hour.

Grade Point Averages: GPA, CGPA

A term grade point average (GPA) and cumulative grade point average (CGPA) are computed for each student after every term. The GPA is calculated by dividing the number of grade points earned during the term by the number of hours attempted in that period. The CGPA is determined by dividing the total number of grade points by the total number of hours attempted at the University. Grade points and hours attempted are accrued in courses graded A, B, C, F, and WF only.

Thesis and Graduate Research Project Grading

A final grade of P or F is awarded upon completion of the thesis or graduate research project. If the student is making progress, a grade of IP is awarded at the end of each

term. The P grade will replace the IP grade for all terms. If the student has not made progress, a grade of F will be issued and will result in a change from IP to F for all thesis or graduate research project credits. A student enrolled for a thesis will receive a grade each term, as determined by the student's thesis committee. Students must continually register for one credit hour of thesis until complete.

Internship Grading

A final grade of P or F is awarded upon completion of a graduate internship.

Dropping a Course

Students may drop a course, with no notation of course enrollment on their transcripts, during the drop period only. The drop period extends through the third week of Spring and Fall terms and the second week of Summer terms.

Auditing a Course (AU)

Because students audit a course solely to enhance their knowledge, academic credit is not granted toward degree requirements for audited courses. Students may change their registration from audit to credit during the add period only. They may change from credit to audit until the last day of the withdrawal period. When a student auditing a course fails to maintain satisfactory attendance, as determined by the instructor, a grade of W will be assigned.

Withdrawing from a Course (W)

Students receive a grade of W if they withdraw from a course before the tenth week

of Spring and Fall semesters and the fourth week of Summer terms. If they withdraw from a course after this period, they receive a grade of F. If students stop attending their classes and fail to withdraw from the University, a grade of F is assigned for each course in which they were enrolled.

Students are not permitted to drop or withdraw from a course while a charge of academic dishonesty is pending. Students who withdraw from a flight course before the initial attempt at the final phase check receive a grade of W.

Incomplete Grade (I)

In exceptional cases, faculty may assign the temporary grade of incomplete (I) if a student is unable to complete the required work in a course because of medical emergency, death in the family, military duty, or other extenuating circumstances. If a student does not complete the course in the specified period, the grade of I automatically converts to an F.

The period to convert an I in a graduate course extends through a time period determined by the instructor, but no later than three calendar months following the end of the term in which the I grade was assigned.

Repeating a Course

Students may petition to repeat one course in which a grade of less than a B was earned for the purpose of improving their grade point average. Both grades earned appear on the transcript, but only the replacement grade is included in the calculation of the grade point average.

Undergraduate Enrollment in Graduate Courses

During their senior year, Embry-Riddle undergraduate students may take selected Embry-Riddle graduate courses, normally 500-level, for credit toward their undergraduate or graduate degree. Students must be within 10 hours of completion of the undergraduate degree, have the approval of the program coordinator of the appropriate graduate program, and have at least a 2.50 CGPA to qualify for enrollment in graduate courses while an undergraduate.

Academic Warning and Dismissal

Warning

Full-time students whose cumulative grade point average (CGPA) falls below 3.00 are placed on Academic Warning. Students on Academic Warning must raise their cumulative grade point average to 3.00 in the next 12 hours of graduate work.

1. Students on conditional status who fail to satisfy the conditions of their admission;
2. Earn less than a B in three graduate courses;
3. Earn an F in any two graduate courses;
4. Are on Academic Warning and fail to earn a 3.00 CGPA in the next 12 hours of graduate work;
5. Earn less than a 2.50 cumulative grade point average.

Students may appeal their first academic dismissal from the University by submitting a petition in writing detailing the existence of any exceptional mitigating circumstances to the chancellor or designee in 30 days of the receipt of the dismissal notice. The chan-

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cellor or designee will refer the student petition to the appropriate appeals committee for recommendation. Upon recommendation of the appeals committee, the chancellor or designee reviews the case and makes the final determination of the action to be taken. Such action will be taken in a timely manner not to exceed 30 days of the receipt of the petition. If confirmed, academic dismissal is final.

Students whose academic dismissal is final will not be readmitted to the University for two years. Unless readmitted to the University, such students will not be permitted to take any further graduate courses with the University. After this two-year period has lapsed, a student must reapply and meet all admission requirements in effect at the time of application to be eligible for reconsideration.

Dismissal for Cause

The University reserves the right to dismiss a student at any time and without further reason, if the student exhibits the following undesirable conduct:

1. Actions that pose a risk to the health, safety, or property of members of the University community, including, but not limited to, other students, faculty, staff, administrative officers, or the student himself/herself;
2. Conduct that disrupts the educational process of the University;
3. Any other just cause.

Transfer Between Graduate Degree Programs

A graduate student who wishes to transfer from one program to another must prepare

a written petition before the transfer will be considered. Requests for transfer of credits from Embry-Riddle or other institutions and/or advanced standing credits should be included in this petition.

The department responsible for the new program, however, has the prerogative to accept or reject the student's request and to determine the courses applicable to the new program. Students should contact the appropriate graduate program coordinator.

When a student elects to transfer from one degree program to another, the catalog in effect when the transfer is approved is applicable.

Additional Graduate Degrees

A graduate student is allowed to apply up to 12 applicable credit hours from one graduate degree program to meet the requirements of another graduate degree program. In order to be awarded a second graduate degree, the student must satisfy all the requirements of the degree sought.

Catalog Applicability

1. A petition to come under the provisions of a later catalog requires approval from the department chair or designee.
2. Former graduate students who reapply for admission to the University will, if readmission is granted, come under the provisions of the catalog in effect at the time of readmission.
3. Students who change from one graduate degree program to another come under the provisions of the catalog in effect on the date the change of program petition was approved.

Time Limitation for Degree Completion

The student has seven years from the date of admission to the master degree program to complete the degree. No Embry-Riddle course older than seven years at the time of graduation may be used in the program of study for a master degree. (Prerequisite courses are exempt from this requirement.) Transfer courses older than seven years, earned at other universities, may be accepted at the discretion of the appropriate program coordinator. Students who do not maintain continuous enrollment (missing enrollment at the University for a period of two years) must file for readmission to the University, although seven years is measured from when the student was first admitted to the program.

Loss of Graduate Status and Readmission

Under certain circumstances (other than graduation), a graduate student may lose graduate status and will no longer be considered a student at Embry-Riddle. This can occur when:

1. A student voluntarily withdraws from the University.
2. A student is dismissed from the University and the dismissal becomes final.
3. A student fails to meet the requirement for continuous enrollment. This occurs when a student does not enroll in at least one term in a two-year period.
4. A student does not complete the degree requirements of a graduate program within seven years of starting the graduate program.

Students who fail to maintain continuous enrollment for any reason are required to apply for readmission under the catalog in effect at that time.

Withdrawal from the University

Students who leave the University for any reason must officially process a withdrawal clearance through the office of Records and Registration. When a student withdraws from the University after the end of the scheduled withdrawal period, a WF grade will be assigned for all courses in which the student is enrolled unless an exception is granted for medical reasons or other extenuating circumstances by the appropriate chancellor or designee.

Graduation Requirements

The following summary of graduation requirements is provided for all students. An Embry-Riddle master degree will be conferred upon the successful completion of the general requirements of the University and the specific requirements of the degree sought.

1. All course, thesis, GRP, and other academic requirements, as appropriate, must be met.
2. The student is not on Academic Warning.
3. All debts and obligations to the University are satisfied.
4. The student is not under University investigation for misconduct or other disciplinary matters.
5. A student must be enrolled in the term in which he/she graduates.
6. An application for graduation must be initiated by the student and received in the time limit specified by the appropriate campus records office.

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7. Participation in graduation exercises will not be permitted, a diploma will not be awarded, nor a transcript annotated as complete, until all of the degree requirements have been satisfied.

Graduation Honors

Students who have completed a graduate degree program and who have excelled academically throughout their graduate careers are recognized through the publication of graduation honors. To be eligible, graduate students must have completed their degree program with a cumulative grade point average of 4.00 based on grades received in all courses that apply to specific degree requirements.

Transcript Requests

A signed request for an academic transcript, accompanied by a fee, may be submitted by the student to the appropriate Records and Registration office. Transcripts will not be released to students who have failed to meet their financial obligations to the University.

Privacy of Student Records

The University respects the rights and the privacy of students in accordance with the Family Educational Rights and Privacy Act (FERPA).

The University may disclose certain items of directory information without the consent of the student, unless the student submits a written nondisclosure request. Students are required to file their request for nondisclosure on an annual basis. Directory information consists of the student's name, address, telephone number, date and place

of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, the most recent education institution attended by the student, and other similar information.

FERPA allows disclosure of educational records or components thereof under certain conditions. Students desiring additional information regarding FERPA should contact the office of Records and Registration.

Student Grievances

It is the policy of Embry-Riddle to administer its educational programs in a fair, equitable, academically sound manner and in accordance with the appropriate regulations and criteria of its governing board, accrediting associations, and federal and state laws and regulations. To this end, graduate students are provided an opportunity to express any complaint, grievance, or dispute that upon investigation may be redressed.

Substance Abuse

Embry-Riddle promotes substance abuse awareness by sponsoring educational programs and distributing literature. The University is additionally committed to assisting students in the resolution of problems associated with substance abuse and encourages students to seek additional help through referrals from University Health Services and Counseling offices.

FINANCIAL INFORMATION

Student Accounts

At the time of acceptance for admission, a University account is opened for each student. This account remains open until graduation. The primary use of this account is for University charges and payments. If an account shows credit balances, a student may request a refund in the form of cash or a check. A student may also complete authorization and have these funds directly deposited to a checking account. Each student is encouraged to open and maintain an account at a local bank for personal matters.

Billing Address

Residential campus students are assigned an Embry-Riddle email address, which is their primary address for all University correspondence. Billing-address change forms are available through the Web site <http://www.erau.edu>.

All student account information may be obtained on Embry-Riddle's Web site.

Payment Procedures

Cash, Visa, MasterCard, Discover, American Express, and personal checks are acceptable forms of payment. Payments made by mail should be addressed to the campus Cashier Office and timed to arrive prior to the first day of class. Charges incurred subsequent to registration are due 30 days from the date of invoice or the last day of class, whichever occurs first. All payments should include the student's name and identification number.

Bills for tuition and fees, issued at the end of registration, are payable on the first

day of class. If full payment cannot be made by this date, tuition-payment agreements on outstanding balances are available. There will be fees incurred for deferring payment. Fees may vary depending on the campus attended.

Books and Supplies

Purchases are made directly from the University Bookstore. Cash, checks, Eagle Dollars, Visa, MasterCard, and American Express are accepted. Students whose estimated financial aid is higher than the total amount for tuition and fees may request these funds from the Bursar Office for book purchases.

Delinquent Accounts

When a student's account is delinquent, registration for that term is subject to cancellation and registration for any subsequent semester will be denied. A delinquent student account will result in suspension of all academic processing and information on class performance, grades, and transcripts will be withheld. Continued delinquency may result in administrative withdrawal from the University. Administrative withdrawal will not relieve a student of the obligation to pay outstanding debts. Sums remaining unpaid will be charged interest at the maximum rate allowed by law. The student is also subject to the costs of collection, including collection-agency fees (33-50%) and reasonable attorney's fees for making such collection. Delinquent accounts may be reported to one or all three major credit bureaus.

Financial Information

Residential Campus Tuition and Fees

Fall 2008/Spring 2009 Tuition

Students registering for coursework during the spring or fall term totaling 12-16 credit hours are billed according to a “block tuition” rate. Registration for coursework equaling 1-11 credit hours is charged on a per-credit-hour basis. Students whose undergraduate course loads during fall or spring semesters are greater than 16 hours are charged the semester rate plus a per-credit-hour charge for those credit hours over 16.

A student with more than 27 completed credit hours and a cumulative GPA of 3.00 or higher may enroll for up to 18 credit hours, in a fall or spring semester, with no increase in tuition for hours over the block. Completed credit hours and a cumulative GPA at the end of the spring semester will be used for fall semester eligibility. Completed credit hours and a cumulative GPA at the end of the summer semester will be used for spring eligibility.

Courses taken in the Aviation Maintenance Science Department (AMS courses) are billed separately from other academic courses, and have a lower per-credit-hour tuition rate. AMS courses do not fall under the “block tuition” rate.

Summer tuition rates are determined solely by the number of credit hours per term. Each summer term is billed separately.

Detailed tuition rates are described in the 2008/2009 financial insert at: <http://www.erau.edu/er/costs.html>.

Hourly Flight Rates

Rates vary by type of aircraft or simulator. Please see the financial insert applicable to Daytona Beach campus for specific rates.

Payment for Flight Instruction

The University uses a cash-basis payment method for all flight instruction. Payment is expected at the completion of each training session.

If your method of payment cannot be processed for whatever reason, the training session will be charged to your student account. A hold will be placed on your flight account until this transaction is paid. Any further instruction, not already scheduled, will be suspended until payment is received.

If you do not wish to use a credit card or do not have one, Eagle Dollars give you another option. Any combination of these payment methods may be used at any time.

Room and Board

Room and Board fees may be incurred each semester by students attending the Daytona Beach Campus and should be used when estimating the cost of attendance. Freshman and sophomore students may be required to live in University-managed housing and participate in the Embry-Riddle Dining Services meal program. A variety of meal plans are offered that may be supplemented with the Eagle Card to suit individual needs. Please refer to the campus financial brochure and/or Housing and Dining Services brochures for the appropriate campus for current options, requirements, and costs.

Mandatory Fees

The following fees are mandatory where applicable. Please see the financial insert at <http://www.erau.edu/er/costs.html>.

- Student Government Association fee
- Health service fee
- International student insurance fee
- International student service fee
- Insurance
- Technology fee
- Student facility fee

User Fees

Other fees apply for services that are not considered mandatory. Please see the financial insert at <http://www.erau.edu/er/costs.html>.

A Graduate Internship Fee based on the cost of one credit hour in a student's degree program is charged for the semester of internship.

Refund Policy

Students who officially withdraw from all classes are eligible for partial refund of tuition. Spring and fall tuition refunds at the Daytona Beach Campus for reduction of hours are not available after the last day of add/drop. Summer term refunds are calculated on a per-course basis. During all terms the effective date of the withdrawal, as determined by the Records Office, governs refund computations. Students who are suspended for disciplinary reasons will not be eligible for a full or percentage refund. Please reference the Withdrawal/Refund Schedule applicable to the Daytona Beach Campus.

The following are refundable according to the Withdrawal/Refund Schedules:

- Tuition
- Student Government Association fees
- Housing fees (less housing processing fee)
- International student service fee
- Health service fee
- Technology fee
- Insurance fee
- Student facility fee
- Meal plans – unused balance at time of withdrawal

University Withdrawal/Refund Schedule

Fall/Spring Semesters

Period I	Class days 1-5	100%
Period II	Class days 6-10	80%
Period III	Class days 11-15	60%
Period IV	Class days 16-20	40%
Period V	Class days 21-25	20%
Period VI	Class days 26 and after	0%

Summer A/B terms

Period I	Class days 1-3	100%
Period II	Class days 4-6	80%
Period III	Class days 7-9	60%
Period IV	Class days 10-12	40%
Period V	Class days 13-15	20%
Period VI	Class days 16 and after	0%

Requests for refunds due to circumstances clearly beyond the student's control, such as illness or required military service, must be in writing and must be accompanied by appropriate documentation, such as a phy-

Financial Information

sician's statement or military orders.

A request for refund must be submitted within 60 days of the date that the student completed a change of registration. Refund petition requests will normally be processed within 10 business days. Personal appeals for denied requests must contain additional documentation not previously presented.

Department of Education Withdrawal/Refunds Policy

Students receiving financial aid who withdraw will be subject to the refund policies specified by the U.S. Department of Education. Refunds of federal aid for students who officially withdraw on or before the 60% point of the enrollment period will be determined by calculating and comparing the amounts due under the federal refund schedule and the University refund schedule.

Required Advance Tuition Deposit (new students only)

The deposit is refundable in full, provided written notice is furnished at least 60 days before the first day of registration for the semester.

Housing Contracts

Students who have housing contracts must contact the Housing Office to release their obligation. Any refunds will be determined at that time. All housing deposits will remain on account until the housing contract expires. The Housing Office will authorize release of the deposit to the student account.

Financial Assistance

Embry-Riddle participates in a number of federal, state, and University-administered programs that help students and their families meet educational costs.

Embry-Riddle believes the primary responsibility for financing education lies with the student and the student's family. Therefore, the student should apply for financial aid early, save money, look for ways to reduce costs, and become aware of specific program requirements by reading all financial aid publications. Financial aid awards are meant to supplement what the student and family can contribute toward costs and rarely cover all educational expenses. All financial assistance will be limited to the student's individual remaining need or Embry-Riddle's established cost of attendance.

A complete description of financial assistance programs and optional financing programs available to students and their parents is available on the Web under the Financial Aid section (<http://www.embryriddle.edu>). Students who expect to need help in meeting their financial obligations are encouraged to seek such assistance through one or more of the programs available for this purpose.

Eligibility Requirements

To be considered eligible to apply for most financial programs, students must:

1. Be U.S. citizens or eligible noncitizens
2. Be enrolled or accepted for enrollment as at least a half-time student in a degree program
3. Be making satisfactory progress toward a degree

4. Be registered with Selective Service if required to do so
5. Establish financial need
6. Not be in default on a loan or owe a repayment on a previous financial aid award received at any institution

The Application Process

After applying for admission to the University, students may complete the federal application (FAFSA) at <http://www.fafsa.ed.gov>. Each year, students are required to reapply for financial aid.

All students are encouraged to complete the FAFSA by Embry-Riddle's priority deadline of March 1.

Programs Available

The major categories of financial assistance programs include grants, scholarships, loans, and student employment. Loans from state and federal government sources or from private lenders must be repaid; the interest rate, however, is usually low, and the repayment period is extended. Grants and scholarships do not have to be repaid, nor does the income earned through student employment. Most of these programs are based on the student's financial need.

Grants

Federal (Undergraduate Only)

- Federal Pell Grant
- Federal Supplemental Educational Opportunity Grant
- Academic Competitiveness (ACT) Grant
- National Science and Mathematics Access to Retain Talent (SMART) Grant

State and Institutional (Undergraduate Only)

- Financial Assistance Program (PFAP)
- Family Grant
- Florida Student Assistance Grant
- Florida Resident Access Grant
- Florida Bright Futures Scholarship Program
- Grants from other states

Loans

Federal

- Federal Stafford Loan (Undergraduate and Graduate)
- Federal Unsubsidized Stafford Loan (Graduate)
- Federal Parent Loan for Undergraduate Students (Undergraduate Only)
- Federal Parent Loan for Graduate Students (Graduate)
- Federal Perkins Loan (Undergraduate Only)
- Other private-sector educational loans

Employment

Federal

- Federal Work-Study Program

Embry-Riddle

- Embry-Riddle Student Employment
- Off-Campus Referral Program
- Resident Advisor Program

Financial Information

Scholarships

Embry-Riddle

A limited number of academic scholarships are awarded to entering freshmen and college transfers who possess outstanding academic credentials. An incoming student's completed application for admission to the University is the only application required for scholarship awarding consideration. For more information about scholarships, students should contact the Financial Aid Office of the Daytona Beach Campus.

Other Financial Assistance Programs

Reserve Officer Training Corps

The following campus-based organizations provide tuition scholarships to students who meet specific academic, medical, and physical requirements. In addition, Embry-Riddle offers special financial assurances to ROTC Scholarship winners. For more information on all requirements and benefits, refer to the Special Academic Programs and Opportunities section of the catalog.

- Air Force Reserve Officer Training Corps (ROTC)
- Army Reserve Officer Training Corps (ROTC)
- Naval Reserve Officer Training Corps (ROTC)
- U.S. Marine Corps Platoon Leaders Class Program

Veterans Education Benefits

Embry-Riddle degree programs are approved by the appropriate State Department of Veterans Affairs (State Approving Agency) for enrollment of persons eligible to receive education benefits from the Department of Veterans Affairs (DVA).

Students must be pursuing a degree in a specific program to be eligible to receive benefits. Admission procedures for veterans and other eligible persons are the same as those for other students. Students who do not satisfy all requirements for full admission may be certified for two terms; however, they may be required to repay the DVA for some or all benefits received if they do not achieve full admission status during that time.

Title 38, United States Code, sections 3474 and 3524, requires that education assistance to veterans and other eligible persons be discontinued when the student ceases to make satisfactory progress toward completion of the training objective. Accordingly, benefits will be interrupted for undergraduate students whose CGPA is less than 2.00 for three consecutive terms or who are otherwise subject to suspension. The DVA will be appropriately notified of the unsatisfactory progress. The student must submit a written request to reinstate education benefits. The request must include proof of academic counseling and the conditions for continued enrollment or re-entrance. The DVA will determine eligibility for reinstatement of benefits, based in part on the school's recommendation.

A veteran's progress will be measured

according to University standards as published in this catalog, and the rules and regulations of the DVA apply. The criteria used to evaluate progress are subject to change. Application and interpretation of the criteria are solely at the discretion of Embry-Riddle. Students are responsible for notifying the certifying official of any change in their enrollment or change in personal information affecting their eligibility. Students also must remain in compliance with University and Department of Veterans Affairs requirements. Students may receive education benefits only for courses that are required for their designated degree program. Students who receive DVA benefits are subject to strict academic regulations and should be aware of how auditing courses, repeating a course, changing degree programs or enrollment status, and other actions may affect their eligibility to receive benefits.

For further information concerning approved programs and the application process, eligible persons should contact the Veterans Certifying Official at the campus they plan to attend.

Extended Payments

Students who use financial assistance to pay their University charges may have the payment date extended for the amount of their award if their funds are not ready to be disbursed by the date payment is due. This is called a payment extension. Any difference between the total charges and the amount of the extension granted must be paid according to the University's payment procedure. To qualify for a payment extension, students must have applied for financial assistance and must have received final approval of their award.

Student Government Association Leadership Program

The Student Government Association (SGA) at each residential campus offers partial tuition waivers for elected officials of the organization. The amount of the waiver varies depending on the position held. The goal is to stimulate interest in holding elected office and to recognize the commitment student leaders make in such positions.

For information about the criteria students must meet to run in an SGA election, or for other information about the program, contact the Student Government Association office.

Flight Leadership/Fellowship Program

The Flight Leadership/Fellowship Program is available to students enrolled in the Aeronautical Science degree program. It is designed to identify, develop, and reward students for demonstrated outstanding academic and leadership abilities.

Students are selected for the Flight Leadership portion of the program based on academic excellence and leadership potential. Selection for the Flight Fellowship portion is made from those Flight Leadership students who complete all required flight courses, demonstrate outstanding academic and leadership qualities, and satisfactorily complete the Embry-Riddle Flight Instructor Evaluation and Standardization Program. While not every Flight Leadership student is offered a Flight Fellowship, those who are selected will serve as a department flight instructor and tutor while finishing their degree requirements.

The Flight Leadership Program is highly

Financial Information

competitive. Interested students should contact the chief flight instructor for additional information.

Athletic Grants

The University offers a limited number of Athletic Grants for qualified students. Awards are available for baseball, basketball, golf, men's and women's soccer, men's and women's tennis, wrestling, women's volleyball, and men's and women's cross-country. The maximum value permitted by the NAIA is the actual cost of tuition, room, board, books, and fees. However, most grants are awarded as partial tuition waivers. To qualify, students must meet both University and NAIA eligibility requirements. The grants are highly competitive, and interested students should contact the Athletic Department for specific details.

Ronald E. McNair Scholars Program

This program is named in honor of the African-American mission specialist who died in the 1986 Challenger disaster, and funded by a U.S. Department of Education TRiO grant. This prestigious diversity program offers financial aid and academic and other support services to eligible underserved low income/first generation and/or underrepresented certain ethnic minority students who are interested in pursuing graduate studies leading to a Ph.D. after leaving Embry-Riddle. In addition to some financial aid, the program provides academic mentoring, academic and career counseling, Graduate Record Examination (GRE) preparation, a research methodology and statistics workshop, funded research

opportunities, and cultural/social activities. Acceptance into the program is selective and is based on a special application process. Eligible transfer students are also welcome to apply. For more information, contact:

McNair Scholars Program
(386) 226-6149
dbmcnair@erau.edu

Military Tuition Assistance

Military tuition assistance may be available to graduate students on active military duty. For further information, students should contact the educational services officer at their assigned installation.

Graduate Assistantships

Graduate assistantships are academic appointments that are normally reserved for qualified graduate students at the Daytona Beach Campus. A graduate teaching assistant helps in teaching undergraduate students in specified courses or laboratories under the general supervision of a faculty member. A graduate research assistant is involved in research activities under the direction of a faculty member or a research associate. A graduate administrative assistant assists departments or faculty with curriculum development, special projects, and other duties as assigned. To be eligible for a graduate assistantship, a student must have full graduate status in a degree program, must have maintained a CGPA of 3.00 out of a possible 4.00 or above through the end of the semester (graduate or undergraduate) preceding the appointment, and must demonstrate adequate communication and technical skills.

Each department has the responsibility to post the availability of its graduate assistantships. Students interested in applying should submit a resume directly to the department. Incoming students should contact departments directly about the availability of assistantships.

Full graduate assistantships carry a stipend set by the University and a tuition waiver for up to nine graduate credits per semester. Graduate assistants with such appointments are expected to devote 20 hours each week to effectively carry out their assignments. Under some circumstances, partial assistantships pro-

viding either tuition or a stipend may be granted. In such cases, expected time to be devoted is set by the assigning department. Graduate assistants are permitted to accept other University employment; however, University policies limit all students to a total of 25 hours of work per week, including the graduate assistantship. All graduate teaching, research, and administrative assistantships, both full and partial, require that the recipient be registered for at least three graduate credits at Embry-Riddle for any semester of their appointment. Summer registration is not required, but encouraged.

STUDENT LIFE AND SERVICES

Student Activities

The mission of the Student Activities Office is to provide students with the opportunity to experience co-curricular programs that support and complement the educational process and contribute to a well-rounded education. Student Activities works with other areas of the campus to offer cultural, intellectual, recreational, and entertainment events for all Embry-Riddle students, while providing a learning experience not available in other academic settings.

There are over 125 student organizations on the Daytona Beach Campus. The campus encourages participation in sports clubs, special interest groups, Greek life (sororities and fraternities), honor societies, aviation clubs, military organizations, and religious clubs. The Student Activities Office provides support for all these organizations in addition to assisting students in starting a new student organization. Involvement in any student organization develops skills in social responsibility, strong group dynamics, leadership, communication, management, budgeting, and decision making. Students have the opportunity to learn about all the organizations at the fall and spring Activities/Club Fair.

The Student Activities Office is also the point of contact for the Programming Board (Touch-N-Go Productions), leadership development, and Homecoming activities.

For specific information, visit the Student Activities Office.

Student Government Association

The Student Government Association (SGA) is responsible for providing a link between the students and the faculty, staff,

and administration. While being the voice of the students, the SGA provides many services, represents the student body, and is actively involved with student activities. SGA services to the students include a free beverage service, safe ride, which provides a free taxi ride to students when they are in unsafe situations; a student directory handbook; discount cards; lawyer service; lockers; banners; color printer; and free faxing. SGA members also participate on almost every committee, and the president of the SGA is a member of Embry-Riddle's Board of Trustees. Direct questions, comments, or concerns to sgapres@erau.edu or call (386) 226-6045.

Judicial Affairs

The Dean of Students Office at the Daytona Beach Campus offers a variety of services to assist students with problems such as personal and family emergencies. The department oversees all non-academic judicial issues and disciplinary records.

Intramural and Recreational Sports

Intramural and Recreational Sports at the Daytona Beach Campus strives to create an atmosphere of competition and fun by offering a wide variety of activities ranging from team sports such as flag football, volleyball, basketball, dodgeball, floor hockey, and softball to individual competition in such sports as table tennis, racquetball, and tennis. Other sports are also available on request.

The director assists chartered clubs and organizations with the use of sports facilities and equipment. An equipment-loan program offers many items for free checkout on

an overnight basis with a valid University I.D. card. Students are encouraged to use all on-campus sports-related facilities (outdoor swimming pool, tennis and basketball courts, playing fields, indoor racquetball, gymnasium, and fitness center). Hours vary for each facility and are posted.

In addition to on-campus recreational activities, a virtually unlimited variety of outdoor recreational opportunities are possible. Hiking, camping, fishing, and sailing are a few of the activities available.

Whether students seek a highly competitive league to demonstrate their athletic skills or select a competition that encourages group participation for fun and to stay in shape and reduce the stress in their lives, they are sure to find what they are looking for in intramural recreational sports.

Intercollegiate Athletics

Embry-Riddle Intercollegiate Athletics brings exciting and highly competitive varsity sports to the Daytona Beach Campus. All Embry-Riddle students are admitted to regular-season home events free of charge, and everyone is encouraged to get involved and support the Eagles. The University is a member of the National Association of Intercollegiate Athletics (NAIA) and successfully competes against opponents from all levels of college athletics. Many of the University's sports programs are ranked among the top 25 teams in the nation and are perennial contenders for conference, regional, and national championships. The 1999-2000 year saw the Eagles basketball program win the NAIA Division II national championship. Eagles baseball competed in the NAIA World Series in 1999, 2002, 2003, and 2004. Women's soccer has participated

in the national tournament the past three years, as has women's golf, finishing fifth in the nation in 2004. Men's and women's tennis have made five consecutive national championship appearances. In addition, the Daytona Beach Campus won the Florida Sun Conference Commissioner's Cup for best all-around athletic program for the fifth straight year in 2003-2004.

The University sponsors 14 intercollegiate sport programs at the Daytona Beach Campus, including men's baseball, basketball, cross-country, golf, soccer, tennis, and track and field; women's cross-country, golf, soccer, tennis, track and field, and volleyball; and co-ed cheerleading. Any student who meets both University and NAIA eligibility requirements is able to compete for a position on a varsity team. Athletic grants-in-aid, in varying amounts, are generally awarded to recruited varsity student-athletes, with walk-on players earning the right to compete for scholarship assistance, when available.

For more information on the Eagles, including game schedules, rosters, results, and statistics, or to sign up for the Daytona Beach Campus' student athletic support group, The Flock, log on to <http://www.embryriddlesports.com>.

For tryout information, contact the Intercollegiate Athletics department.

First Year Programs

Dedicated to helping students achieve their academic goals, the First Year Programs (FYP) team consists of highly qualified academic advisors, student assistants, peer mentors, and tutors who work together with faculty and staff campuswide to assist students in their transition to university life.

Student Life and Services

First Year Programs, conveniently located on campus in the Doolittle Annex, focuses on the academic success of first-year students through developmental and intentional academic advisement. First Year Programs coordinates and provides academic counseling, grade monitoring, academic intervention strategies, tutoring, supplemental instruction, and acts as a liaison for students seeking appropriate sources of information and specialized services on campus.

First Year Programs oversees the university success course offerings for the campus and coordinates with the Living-Learning Program in the residence halls. In addition, First Year Programs runs the “First Class” program for first-year students who begin their studies early by attending the Summer B semester, and also offers the First Generation Student program designed to help students who are among the first generation in their families to attend a university.

Hunt Library

The mission of the Hunt Library is to provide materials, services, and facilities to students, faculty, and staff in support of the University’s commitment to excellence in teaching, learning, and research for both the Daytona Beach and Worldwide Communities.

Visitors to the Hunt Library will find resources in a variety of formats: books, government documents, periodicals, microforms, conference proceedings, reports, videos, and DVDs. An extensive collection of electronic resources are available to Embry-Riddle students, faculty, and staff through the library’s website: <http://amelia.db.erau.edu>. Many can be accessed from off-campus

and provide full-text access to periodicals, documents, and other research materials.

The library also houses a special collection of historical aviation materials which originated from the Manufacturers’ Aircraft Association. Materials that are not available in the Hunt Library’s collection can be obtained through the library’s Interlibrary Loan service.

Library users can access the Internet on public-use computers or sign on to computers equipped with productivity software to aid in the completion of course-related research. Assistance can be obtained by consulting one of several reference librarians who are available to assist students and teach research skills.

With a variety of seating options, the Hunt Library is a comfortable, popular venue to browse magazines, study, and gather for group projects.

Information Technology Services

Information Technology strives to provide students with stable, secure, highly available, always-on systems via the Web that offer a leading-edge in technology. The Embry-Riddle Web portal, known as ERNIE (Embry-Riddle Network for Information Exchange), can be found at <http://ernie.erau.edu>. ERNIE accounts are provided to all students. ERNIE gives students one-stop-shopping for class and University information as well as details on campus events. ERNIE also provides a number of services that students can access, such as email, unofficial transcripts, class grades, class schedules, account balances, and flight schedules. Additional services are available and more are continually being added. ERNIE can be accessed from any computer with an Internet connection. Information

Technology also provides the following services:

- Computerized labs and classrooms
- Email accounts
- Network storage space for class assignments
- Storage space for personal Web pages
- Assistance in connecting to the Residential Network (ResNet) for on-campus housing
- Voicemail accounts for on-campus housing
- Popular Microsoft software titles available.
- Telecommunications support for University Housing
- Wireless Internet access in many buildings

As the technology used in the aviation and aerospace industries grows and advances, so are the tools of teaching future aviation and aerospace pioneers.

Student Employment

The Student Employment Office provides assistance to students seeking part-time employment on or off campus. On-campus employment is available to students regardless of financial need. Working on or off campus not only gives students more financial support, but also helps them develop self-confidence, gain valuable employment, credit references, establish a work record, and acquire useful skills in time management, financial planning, and communication. Once students are registered at the Daytona Beach Campus they may seek employment by visiting our office or by

viewing all available positions via our on-line system.

Because students work and serve each other at Embry-Riddle, a sense of community is created. Students are participants in the life and work of the University as well as consumers of the educational program. Embry-Riddle depends on student workers for much of the work essential to sustain day-to-day operations.

Embry-Riddle adheres to the principle of equal employment opportunities for all students.

Safety and Security

Safety and security is provided by the Campus Safety Department, an in-house unit consisting of full-time officers and part-time student assistants. The Safety Department provides patrol and escort services, parking and traffic services, life safety systems, crime prevention, and communications/dispatch services.

The patrol and communications sections provide 24-hour service to the campus and its satellite locations. Safety officers respond to routine requests for service as well as to emergency situations. They also conduct field investigations as required and provide specialized security service to the campus flight line. The parking and traffic services section manages campus parking, traffic, and associated enforcement functions. It also provides support for special events. The crime prevention section actively engages in safety education and crime prevention programs for students, faculty and staff. The department maintains a close liaison with local law enforcement agencies to provide the safest possible learning environment.

Student Life and Services

Campus Ministry

The University recognizes that the typical student feels challenged by the many questions, experiences, and world views encountered on campus. It also recognizes that because students are faced with a consuming social life and the subtle influence of peers, it is important to encourage and promote spiritual development. Special opportunities for deepening faith such as meetings and programs sponsored by student religious clubs and pastoral counseling are offered during the regular academic year. At the Daytona Beach Campus, worship services are available each Sunday at the Interfaith Chapel.

Disability Support Services

The University is committed to ensuring access and providing reasonable accommodation for students with documented disabilities who request assistance. The Director serves as the advocate of Disability Support Services at the Daytona Beach residential campus, Worldwide Campuses, and online.

Students' needs are addressed on an individual basis with regard to their specific disabilities, academic and career goals, learning styles, and objectives for personal development. Campus-specific services include academic advisement or assistance with planning academic schedules, registration assistance and advance registration, academic intervention programs, time management training, study skills assistance, arrangements for peer tutoring, testing modifications, advocacy, and facilitation of physical access. The University does not provide diagnostic testing but will make referrals for evaluation by area specialists.

Costs associated with testing referrals are the responsibility of the individual student. Because certain academic programs are FAA-certified, those programs are subject to regulation by that agency. Therefore, regulatory limitations may delay or preclude participation or licensure in those programs by persons with certain disabilities. Prospective students considering a program of study are encouraged to contact the Disability Support Services coordinator for information on eligibility concerns or campus-specific services.

Health Services

Maintaining good health promotes a productive university experience. The Health Services staff is committed to promoting student wellness through direct care, education, and assistance with lifestyle modification.

Services include assessment, prescriptive and nursing care, referrals, wellness education and counseling, women's health care, medical grounding of flight students, and assistance with aerospace medical concerns.

Students must satisfy the mandatory immunization requirement prior to enrollment or participate in campus-based clinics. The Medical Report form supplied by University Admissions indicates the immunizations that students must document in order to register for courses and live in University-managed housing.

Prospective flight students should be aware that certain sensory impairments, medical, neurobiological, and psychological conditions, and prescriptive medications may delay or preclude medical certification by the FAA. These issues should be discussed with an aviation medical exam-

iner (AME) to ensure participation in flight instruction. Students may also contact the Health Services clinical staff for information on eligibility for medical certification.

Health Insurance Requirement for Students

All students must have health insurance and provide proof of coverage on an annual basis; insurance coverage must be continuous throughout enrollment at Embry-Riddle. The university recommends that students and/or their parents who are currently insured contact their plan administrator to ascertain benefits and limitations while enrolled. Some plans cover only emergency room care or require extended waits to become established with a local provider; many plans reimburse services received out-of-network at a lower rate or not at all.

All students will be automatically enrolled in the University's student health insurance plan with the premium assessed to their student account. Students with comparable private insurance may waive out of this plan and have the charge removed from their account. Prior to completing the waiver request, we encourage students and/or their parents to review the University's basic student plan and major medical options at www.uhcsr.com. The waiver request must be received and approved by the first day of classes. Failure to waive the insurance by the semester deadline will result in the nonrefundable insurance fee remaining on your student account. Embry-Riddle is not responsible for insurance waivers that are submitted after the deadline. The waiver can be completed by logging on to www.SRStudentcenter.com.

International students with an F-1 or J-1 visa must demonstrate proof of coverage that meets the State Department's

requirements for international students. International Students: Please contact the International Student Services Office for assistance.

Counseling Services

The college experience is highly complicated, offering students tremendous intellectual and personal opportunities, as well as difficult challenges and demands. Many students find themselves seeking counseling as a way of learning, growing, and dealing with these experiences.

Individual counseling provides an avenue for students to meet one-to-one with a counselor to discuss and explore the issues, concerns, and feelings they are experiencing. Issues addressed in counseling vary from adjustment to college life, relationship problems, and stress, to more serious problems. Counseling is available without cost to students, and the content and records of sessions are confidential.

The Residence Life Program

Embry-Riddle provides campus housing for students. Embry-Riddle believes that the on-campus living experience is an integral and positive part of a well-rounded university education. Interaction with other students in the campus community living environment is a major contributor to student success. National research shows that students who live on campus earn better grades, tend to be more involved in campus activities, and are more likely to graduate than students who live off campus. The campus housing system offers programs and services that support the academic mission of the University and promote student success. All residence halls are staffed by specially trained personnel who are committed to

Student Life and Services

helping students and promoting a positive community environment.

Residential Facilities

Residence halls are furnished and air-conditioned. Housing fees include all utilities, Internet, and cable TV access (with the exception of Internet at the Chanute Complex). Although computer labs are conveniently located in academic buildings, first-year students should provide their own personal computers for use in residential housing.

All residence halls have vending facilities and easy access to laundry facilities and campus dining areas. First-year students are assigned to buildings that are specially designated for new students.

Upperclass students can live in a variety of campus residences, including suites and apartments, on a space-available basis. Accommodations for disabled students are available. Requests for these spaces should be made to the Director of Housing and Residence Life.

Housing Policies and Application Policy

Residency Policy: All first-year students under 21 years of age with less than 28 earned credit hours are required to live in Embry-Riddle-managed housing for their first full academic year (fall and spring). First-year students are also required to participate in the Dining Services meal program.

Exceptions to the residency and board requirements are as follows:

- Students who are 21 years of age on or before Sept. 1, 2008

- Students who are legally married
- Students who are full-time, year-round residents of Volusia County, Florida, for a minimum of one year prior to entering Embry-Riddle

All requests for exception must be submitted in writing to the Director of Housing and Residence Life with supporting documentation of circumstances.

Application Process

Housing brochures and contracts are sent to students who have been accepted to the University. Completed contracts must be returned to the campus Housing Office with a \$250 deposit no later than June 1, 2008, in order to receive a priority room assignment. New students over the age of 21 may apply for Embry-Riddle-managed housing; however, assignments are made on a space-available basis.

Room and Board Costs

The room rate for all first-year student residence halls is \$2,500 per semester, per person. Rates for upperclass student apartments are generally higher.

Board Costs

All first-year students are required to purchase a 14-meal-per-week plan (\$1,620 per semester) for each of their first consecutive fall and spring semesters. First-year students may upgrade to larger meal plans if desired.

Eagle Card

The Eagle Card, which you will receive at orientation, is the official Embry-Riddle identification card for all students. It should be readily available at all times to present to

University officials who may request verification. The Eagle Card is the property of Embry-Riddle, which reserves the right to revoke use of the Eagle Card on any of its accounts at any time. Only the individual to whom it is issued may use the Eagle Card. Other uses include:

- **Activity Card:** Your Eagle Card allows you access to student activities, events, games, voting, and other services provided by Embry-Riddle.
- **Access Card:** If you reside in on-campus University housing, your Eagle Card will give you access to the residence halls. Also, certain labs and buildings require the use of an Eagle Card for entry.
- **Library:** You must present your Eagle Card each time you check out library materials.
- **Debit Card:** Your Eagle Card offers two debit accounts that are managed by the University. The Eagle Dollar account can be used at any University point of sale, including vending, copy, laundry machines, dining locations, and the University bookstore. The Eagle Dollar account is also accepted as payment by some of the local merchants in the Daytona Beach area; see our website for a complete listing: www.erau.edu/db/eaglecard. The Flight Account can only be used to pay for on-campus flight training activities.
- **Meal Plans:** These are accessed via your Eagle Card. (See the Dining Services section for more information regarding meal plans.)

Deposits

The Eagle Dollars and Flight Account minimum deposit is \$1.00. Deposits to either account can be made at the Cashier's Office,

at one of the on-campus Value Transfer Stations, or via the Web through your Blackboard account at the Eagle Card tab. The University reserves the right to suspend any account if a negative balance goes unpaid for more than 30 days, or if a student account is delinquent.

Transactions

The cardholder must present their Eagle Card at the time of purchase. All sales transactions charged to an account through the use of the Eagle Card are final at the point and time of sale. The cardholder is responsible for observing the amount charged during the transaction and monitoring balances. A cardholder can check their account balances online via the card holder's University Blackboard account. Up to 90 days' history is available.

Statements

The cardholder can obtain a detailed statement of their debit transactions through their Blackboard account. Up to 90 days' of history is available.

Account Closing and Refund

Your funds in an Eagle Card account are not transferable and there are no cash withdrawals permitted from the account(s). The funds will stay there semester-to-semester, year-to-year, and will not be refunded unless the cardholder withdraws, graduates, or is dismissed from the University, with proof required. Flight Account refunds can be requested upon flight course completion or withdrawal from the flight program. A request for a refund must be submitted to the Eagle Card Center in writing. A \$10.00 processing fee will be applied to any remaining funds in your Eagle Dollars account.

Student Life and Services

Lost or Stolen Card

The cardholder is required to immediately contact the Eagle Card Center during normal business hours (8 a.m. to 4 p.m.), the Safety Office after business hours, or via the Web through the Eagle Card tab on their Blackboard account, if an Eagle Card is lost or stolen. This action will suspend the card until it is reactivated at the Eagle Card Center. The cardholder is responsible for all transactions charged to their accounts prior to proper notification to the Eagle Card Center, the Safety Office, or via the Web. Once the card has been reported as lost or stolen, all accounts and privileges accessed with use of the Eagle Card will be deactivated.

Replacement of Lost/Stolen or Replacement Cards

A replacement fee of \$10.00 will be charged for lost cards. The fee will be waived if a card was reported as stolen and a report number was issued by Campus Safety. Temporary cards are available free of charge for up to seven days. A replacement fee of \$5.00 will be charged for damaged cards if the cardholder turns in the nonfunctioning card to the Eagle Card Center.

Error Resolution

If you feel there has been an error on your account, please notify the Eagle Card Office within 60 days from the date of the transaction in question. In order to resolve the problem we will require the following:

- Name, student ID number, and Social Security number
- Description of the error or transaction in question

- Dollar amount of the transaction in question
- A clear explanation of why you believe there is an error

Disclosure of Accounting Information to Third Parties

The University will disclose information to third parties about the account holder's account(s) or the transfer made only: (1) in order to comply with court orders or other applicable laws, or (2) if the account holder gives written or verbal permission, or (3) if the student's account receivables is in the third party's name. All policies and procedures are subject to change.

Dining Services

A variety of nutritious and satisfying dining services and meal plan options are offered. Dining facilities are conveniently located to residence halls and offer a wide range of food selections, from full hot meals to fast food and snacks. Students can also enjoy weekly specials and events such as cook-outs, buffets, and celebrations. Dining service hours are designed to meet the needs of students, with meals available throughout the day. Accommodations can be made for students with special dietary needs or medical conditions. Dining service personnel are available to consult with students on an individual basis. Requests for special services should be made to the director of Dining Services.

Please note the following information regarding meal plan requirements.

All first-year students are required to purchase a minimum 14-meal-per-week plan for each of their first consecutive fall and spring

semesters. This minimum required plan provides 14 full meals per week and flexible Riddle Bucks that can be used to purchase individual food items at any campus dining location. First-year students may upgrade to a larger meal plan that offers 19 meals per week. Detailed dining service information will be sent to all incoming first-year students to help with their meal plan choice.

Mail

Prior to a student's arrival, all personal mail, UPS, Federal Express, deliveries, etc., should be addressed as follows:

If box number is known:

This format for USPS only:

Student Name (include middle initial)

P.O. Box 14_____

Daytona Beach, FL 32114-3977

This format for UPS and FEDEX:

Student Name (include middle initial)

Mail # 14_____

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3977

If box number is unknown:

Student Name

"New Student"

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

All students are assigned a mailbox and are required to check it on a daily basis.

Career Services

Career Services provides career resources and career development assistance to all Embry-Riddle students and alumni. The Career Services Web site offers students and

alumni a virtual library of job search aids, including interview tips, sample resumes and cover letters, company profiles, direct links to employment Web sites, cooperative education/internship opportunities, current job listings, and a Web-based resume referral service.

Industry/Career Expos are held in the fall. Over 100 companies visit the campus to recruit students for full-time, cooperative education, and internship opportunities and to provide information on the industry. On-campus interviews and informational presentations are also scheduled year-round.

Career Services employs a staff of program managers to provide one-on-one career advisement, mock interviews, and resume critique services. Career Services encourages students to contact them early in their education to explore career options and to develop a successful job search strategy.

International Student Services

The International Student Services Office serves as the central point of contact for issues concerning international students at Embry-Riddle. An International Student Orientation is held each semester to familiarize students with University policies and procedures as well as the American education system in general. The office provides services that include advising students on immigration regulations and financial and personal matters. The office also assists international students with the processing of forms and documentation of status required by foreign governments, sponsors, the U.S. government, and the University.

International Student Services staff members continually strive to provide opportunities for international students to

Student Life and Services

become involved in campus and community programs that promote a cross-cultural awareness with University faculty, staff, and students as well as the local community. Some of these activities include International Day, programs with local families to introduce students to the community, speaking engagements in local schools and at community service organizations, and trips to area attractions such as amusement parks, national parks, and cultural festivals.

Embry-Riddle Language Institute

The Embry-Riddle Language Institute (ERLI) is an intensive English program providing English-language instruction and cultural orientation to nonnative speakers of English. Most of our students plan to attend Embry-Riddle, but we also welcome others who just want to improve their English-language ability. If you desire to become more proficient in listening, speaking, reading, and writing the English language, this intensive English program is for you. Students benefit from a computer laboratory with up-to-date language-learning software and TOEFL preparation software. Students who wish to attend Embry-Riddle can be granted conditional acceptance pending completion of our program or a passing TOEFL score, assuming they meet all other University admission requirements. Eligible students are also able to earn a part-time recommendation after successful completion of a semester at ERLI, which allows them to begin their University studies while continuing their English-language studies. Other benefits of our program include field

trips, social events, and full access to all Embry-Riddle facilities.

For more information, contact:

Embry-Riddle Language Institute
600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114-3900
(386) 226-6192
fax: (386) 226-6165
email: erli@erau.edu

Delta Mu Delta

The Delta Mu Delta National Honor Society is a nationally recognized organization that identifies business administration students who have distinguished themselves scholastically. Founded in 1913, Delta Mu Delta has grown to encompass 76,000 members from over 150 chapters. The Society has established an affiliation with the Association of Collegiate Business Schools and Programs (ACBSP), which requires that Delta Mu Delta chapters be established exclusively at colleges and universities with business programs accredited by ACBSP. Graduate students who achieve a 3.65 cumulative grade point average and who complete 12 credit hours of graduate work are considered for membership in Delta Mu Delta.

ACADEMIC PROGRAMS

Embry-Riddle offers students opportunities to pursue academic programs in a wide variety of aviation and aerospace fields. Each degree program includes both general education and academic specialization, the two components complementing each other. Detailed informa-

tion about specific degree programs begins on page 82 of this section of the catalog. Minor courses of study are described in the following section.

The University currently offers the following programs at the Daytona Beach Campus.

College of Arts and Sciences

- B.S. in Aerospace Studies
- B.S. in Communication
- B.S. in Engineering Physics
- Accelerated Program in Engineering Physics
- Master of Science in Engineering Physics
- B.S. in Human Factors Psychology
- B.S. in Human Factors Psychology /
M.S. in Human Factors and Systems
- M.S. in Human Factors and Systems
- B.S. in Space Physics
- Still Exploring

College of Aviation

- B.S. in Aeronautical Science
- B.S. in Aeronautics
- M.S. in Aeronautics
- B.S. in Aerospace Electronics
- B.S. in Air Traffic Management
- B.S. in Applied Meteorology
- A.S. in Aviation Maintenance Science
- B.S. in Aviation Maintenance Science
- B.S. in Homeland Security
- B.S. in Safety Science
- Still Exploring

College of Business

- B.S. in Business Administration
- M. of Business Administration
- B.S. in Aerospace Studies/Master of Business Administration (5-Year Program)
- B.S. in Communication/Master of Business Administration (5-Year Program)
- B.S. in Human Factors/Master of Business Administration (5-Year Program)
- Still Exploring

College of Engineering

- B.S. in Aerospace Engineering
- Accelerated Program in Aerospace Engineering
- M. of Aerospace Engineering
- M.S. in Aerospace Engineering
- B.S. in Civil Engineering
- B.S. in Computer Engineering
- B.S. in Computer Engineering/M.S. in Software Engineering
- B.S. in Computer Science
- B.S. in Electrical Engineering
- B.S. in Mechanical Engineering
- M.S. in Mechanical Engineering
- B.S. in Software Engineering
- B.S. in Software Engineering/
M.S. in Software Engineering
- M. of Software Engineering
- Still Exploring

Embry-Riddle reserves the right to terminate or modify program requirements and content, as well as the sequence of program offerings from term to term, for educational, financial, or other reasons that it determines are sufficient to warrant such action.

Basic Skills Requirement

Embry-Riddle recognizes the importance of communication and quantitative skills in all areas of aerospace. Successful pilots, engineers, airport managers, aviation maintenance technicians, and other aviation professionals must possess these skills to perform their jobs effectively. Embry-Riddle, therefore, requires all students, including transfer students, to demonstrate proficiency in writing, reading, and mathematics before they are permitted to complete registration during their first term at the University. Proficiency may be demonstrated by earning qualifying scores on SAT/ACT tests, or by transferring credit for college-level English and mathematics courses.

If they cannot demonstrate proficiency in these basic skills, students must enroll in COM 020, Fundamentals of Communication, a reading, writing, and critical thinking skills course. Quantitative skills courses (MA 006, MA 106) help students prepare for introductory mathematics courses required in the various degree programs.

Students whose primary language is not English are required to demonstrate advanced English proficiency by achieving a satisfactory score on a placement test. Students unable to demonstrate such proficiency must enroll in appropriate basic skills courses in their first term at the University. These courses are COM 008, Academic English, and COM 018, Advanced Academic English.

Although basic skills courses are computed into the student's term grade point average (GPA) and cumulative grade point average (CGPA), credits earned in basic skills courses do not apply to minimum degree requirements in any degree program.

General Education Introduction

Recognizing its general and special missions in education, Embry-Riddle embraces a general education program. This course of study ensures that students possess the attributes expected of all university graduates. Encouraging intellectual self-reliance and ability, the general education program enables students, regardless of their degree program, to understand the significance of acquiring a broad range of knowledge.

Throughout the general education program, students gain and enhance competence in written and oral communication. They practice reasoning and critical thinking skills and demonstrate computer proficiency. As students engage in this course of study, they familiarize themselves with and investigate ideas and methodologies from several disciplines. These include the arts and humanities, the social sciences, and the natural sciences and mathematics. The program also helps students recognize interrelationships among the disciplines.

Promoting the appreciation of varied perspectives, the general education program provides intellectual stimulation, ensuring that students are broadly educated. This course of study empowers students to make informed value judgments, to expand their knowledge and understanding of themselves, and to lead meaningful, responsible, and satisfying lives as individuals, professionals, and concerned members of their society and the world.

General Education Requirements

Embry-Riddle's general education program encourages effective learning and provides a coherent base for students to pursue their academic specializations. In specific support of the goals of general education, can-

Academic Programs

didates for bachelor degrees must complete coursework or demonstrate competency in the following areas. The faculty certify all coursework accepted for general education credit as advancing general education objectives. They additionally establish methods for students to demonstrate competency in these areas of study. **Because certain degree programs require particular courses in the general education program, refer to the degree requirements section of the catalog before selecting general education courses.**

Communication Theory and Skills

9 hours

In order to lead meaningful and responsible lives in complex societies, students produce, evaluate, articulate, and interpret information and meanings in oral and written communications.

Mathematics

6 hours

In order to develop quantitative reasoning skills and to use and understand the language of science and technology, students must demonstrate mathematical proficiency for three of these hours by placement, examination, or course completion. One course must have college algebra as a prerequisite.

Computer Science/Information Technology

3 hours

In order to use computers and to understand and evaluate their significance in the solution of problems, students study the concepts, techniques, and tools of computing.

Physical and Life Sciences

6 hours

In order to appreciate current understandings of the natural world, students study the

concepts and methods of the physical and life sciences, applying the techniques of scientific inquiry to problem-solving. All students participate in a laboratory experience.

Humanities

3-6 hours lower-level

*3 hours 300-400 level

In order to participate in the complexity of human experiences that arise in a framework of historical and social contexts, students are exposed to the humanities. Such areas of studies may include cultural, aesthetic, philosophical, and spiritual dimensions of the human condition.

Social Sciences

3-6 hours lower-level

*3 hours 300-400 level

In order to understand interrelationships between the individual and society and connections between historical memory and the future, students examine the social sciences, including history, economics, psychology, or sociology.

General Education Requirement

36 Hours Total

* In order to experience advanced studies in either the Humanities or Social Sciences, students must choose at least one upper-level elective in the Humanities or Social Sciences.

Still Exploring Engineering Freshman

Students exploring engineering who have not selected a specific degree program may, during their freshman year, enroll in the courses listed in the common engineering first-year catalog description. This enables an engineering student interested in engineering to explore the content of all the engineering programs over their freshman year prior to declaring a major at the beginning of their sophomore year. The courses apply toward any engineering degree. Still Exploring

students should follow the common freshman engineering program, then select a degree program upon completion. After a degree program is chosen, an advisor will be assigned to the student to discuss courses to take and future career goals. Pre-college preparation in math and physics is essential for success in engineering. If it is necessary to enroll in more basic math and physics courses to ensure that preparation, students should understand it may take them longer to complete the degree they choose.

Communication Theory and Skills (One course must be college composition.)	6
Computer Science /Information Technology Elective	3
Humanities (Lower-Level)	3
Social Sciences	6
Mathematics (Highest placement possible; one course for which college algebra is a prerequisite.)	6-8
Physical Sciences (One course must contain a laboratory.)	6-10
UNIV 101 (required)	1

The Common First-Year Engineering Program

The Common Freshman Engineering Program is a joint responsibility between the College of Engineering and all departments in the College. The purpose of this coordination is to ensure success of all engineering programs at the freshman level. In industry, engineers in a certain discipline have to work with engineers in other disciplines, so it is in the best interest of our engineering students that they interact with students in other engineering programs. This is accomplished via team projects, common engineering courses,

and invited colloquium speakers.

The First-Year Program ensures that instructors involved in the program have the appropriate quality and experience to teach the freshman courses. The program maintains consistency in the continuous processes of outcomes assessment throughout all of the College of Engineering curricula as required by the program's accrediting agencies. The program also deals with personal matters that may arise in freshman engineering courses.

The College of Engineering First-Year Advising Program focuses on advising and retaining all engineering freshmen starting from the time they make their tuition deposit until they finish their first year.

GRADUATE PROGRAMS

Introduction

Status quo is virtually an unknown concept in the aviation industry. The technology with which aviation works and the national and international regulations by which it must abide are subject to rapid, frequent, and sweeping change. Aviation touches every sphere of modern personal and business life and, therefore, must be sensitive to and respond to stimuli from a variety of unrelated sources. A healthy aviation industry is critical to the nation's economic well-being and security.

Embry-Riddle graduate degree programs are designed to stress pragmatic solutions to the managerial, technological, and organizational challenges in the aviation and aerospace industry today. The problems currently confronting industry are brought into the classroom for analysis, making use of the latest theories, tools, and techniques available to engineers, operations personnel, and

Academic Programs

managers. Case studies, simulations, computer-aided analysis, and computer-assisted design, as well as experiential exercises are interspersed throughout the curricula to achieve a balance between theory and the realities of the aviation/aerospace industrial world of the 21st century.

In most programs, opportunities are provided in each degree program to tailor the curriculum to meet specific, individual career objectives. Classes are scheduled to accommodate both full-time and part-time study. Many of the graduate courses are nonsequential, allowing study to begin in any term. Electives needed to complete the requirements of any graduate degree are selected from among the 500/600 numbered courses (except BA 503 and the AED course series) listed in this catalog.

Graduate Internships

Graduate internships are temporary professional or industrial work opportunities available to graduate students in some programs. There are two types of internships: resident and nonresident. Resident internships are professional work activities supported by a partnership between the University and industry and conducted on campus under the supervision of a faculty/staff sponsor. Nonresident internships are professional work activities conducted off campus at the supporting organization facility. Full-time employees of the offering organization are not eligible for an internship appointment and cannot receive elective credit for their professional work service.

Graduate students who have full graduate status in a degree program and are in good standing with a minimum of six completed graduate credit hours, and who earn

a cumulative GPA of 3.00 on a 4.00 basis, are eligible to apply for graduate internships. Students must demonstrate adequate communication and technical skills.

Students selected for an internship must register for the approved number of credit hours in the appropriate departmental internship course, and pay all fees. Graduate academic credit is awarded at a rate of one credit hour for every 200 clock hours of work completed, up to a maximum of three credit hours in one semester. Three internship credit hours may be applied as an elective toward degree requirements in most degree programs. Students are advised to consult with their graduate program coordinator for approval to use internship credits toward their degree program.

Thesis and Graduate Research Project Options

Requirements

Students who elect a thesis or graduate research project must obtain approval of the research topic. The University encourages graduate students to select thesis and graduate research project topics that permit them to participate in faculty research. Once approved, a research advisor and one or more additional committee members are selected and approved by the department coordinator or designee. Normally, if a student is working with a faculty research team as part of his/her thesis or graduate research project, the faculty member who is directing the student's research should generally be the student's research advisor. The graduate research project option may not be available for all programs.

College of Arts and Sciences

Dr. William F. Grams, Interim Dean

The College of Arts and Sciences is home to several outstanding degree programs and, in addition, is the primary provider of the curricula that fulfill the university's general education goals. Students may choose to pursue such majors as Aerospace Studies, Communication, Engineering Physics, Space Physics, and Human Factors Psychology. At the graduate level the College offers the Master of Science in Engineering Physics and the Master of Science in Human Factors and Systems. Minor programs of study are offered in Mathematics as well as many of the major fields.

The College of Arts and Sciences' primary responsibility is to provide a high-quality educational opportunity to all adequately prepared students. It seeks to inculcate in its students a lifelong love of learning; an appreciation of the cultural, intellectual, and historical impact of the search for truth and knowledge; the opportunity for professional specialization; and emotional and social development through out-of-class experiences. All students are expected to master the skills that enable them to communicate clearly, to understand the logic of mathematics and the methods of scientific inquiry, and to understand their cultural heritage

and that of others. The College seeks to develop in its students the ability to think independently, to accept responsibility, to interact with people different from themselves, to assess ideas, to challenge orthodoxies, and to criticize opinions in order to achieve the intellectual, ethical, and aesthetic maturity expected in educated citizens. The College affirms the right of all students to achieve an educational level limited only by their own commitment and ability.

The College endorses the use of non-traditional experiences to enhance learning, including cooperative education, industry internships, study abroad, and undergraduate research involvement. The College participates in the university Honors Program; thus students of exceptional academic promise can experience unique and challenging programs of study.

The College of Arts and Sciences is home to Air Force, Army, and Naval Reserve Officers Training Corps (ROTC). The ROTC programs give students an opportunity to receive military training while pursuing a baccalaureate degree. Several significant scholarships are available for students interested in these excellent programs.

Aerospace Studies

Bachelor of Science

Program Plan of Study and Requirements

A unique interdisciplinary degree program, Aerospace Studies offers students an opportunity to design a program of study that serves their needs and aspirations. This flexible degree, born in response to appeals from corporate leaders, nurtures worldly thinkers who understand the intersections between technologies and humans.

Aerospace Studies requires coursework in general education, a core curriculum, three minors, and open electives. General education provides a broad foundation of study, upon which the ASP core expands. ASP core courses aim to enhance communication and analytical abilities and to help students gain an understanding of history, art, and literature, all of which shape an awareness of what it means to be human. Courses in the core also prepare students to discover meaningful connections among their three minors. The element of choice in Aerospace Studies, primarily lodged in the selection of minor courses of study, obliges them to explore the University's offerings in search of a configuration that will help them attain future goals. In the capstone experience, each ASP student engages in a cooperative internship or writes a senior thesis.

Aerospace Studies students acquire foundational knowledge and skills that cross academic boundaries, enabling them to make creative connections. These abilities, in addition to an entrepreneurial spirit that arises

from a self-designed program, position these majors to continue their education or to excel in a wide variety of professions.

Degree Requirements

The Bachelor of Science degree in Aerospace Studies requires successful completion of a minimum of 120 credit hours. Included in the 120 credit hours must be 40 credit hours of upper-division courses (300-400 level)

General Education

Courses	Credits
Communication Theory and Skills*	9
Computer Science	3
Lower-Level Humanities*	3
Mathematics	6
Physical and Life Sciences	6
Lower-Level Social Sciences*	6
HU/SS 300-400 level*	3
Total Credits	36

*Embry-Riddle courses Communication Theory and Skills, Humanities, and Social Sciences may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories.

Communication Theory and Skills
COM 122, 219, 221, 222

Humanities
LOWER-LEVEL:
HU 140-146
UPPER-LEVEL:
300-400 level

Social Sciences
LOWER-LEVEL:
EC 200, 210, 211 (EC 200 is not acceptable together with EC 210 or EC 211 or their equivalent.)
PSY 101

Academic Programs at the Daytona Beach Campus

SS 110, 120, 130
UPPER-LEVEL:
 SS 302, 305, 310, 320, 325, 326, 331, 340, 350, 352,
 360

Core Requirements/Categories

Aviation Foundation

Course Title	Credits
AS 120 Introduction to Aeronautical Science -OR-	
SP 110 Introduction to Space Flight -OR-	
SS 130 History of Aviation -OR- Private Pilot Certificate	
Total Credits	3

Humanities Survey

Course Title	Credits
HU 140 Western Humanities -OR-	
HU 141 Western Humanities II (must be taken in addition to HU 140's series course for General Education)	
Total Credits	3

Management Foundation

Course Title	Credits
BA 201 Principles of Management -OR-	
BA 335 International Business	
Total Credits	3

Interdisciplinary Research and Skills

Course Title	Credits
HU 335 Technology and Modern Civilization -OR-	
HU 338 Traversing the Borders	
Total Credits	3

International Perspectives

Course Title	Credits
Two courses selected from the following:	
SS 321 U.S. Military History 1900-Present	
SS 325 International Studies	
SS 326 Russian-American Relations	
SS 331 Current Issues in America	
SS 333 U.S.-Asian Relations	
SS 334 Contemporary Africa and the World	
SS 336 The Modern Middle East in World Affairs	
SS 340 American Foreign Policy	
SS 363 Inter-American Relations	
Total Credits	6

Philosophical Perspectives

Course Title	Credits
HU 330 Values and Ethics -OR-	
HU 341 World Philosophy -OR-	
HU 345 Comparative Religions	
Total Credits	3

Upper-Level Literature

Course Title	Credits
HU 300 World Literature -OR-	
HU 305 Modern Literature -OR-	
HU 310 American Literature	
Total Credits	3

Upper-Level Communication

Course Title	Credits
COM225 Science and Technology Communication -OR-	
COM322 Aviation and Aerospace Communication -OR-	
COM350 Environmental Communication -OR-	
HU 420 Applied Cross-Cultural Communication	
Total Credits	3

Capstone Experience

Course Title	Credits
CE 396/397 Cooperative Education -OR-	
HU 475 Senior Thesis	
Total Credits	3

Total Credits Required

30

Minors

Students must select three minor fields of study. Required credits in each minor vary, depending on the minors chosen. See Minor Courses of Study in this catalog.

Total Credits	45/54
Open Electives	0-9
TOTAL DEGREE CREDITS	120

Communication

Bachelor of Science

The Bachelor of Science in Communication requires students to integrate knowledge of science and technology with practice in communication. In this program, students learn how scientists think, how they frame research questions, and how they use various methodologies to pursue their goals. Communication students additionally practice gathering, analyzing, and disseminating scientific and technological information to a variety of audiences. A significant element of the program is the capstone experience, an internship in which students put theory into practice.

As modern society is increasingly influenced by developments in science and technology, the demand for skilled communicators in these fields continues to grow. Aviation, aerospace, and business industries, for example, require more internal communications specialists, as well as professionals in media and public relations, to relay information clearly and accurately. This program addresses that nationwide necessity.

News organizations rely on science communicators in various fields, including meteorology, environmentalism, medicine, and technology. Communication students work in traditional written media, such as newspapers, newsletters, magazines, and journals, as well as in cutting-edge information retrieval and delivery systems, including Web sites and networked blogs.

This focused, yet flexible, course of study requires students to hone specialized communication skills and to produce portfolios displaying those skills. These graduates, the next

generation of communication specialists, are positioned to enter three specific career paths, including: 1) communicating science information to specific and general audiences through a variety of mass media, 2) representing companies and organizations through media relations, using written, oral, and visual media, and 3) communicating news to general audiences through print and electronic media.

Degree Requirements

The Bachelor of Science degree in Communication requires successful completion of a minimum of 120 credit hours, of which 40 credit hours must be upper-division courses (300-400 level.)

The Communication program requires coursework in General Education, the Communication Core, Communication Specified Electives, a Minor, and Open Electives:

General Education

Courses	Credits
Communication Theory & Skills	9
Computer Science	3
Lower-Level Humanities*	3
Mathematics	6
Physical and Life Sciences	6
Lower-Level Social Sciences*	6
HU/SS 300-400 level*	3
Total Credits	36

* Embry-Riddle courses in the general education categories of Communication Theory and Skills, Humanities, and Social Sciences may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories.

Academic Programs at the Daytona Beach Campus

Communication Theory and Skills

COM 122, 219, 221

Humanities

Lower Level: HU 140-146

Upper Level: 300-400 level

Social Sciences

Lower Level: EC 200, 210, 211 (EC 200 is not acceptable together with EC 210 or EC 211 or their equivalent.), PSY 101, SS 110, 120, 130

Upper Level: HU 319, 363, 415, 375, 412, 420, 460 SS 325, 326, 332, 333, 334, 336, 363

Core Requirements

The Communication core has three components: Required Communication Courses, Aviation and Aerospace Foundation Courses, and Science Foundation Courses.

Required Courses

This component of the Communication Core requires students to complete eight courses, including the following:

Course Title	Credits
COM260 Introduction to Media	3
COM265 Introduction to News Writing.	3
COM225 Science & Technology Communication.	3
COM320 Mass Communication Law & Ethics	3
COM322 Aviation & Aerospace Communication.	3
COM350 Environmental Communication.	3
COM410 Advanced Professional Writing -OR-	
COM360 Media Relations I	3
CE 396/7 Internship/Co-Op -OR-	
COM 399/499 Directed Study	3
Total Credits	24

Aviation/Aerospace Foundation Courses

This component of the Communication Core requires students to complete two courses from among the following:

Course Title	Credits
AS 120 Principles of Aeronautical Science	3
SS 130 History of Aviation.	3
SP 110 Introduction to Space Flight	3
Total Credits	6

Science Foundation Courses

This component of the Communication Core requires students to complete two courses from among the following:

Course Title	Credits
HU 335 Technology & Modern Civilization	3
SS/PS 302 Evolution of Scientific Thought	3
HU 302 Contemporary Issues in Science.	3
Total Credits	6
Total Credits for Communication Core	36

Specified Electives

To supplement coursework from the Communication Core, students complete five classes selected from among the following specified electives in Communication, Humanities, and Social Sciences:

Course Title	Credits
COM230 Digital Photography.	3
COM 268 Introduction to Sports Writing	3
COM364 Visual Design.	3
COM411 Web Design Workshop.	3
COM412 Advanced Technical Writing.	3
COM415 Nonverbal Communication.	3
COM460 Media Relations II.	3
HU 143 Introduction to Rhetoric	3
HU 319 Advanced Speech	3
HU 363 Communication and Society.	3
HU 375 Nature of Language	3
HU 420 Applied Cross-Cultural Communication.	3
International Relations Course(s), including SS 325, 326, 332, 333, 334, 336, 363.	3 each
Total Credits	15

Minor

In consultation with their advisor and/or Communication program coordinator, students select a minor that enhances their knowledge base and increases their job prospects. Total credits in the minor vary, depending on the minor chosen. Suggested minors include:

Academic Programs at the Daytona Beach Campus

Minors	Required Credits
Environmental Studies	15-16
Human Factors	15
International Relations	15
Business Administration	18
Information Technology	18
Aeronautical Studies	18
Aviation Safety	15
Aviation Weather	15
Space Studies	15
Total Credits	15-18

Open Electives

Students complete open electives, experiencing the breadth of curriculum offerings of the University or selecting an additional minor.

Open Electives: Total Credits	15-18
TOTAL DEGREE CREDITS	120

Academic Programs at the Daytona Beach Campus

Engineering Physics

Bachelor of Science

The Bachelor of Science in Engineering Physics, is designed to produce graduates with the knowledge and skills of both scientists and engineers. Combining the fields of space systems engineering and space physics, this program focuses on the scientific challenges and planning associated with mission design and research related to the exploration of the space environment. Because of the strong emphasis on fundamentals, the Engineering Physics program provides not only an excellent stepping stone into the space program, but also the flexibility to enter a broad variety of engineering and physics applications and graduate programs.

The Engineering Physics degree program has a full engineering accreditation by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21204-4012, telephone: 410-347-7700) and is administered by the Physical Sciences Department. This program supports the University's purpose "to provide a comprehensive education to prepare graduates for productive careers and responsible citizenship with special emphasis on the needs of aviation, aerospace engineering, and related fields." The educational objectives of the Engineering Physics program ensure that our graduates:

- Effectively use mathematical, scientific, and modern engineering tools in the professional practice of engineering.
- Pursue successful careers built upon understanding of ethical and professional

responsibility, good citizenship, and on the ability to be a life-long learner.

- Demonstrate oral and written communication skills, and the ability to work in teams across disciplines.
- Demonstrate the ability to identify, formulate, and solve real-world technical problems, incorporating political, economic, and environmental considerations.

Admission Requirements

To enter this program, students must have completed four years of high school science and mathematics, demonstrating a high level of competency. Successful candidates for this program will be prepared to enter Calculus I and Chemistry for Engineers.

Degree Requirements

The Bachelor of Science in Engineering Physics degree program requires 130 credit hours. The program can be completed in eight semesters. The courses necessary to earn this degree are listed below.

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

A grade of C or better is required in MA 241, MA 242, MA 243, PS 215, PS 208, and PS 219.

Academic Programs at the Daytona Beach Campus

FRESHMAN YEAR

Course	Title	Credits
	Communication Theory and Skills*	6
	Lower-Level Humanities*	3
	Lower-Level Social Sciences*	3
EGR 111	Engineering Drawing	2
EP 101	Current Topics in Space Sciences	1
MA 241	Calculus and Analytic Geometry I	4
MA 242	Calculus and Analytic Geometry II	4
PS 140	Chemistry for Engineers	4
PS 141	Chemistry for Engineers Laboratory	1
PS 215	Physics I	3
PS 216	Physics Laboratory I	1
Total Credits		32

SOPHOMORE YEAR

Course	Title	Credits
	Communication Theory and Skills*	3
EGR 115	Intro to Computing for Engineers	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
HU	Humanities Elective	3
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 208	Physics II	3
PS 219	Physics III	3
PS 220	Physics Laboratory III	1
PS 290	Physics Laboratory Practicum*	0
Total Credits		33

* May be taken in the fourth or fifth semester.

JUNIOR YEAR

Course	Title	Credits
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering Laboratory I	1
EP 320	Electro Optical Engineering	3
EP 340	Introduction to Space Systems Design	2
EP 393	Spaceflight Dynamics	2
EP 394	Space Systems Engineering	3
ES 206	Fluid Mechanics	3
ES 305	Thermodynamics	3
MA 441	Advanced Engineering Mathematics I	3
MA 442	Advanced Engineering Mathematics II	3
ME 200	Machine Shop Laboratory	1
PS 303	Modern Physics	3
PS 305	Modern Physics Laboratory	1
PS 320	Classical Mechanics	3
Total Credits		33

SENIOR YEAR

Course	Title	Credits
	Engineering Elective	3
HU/SS	Upper-Level HU/SS Elective	3
EP 391	Microcomputers and Electronic Instrumentation	3
EP 410	Space Physics	3
EP 440	Engineering Electricity and Magnetism	3
EP 455	Quantum Physics	3
EP 496	Space Systems Design I	2
EP 497	Space Systems Design II	3
ES 320	Engineering Materials Science	2
ES 321	Engineering Materials Science Laboratory	1
	Open Electives	6
Total Credits		32

TOTAL DEGREE CREDITS

130

* Embry-Riddle courses in the general education categories of Communication Theory and Skills, Humanities and Social Sciences, and the Engineering Electives may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified above in the Engineering Physics vertical outline.

Communication Theory and Skills

COM 122, 219, 221, 222, 351, 360

Humanities

LOWER-LEVEL:
HU 140-146, 250
UPPER-LEVEL:
HU 300-400

Social Sciences

LOWER-LEVEL:
EC 200, PSY 220, SS 110, 120, 130, 204, 210
UPPER-LEVEL:
HF 300, PSY 350, 365, SS 300 level

Engineering Electives

AE/AEL/CEC/CIV/CS/EE/EGR/EL/EP/ES/
ME/SE 300-400 LEVEL

Academic Programs at the Daytona Beach Campus

Accelerated Program in Engineering Physics

Bachelor of Science in Engineering Physics

Master of Science in Engineering Physics

The accelerated program allows exceptional students to complete both the Bachelor of Science in Engineering Physics (BSEP) and Master of Science in Engineering Physics (MSEP) degrees. Students enrolled in the BSEP program may apply for entry into the accelerated program when they attain junior standing. Students must have a minimum CGPA of 3.2 in EP/ES/MA/PS courses for selection.

Degree Requirements

Students in this program must meet the following requirements:

- Maintain at least a 3.0 CGPA throughout the academic program.
- Maintain at least a 3.0 CGPA for the graduate credits.
- Complete a total of 151 credit hours as listed below.

FIRST YEAR

Course	Title	Credits
	Communication Theory and Skills	6
	Lower-Level Humanities	3
	Lower-Level Social Science	3
EGR 111	Engineering Drawing	2
EP 101	Current Topics in Space Sciences	1
MA 241	Calculus and Analytic Geometry I	4
MA 242	Calculus and Analytic Geometry II	4
PS 140	Chemistry for Engineers	4
PS 141	Chemistry for Engineers Laboratory	1
PS 215	Physics I	3
PS 216	Physics Laboratory I	1
Total Credits		32

SECOND YEAR

Course	Title	Credits
	Communication Theory and Skills	3
EGR 115	Introduction to Computing for Engineers	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
HU/SS	Upper-Level HU/SS Elective	3
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 208	Physics II	3
PS 219	Physics III	3
PS 220	Physics Laboratory III	1
PS 290	Physics Laboratory Practicum	0
Total Credits		33

THIRD YEAR

Course	Title	Credits
EP 320	Electro-Optical Engineering	3
EP 340	Introduction to Space Systems Design	2
EP 393	Spaceflight Dynamics	2
EP 394	Space Systems Engineering	3
EP 501	Numerical Methods for Engineers & Scientists	3
ES 206	Fluid Mechanics	3
ES 305	Thermodynamics	3
MA 441	Advanced Engineering Mathematics I	3
MA 502	Boundary Value Problems	3
PS 303	Modern Physics	3
PS 305	Modern Physics Laboratory	1
PS 320	Classical Mechanics	3
Total Credits		32

SUMMER SESSION

Course	Title	Credits
HU/SS	Upper-Level HU/SS Elective	3
ES 320	Engineering Materials Science	2
ES 321	Engineering Materials Science Laboratory I	1
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering I Laboratory	1
Total Credits		9

Academic Programs at the Daytona Beach Campus

FOURTH YEAR

Course	Title	Credits
EP 505	Advanced Spacecraft Dynamics & Control	3
EP 5XX	Graduate Elective	3
EP 391	Microcomputers and Electronic Instrumentation.	3
EP 410	Space Physics.	3
EP 440	Engineering Electricity and Magnetism . .	3
EP 455	Quantum Physics	3
EP 496	Space Systems Design I	2
EP 497	Space Systems Design II	3
ME 200	Machine Shop Laboratory	1
Total Credits		24
TOTAL DEGREE CREDITS		130

GRADUATE-LEVEL STUDIES

Course	Title	Credits
EP 509	Advanced Space Physics	3
EP 600	Experimental Methods in Space Science. .	3
EP 605	Spacecraft Power & Thermal Design. . . .	3

Option I - Thesis

Course	Title	Credits
EP 700	Thesis	9
	-AND-	
	Graduate Elective	3

Option II - Non-Thesis

Course	Title	Credits
	Graduate Electives	12
Total Credits		21
TOTAL BS/MS DEGREE CREDITS		151

Master of Science in Engineering Physics (MSEP)

Master of Science

Department Chair - **John Olivero**
Program Coordinator - **Peter Erdman**

Introduction

The Master of Science in Engineering Physics degree program provides graduate-level education and training in space science and space systems engineering. The goal is to provide graduates with the skills that will allow them to make an immediate contribution to the space-related industries or to proceed to doctoral studies in a wide variety of disciplines. This program's objectives are:

- Fundamental understanding of scientific and engineering approaches to conceiving and designing complex spacecraft systems.
- Development of the diverse set of research skills required to evolve the state of the art in the areas of space science and engineering.

The program specifically emphasizes scientific instrumentation, applied optics, remote sensing, spacecraft subsystems (power, attitude, and thermal control), and a wide variety of topics in space science and engineering.

This program is heavily research oriented, with a majority of the faculty in the Department of Physical Sciences actively involved in scholarly activities in the space sciences and engineering.

The research areas include experimental programs with satellite systems, sounding rockets, ground-based remote-sensing experiments, and a parallel program of theoretical studies in the areas of space systems engineering, upper atmospheric physics, space physics, and plasma and magnetospheric physics.

Degree Requirements

The curriculum consists of 15 credits of required coursework, with an additional 15 credits of electives and/or thesis research. The core courses emphasize the heavily technical nature of the space sciences and require an undergraduate degree in Physics, Engineering, or a related field (such as Mathematics or Chemistry) for preparation.

Academic Programs at the Daytona Beach Campus

Master of Science in Engineering Physics

Option	Core Courses	Electives	Thesis	Total
Thesis	15	6	9	30
NonThesis	15	15	0	30

Core Courses

	Credits
EP 501 Numerical Methods for Engineers and Scientists	3
EP 505 Advanced Spacecraft Dynamics and Control	3
EP 509 Advanced Space Physics	3
EP 600 Experimental Methods in Space Science	3
EP 605 Spacecraft Power and Thermal Design	3

Electives

	Credits
AE 508 Heat Transfer	3
AE 514 Introduction to the Finite Element Method	3
AE 520 Perturbation Methods in Engineering	3
AE 524 Rocket Engine Propulsion Systems	3
BA 511 Operations Research	3
EP 696 Graduate Internship in Eng. Physics	1-3
EP 699 Special Topics in Eng. Physics	1-3
EP 700 MSSPS Thesis	1-9
MA 502 Boundary Value Problems	3
MA 504 Potential Theory	3
MA 506 Probability for Engineers	3
MA 510 Fundamentals of Optimization	3
MSE 500 Software Engineering Concepts	3
MSE 545 Specification and Design of Real-Time Systems	3
MSE 585 Metrics and Statistical Methods for Software Engineering	3
MSE 610 Software Architecture and Design	3
MSE 655 Performance Analysis of Real-Time Systems	3

Human Factors Psychology

Bachelor of Science

The Bachelor of Science degree in Human Factors Psychology emphasizes human behavior, ergonomics, and human capabilities. The program seeks to develop a student with the capacity to design, conduct, and apply human factors research to the design of simple and complex systems. The goal of the program is to educate and graduate professionals who are equipped for employment as human factors specialists or to continue their education in graduate school.

Human Factors Psychology is an applied discipline that develops knowledge concerning the abilities and limitations of humans to sense, store, and process information, as well as to act. This knowledge is applied to the design, use, and maintenance of human/machine systems. Depending on its goals, the system is then optimized with respect to human performance. The environmental factors affecting system performance are recognized as important and are considered systematically. When relevant data are not available, they must be uncovered through research efforts. This requires considerable skill in experimental design and quantitative methodology. Students will receive training in the content and techniques of human factors, including statistical and quantitative procedures, experimental design, survey methods, computer techniques, and other research methodologies.

Degree Requirements

The Bachelor of Science in Human Factors Psychology can be earned in eight semesters

assuming appropriate background and full-time enrollment. Successful completion of a minimum of 123 credit hours is required.

Students are encouraged to choose a minor field of study. Minors that complement Human Factors are Air Traffic Control, Aviation Safety, Computer Science, Flight, and Mathematics. Most minors can be accommodated within the 15 hours of open electives required in the program.

Students will be encouraged to have an applied practicum experience. This requirement may be fulfilled in several ways, including co-ops, internships, or working on an on-campus research team. Practicums provide opportunities to gain practical experience in real-world settings. A practicum experience is highly regarded by employers and increases the student's employment potential after graduation. Typically, students will engage in practical experience activities toward the end of the degree program so they can take maximum advantage of their undergraduate experience.

General Education

Courses*	Credits
Communication Theory and Skills.....	9
Mathematics.....	6
Computer Science.....	3
Physical and Life Sciences (one course must include a laboratory).....	6
Lower-Level Humanities.....	3
Lower-Level Social Sciences.....	6
HU/SS 300-400 level.....	3
Total Credits	36

Academic Programs at the Daytona Beach Campus

Embry-Riddle courses in general education may be chosen from those listed below, assuming prerequisites are met. Courses from other institutions are acceptable if they fall into these broad categories.

Communication Theory and Skills

COM 122, 219, 221, 222, 351, 360, 364, 410, 411, 412
 HU 143, 319, 351, 355, 361, 362, 363, 370, 375, 420

Mathematics

MA 111, 112, 140, 142, 145, 222, 241, 242, 243

Computer Science

IT 109, CS 118, BA 120

Physical and Life Sciences

PS 101-109, 142, 302, 304, 308, 309

Humanities

LOWER-LEVEL:

HU 140s series, 250

UPPER-LEVEL:

HU 300-315, 320-345

Social Sciences

LOWER-LEVEL:

PSY 101 (required) and 3 credits from the following: EC 200-211, SS 110-130, 204, 210

UPPER LEVEL:

SS 302-361

Core Requirements**

College Success

UNIV 101

Total Credits

1

Advanced Communication

For the Advanced Communication requirement, Human Factors majors are required to take one Advanced Communication class for a total of three credits. This exists in addition to the nine credits (three classes) taken for the Communication General Education Requirement.

COM 360, 364, 410, 411, 415, 460

HU 335, 361, 362, 363, 375, 415, 420

Total Credits

3

Computer Science

Six credit hours from CS courses listed below. These courses are in addition to those taken as General Education.

CEC 220, 222

CS 118, 125, 223

IT (All courses in the curriculum may be used)

SE 300

Total Credits

6

Psychology and Human Factors

Course	Title	Credits
HF 210	Human Factors I: Principles and Fundamentals	3
HF 302	Human Factors II: Analytic Methods and Techniques	4
HF 305	Human Factors III: Test and Evaluation	4
HF 400	Human Factors IV: System Design	4
PSY 312	Research Analysis in Psychology	4
PSY 322	Research Design	4
PSY 310	Sensation and Perception	3
PSY 315	Cognitive Psychology	3
PSY 335	Physiological Psychology	3
HF 310	Human Computer Interaction	3
HF 312	Ergonomics and Bioengineering	3
HF 412	Simulating Humans in Complex Systems	3
Total Credits		41

Aviation

Course	Title	Credits
AS 120	Principles of Aeronautical Science -OR-	
SP 110	Introduction to Space Flight -OR-	
FAA	Private Pilot Certificate -OR-	
WX 201	Meteorology I	3
Total Credits		3

Practicum

Course	Title	Credits
HF 490	Practicum in Human Factors Psychology	3
Total Core Credits		57

Specified Electives

Take two courses from each of the following two groups of courses and any one additional course from either group (15 credit hours total).

Group I: Applied Systems in Human Factors

Course	Title	Credits
HF 315	Automation and Systems Issues in Aviation	3
HF 325	Human Factors and System Safety	3
HF 330	Human Factors in Space	3
HF 335	Human Factors in Air Traffic Control	3
HF 340	Human Factors and Product Liability	3
HF 410	Human Factors in Crew Station Design	3
HF 415	Human Factors in Simulation Systems	3
HF 422	Applied Ergonomic Design, Analysis, and Evaluation	3

Academic Programs at the Daytona Beach Campus

Group II: Psychological Foundations of Human Factors

Course Title	Credits
PSY 320 Aviation Psychology.....	3
PSY 340 Industrial-Organizational Psychology....	3
PSY 345 Training and Development.....	3
PSY 350 Social Psychology.....	3
PSY 400 Introduction to Cognitive Science.....	3
(Other courses with approval of advisor.)	
Total Specified Elective Credits	15
Open Elective Credits	15
Total Elective Credits	30
TOTAL DEGREE CREDITS	123

Suggested Program of Study

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

FRESHMAN YEAR

Course Title	Credits
Communication Theory and Skills*.....	6
Computer Science*.....	3
Lower-Level Humanities*.....	3
Mathematics*.....	6
Physical and Life Sciences*.....	3
HF 210 Human Factors I: Principles and Fundamentals.....	3
HU HU/PSY/SS 300-400 level*.....	3
PSY 101 Intro to Psychology*.....	3
UNIV101 College Success.....	1
Total Credits	31

SOPHOMORE YEAR

Course Title	Credits
Communication Theory and Skills*.....	3
Lower-Level Social Sciences*.....	3
Physical and Life Sciences*.....	3
Computer Science**.....	3
HF 302 Human Factors II: Analytic Methods and Techniques.....	4
HU Advanced Communication**.....	3
PSY 312 Research Analysis in Psychology.....	4
PSY 335 Physiological Psychology.....	3
AS 120 Principles of Aeronautical Science -OR-	
SP 110 Introduction to Space Flight -OR-	
FAA Private Pilot Certificate -OR-	
WX 201 Meteorology I**.....	3
Open electives.....	3
Total Credits	32

JUNIOR YEAR

Course Title	Credits
Computer Science**.....	3
HF 305 Human Factors III: Test and Evaluation..	4
HF 490 Practicum in Human Factors Psychology.....	3
HF/PSY Specified Electives.....	6
PSY 322 Research Design.....	4
PSY 310 Sensation and Perception.....	3
PSY 315 Cognitive Psychology.....	3
HF 312 Ergonomics and Biomechanics.....	3
Total Credits	29

SENIOR YEAR

Course Title	Credits
HF 310 Human Computer Interaction.....	3
HF 412 Simulating Humans in Complex Systems.....	3
HF 400 Human Factors IV: System Design.....	4
HF/PSY Specified Electives.....	9
Open Electives.....	12
Total Credits	31
TOTAL DEGREE CREDITS	123

* General Education Requirement

** Degree Core Requirement

‡ All Psychology and Human Factors courses must be passed with a "C" or better to count toward degree completion.

Human Factors Psychology/ Master of Human Factors and Systems

Bachelor of Science in Human Factors Psychology /
Master of Human Factors and Systems

In conjunction with the Bachelor of Science in Human Factors Psychology and the traditional master degree in Human Factors and Systems, the Department of Human Factors and Systems also offers a five-year master degree program in Human Factors and Systems. The five-year master program offers upper-level undergraduates in the major the chance to begin their graduate work while completing their bachelor degree program. The program is open to all undergraduate Human Factors students who meet eligibility requirements that include a CGPA of 3.20 and junior-year standing.

Student applications will be reviewed for the program and students accepted into the five-year master program will be notified of such at the end of their junior year. During their senior undergraduate year, they will take HFS 500 and one additional graduate course (six credits) that will fulfill requirements for both the bachelor and the master degree program. Five-year master students are required to complete 30 credits of graduate work to complete the degree program. Both the Bachelor of Science degree in Human Factors Psychology and the master degree in Human Factors and Systems will be awarded when the student completes the master degree program.

General Education

Course*	Credits
Communication Theory and Skills	9
Mathematics	6
Computer Science	3
Physical and Life Sciences (one course must include a laboratory)	6
Lower-Level Humanities	3
Lower-Level Social Sciences	6
HU/SS 300-400 Level	3
Total Credits	36

Embry-Riddle courses in general education may be chosen from those listed below, assuming prerequisites are met. Courses from other institutions are acceptable if they fall into these broad categories.

Communication Theory and Skills

COM 122, 219, 221, 222, 351, 360, 364, 410, 411, 412
HU 143, 319, 351, 355, 361, 362, 363, 370, 375, 420

Mathematics

MA 111, 112, 140, 142, 145, 222, 241, 242, 243

Computer Science

IT 109, CS 118, BA 120

Physical and Life Sciences

PS 101-109, 142, 302, 304, 308, 309

Humanities

LOWER-LEVEL:

HU 140s series, 250

UPPER-LEVEL:

HU 300-315, 320-345

Social Sciences

LOWER-LEVEL:

PSY 101 (required) and 3 credits from the following: EC 200-211, SS 110-130, 204, 210

UPPER-LEVEL:

SS 302-361

Academic Programs at the Daytona Beach Campus

Core Requirements**

College Success		
UNIV 101	1
Advanced Communication		
For the Advanced Communication requirement, Human Factors majors are required to take one Advanced Communication class for a total of three credits. This exists in addition to the nine credits (three classes) taken for the Communication General Education Requirement.		
COM 360, 364, 410, 411, 415, 460		
HU 361, 362, 363, 375, 415, 420		
Total Credits		3
Computer Science		
Six credit hours from CS courses listed below. These courses are in addition to those taken as General Education.		
CEC 220, 222		
CS 118, 125, 223		
IT All courses in the curriculum may be used		
SE 300		
Total Credits		6
Psychology and Human Factors		
Course Title		Credits
HF 210	Human Factors I: Principles and Fundamentals	3
HF 302	Human Factors II: Analytic Methods and Techniques	4
HF 305	Human Factors III: Test and Evaluation	4
HF 400	Human Factors IV: System Design	4
PSY 312	Research Analysis in Psychology	4
PSY 322	Research Design	4
PSY 310	Sensation and Perception	3
PSY 315	Cognitive Psychology	3
PSY 335	Physiological Psychology	3
HF 310	Human Computer Interaction	3
HF 312	Ergonomics and Bioengineering	3
HF 412	Simulating Humans in Complex Systems	3
Total Credits		41
Aviation		
Course Title		Credits
AS 120	Principles of Aeronautical Science -OR-	
SP 110	Introduction to Space Flight -OR-	
FAA	Private Pilot Certificate -OR-	
WX 201	Meteorology I	3
Total Credits		3
Practicum		
Course Title		Credits
HF 490	Practicum in Human Factors Psychology	3
Total Core Credits		57

Specified Electives

Take two courses from each of the following two groups of courses and any one additional course from either group (15 credit hours total).

Group I: Applied Systems in Human Factors

Course	Title	Credits
HF 315	Automation and Systems Issues in Aviation	3
HF 325	Human Factors and System Safety	3
HF 326	Human Performance in Extreme Environments	3
HF 330	Human Factors in Space	3
HF 335	Human Factors in Air Traffic Control	3
HF 340	Human Factors and Product Liability	3
HF 410	Human Factors in Crew Station Design	3
HF 415	Human Factors in Simulation Systems	3
HF 422	Applied Ergonomic Design, Analysis, and Evaluation	3

Group II: Psychological Foundations of Human Factors

Course	Title	Credits
PSY 320	Aviation Psychology	3
PSY 340	Industrial-Organizational Psychology	3
PSY 345	Training and Development	3
PSY 350	Social Psychology	3
PSY 400	Introduction to Cognitive Science	3

(Other courses with approval of advisor.)

Total Specified Undergraduate Elective Credits	15
Open Elective Credits	12
Total Elective Credits	27

UNDERGRADUATE SENIOR YEAR

Course	Title	Credits
HFS 500	Systems Concepts (Fall)	3
	One Additional Graduate Course (Spring)	3
Total Credits at End of Senior Year		126

GRADUATE-LEVEL STUDIES

Two graduate-level HFS courses are taken in the senior year as described above. 27 credits remain.

Course	Title	Credits
HFS 510	Research Design and Analysis I	3
HFS 610	Research Design and Analysis II	3
HFS 615	Sensation and Perception	3
HFS 700	Thesis	6
HFS	Graduate Elective***	12
Total Credits		27
TOTAL DEGREE CREDITS		153

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Suggested Program of Study

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

FRESHMAN YEAR

Course Title	Credits
Communication Theory and Skills*	6
Computer Science*	3
Lower-Level Humanities*	3
Mathematics*	6
Physical and Life Sciences*	3
HF 210 Human Factors I: Principles and Fundamentals	3
HU/PSY/SS 300-400 level*	3
PSY 101 Intro to Psychology*	3
UNIV101 College Success	1
Total Credits	31

SOPHOMORE YEAR

Course Title	Credits
Communication Theory and Skills*	3
Lower-Level Social Sciences*	3
Physical and Life Sciences*	3
Computer Science**	3
HF 302 Human Factors II: Analytic Methods and Techniques	4
HU Advanced Communication**	3
PSY 312 Research Analysis in Psychology	4
PSY 335 Physiological Psychology	3
AS 120 Principles of Aeronautical Science -OR-	
SP 110 Introduction to Space Flight -OR-	
FAA Private Pilot Certificate -OR-	
WX 201 Meteorology I**	3
Total Credits	29

JUNIOR YEAR

Course Title	Credits
Computer Science**	3
HF 305 Human Factors III: Test and Evaluation	4
HF/PSY Specified Electives	9
PSY 305 Research Design	4
PSY 310 Sensation and Perception	3
PSY 315 Cognitive Psychology	3
HF 312 Ergonomics and Biomechanics	3
Open Electives	3
Total Credits	32

SUMMER TERM

Course Title	Credits
HF 490 Practicum in Human Factors Technology	3

Students must spend the term performing a co-op engaged in a human factors engineering activity (analysis, design, or test).

SENIOR YEAR

Course Title	Credits
HF 310 Human Computer Interaction	3
HF 412 Simulating Humans in Complex Systems	3
HF 400 Human Factors IV: System Design	4
HFS 500 Systems Concepts	3
HFS 620 Memory and Cognition	3
HF/PSY Specified Electives	6
Open Electives	9
Total Credits	31

GRADUATE-LEVEL STUDIES

Course Title	Credits
HFS 510 Research Design and Analysis I	3
HFS 610 Research Design and Analysis II	3
HFS 615 Sensation and Perception	3
HFS 700 Thesis	6
HFS Graduate Elective***	12
Total Credits	27
TOTAL DEGREE CREDITS	153

* General Education Requirement

** Degree Core Requirement

*** Please refer to the graduate section of this catalog for a listing of available graduate-level Electives.

‡ All Psychology and Human Factors courses must be passed with a "C" or better to count toward degree completion.

Human Factors and Systems (MSHFS)

Master of Science

Department Chair - **Albert Boquet**
Program Coordinator - **Shawn Doherty**

Introduction

The Department of Human Factors and Systems offers graduate instruction leading to the Master of Science degree in Human Factors and Systems with two distinct tracks in Human Factors and in Systems. These programs are designed to meet the highest academic standards, fully preparing students for doctoral-level studies while at the same time preparing students for immediate employment in the real world of cost-sensitive and operationally driven aviation/aerospace environments.

The Human Factors track will develop a graduate with the capacity to design, conduct, and apply human factors research in support of the design of simple and complex systems. It will develop a student's ability to work as a human factors professional in aviation and aerospace environments based on their academic preparation and to actively participate in human factors projects at the graduate level. A variety of research, consulting, and internship arrangements are included in the program.

This track is based on the scientist-practitioner model of the American Psychological Association (APA) and adheres to guidelines established by the committee for Education and Training of APA's Division 21 (Applied Experimental and Engineering Psychology). The program has been designed to meet the accreditation requirements of the Education Committee of the Human Factors and Ergonomics Society, as well as the International Ergonomics Association.

Students receive education in the content and

techniques of human factors, including statistical and quantitative procedures, experimental design, survey methods, computer techniques, and other research methodologies.

The Systems track provides a systemic focus to the transformation of an operational need into a defined system configuration through the iterative process of functional analysis, synthesis, optimization, and design integration.

History indicates that a properly coordinated and functioning system that has a minimum of undesirable side effects cannot be achieved unless the system designer is sensitive to operational feasibility during the early stages of system development and assumes the responsibility for a user-centered life cycle. Therefore, a major focus of the Systems Track is an appreciation of the total life cycle of the system, including design, development, testing, production, operations, sustaining support, and disposal.

The track addresses considerations of human factors, reliability, maintainability, logistic support, safety, producibility, economic, and related parameters as they apply to system design, integration, and evaluation. The goal of the track is to produce graduates who understand the proper balance between operational, behavioral, economic, and logistic factors.

Finally, the Systems track produces graduates who can move easily across disciplines. The graduates will understand the relative capabilities and limitations of each and thus know where trade-offs can effectively be made. This interdisciplin-

Academic Programs at the Daytona Beach Campus

ary prerequisite also requires that the graduate be able to use the tools and techniques of the various disciplines in both traditional and nontraditional applications.

* A five-year Human Factors and Systems program is available. Please see the undergraduate section of this catalog for details.

Degree Requirements

HUMAN FACTORS TRACK

Core Courses	Credits
HFS 500 Systems Concepts, Theory, and Tools	3
HFS 510 Research Design and Analysis I	3
HFS 600 Human Factors in Systems	3
HFS 610 Research Design and Analysis II	3
HFS 615 Sensation and Perception	3
HFS 620 Memory and Cognition	3
Electives*	Credits
BA 511 Operations Research	3
HFS 515 Ergonomics	3
HFS 520 Team Resource Management	3
HFS 525 Human and Organizational Factors in Technological Systems	3
HFS 530 Systems Psychology	3
HFS 590 Graduate Seminar	3
HFS 625 Applied Testing and Selection	3
HFS 630 Cognitive Systems	3
HFS 635 Human Computer Interaction	3
HFS 640 Aviation/Aerospace Psychology	3
HFS 645 Underpinnings of Human Factors and Ergonomics	3
HFS 650 Human Factors of Aviation/Aerospace Applications	3
HFS 696 Internship in Human Factors and Systems (highly recommended)	3
HFS 699 Special Topics in Human Factors and Systems	3
MSA 611 Aviation/Aerospace System Safety	3
MSA 612 Aviation/Aerospace Industrial Safety Management	3
MSE 500 Software Engineering Discipline	3
TM 605 Organization Theory in a Technical Environment	3
TM 610 Managing Effective Technical Work Teams	3

* Electives are selected with the consent of the student's graduate advisor. Other elective courses may be selected with the approval of the graduate advisor. A total of four electives must be fulfilled for degree completion.

Option I

HFS 700 Thesis	6
-OR-	

Option II

HFS 515 Ergonomics	3
-AND-	
HFS 611 Work Physiology	3
-AND-	
Comprehensive Exam	0

Total Required	36
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SYSTEMS TRACK

Core Courses	Credits
HFS 500 Systems Concepts, Theory, and Tools	3
HFS 505 System Engineering I	3
HFS 510 Research Design and Analysis I	3
HFS 600 Human Factors in Systems	3
HFS 605 System Engineering II	3
HFS 610 Research Design and Analysis II	3
Electives*	Credits
BA 511 Operations Research	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
HFS 515 Ergonomics	3
HFS 520 Team Resource Management	3
HFS 525 Human and Organizational Factors in Technological Systems	3
HFS 530 Systems Psychology	3
HFS 590 Graduate Seminar	3
HFS 625 Applied Testing and Selection	3
HFS 635 Human Computer Interaction	3
HFS 640 Aviation/Aerospace Psychology	3
HFS 645 Underpinnings of Human Factors and Ergonomics	3
HFS 650 Human Factors of Aviation/Aerospace Applications	3
HFS 696 Internship in Human Factors and Systems (highly recommended)	3
HFS 699 Special Topics in Human Factors and Systems	3
MSA 611 Aviation/Aerospace System Safety	3
MSA 612 Aviation/Aerospace Industrial Safety Management	3
MSA 641 Production & Procurement Management in the Aviation/Aerospace Industry	3
MSA 643 Management of Research & Development in the Aviation/Aerospace Industry	3

Academic Programs at the Daytona Beach Campus

MSE 500	Software Engineering Discipline.	3
MSE 520	Formal Methods for Software Engineering	3
MSE 540	Simulation and Software Engineering.	3
MSE 545	Specification and Design of Real-Time Systems	3
TM 505	Computer Applications in Systems Management	3
TM 510	Project Development Techniques with Statistical Applications	3
TM 610	Managing Effective Technical Work Teams	3
TM 615	Planning for Systems Development and Operations.	3
TM 645	Advanced Operations Research and Management Science.	3

* Electives are selected with the consent of the student's graduate advisor. Other elective courses may be selected with the approval of the graduate advisor. A total of four electives must be fulfilled for degree completion.

Option I

HFS 700	Thesis	6
	-OR-	

Option II

HFS 515	Ergonomics.	3
	-AND-	
HFS 611	Work Physiology.	3

-AND-

Comprehensive Exam

Total Required		36
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Space Physics

Bachelor of Science

The Bachelor of Science in Space Physics, is designed to produce graduates who want to pursue careers in space-related professions or who want to pursue advanced studies in diverse areas of science and engineering. This program supports the University's purpose "to provide a comprehensive education to prepare graduates for productive careers and responsible citizenship with special emphasis on the needs of aviation, aerospace engineering, and related fields."

As defined by NASA, "Space Physics is the scientific study of magnetic and electric phenomena that occur in outer space, in the upper atmosphere of planets, and on the Sun. Space physicists use ground based instruments, balloons, rockets, satellites, and deep space probes to study these phenomena where they occur." Examples of such studies include space shuttle aurora observations, ground-based solar studies, ground-based ionospheric studies, balloon flights to the edge of the atmosphere, and sounding rocket flights into near space.

The Space Physics program focuses on Space Science with emphasis on solar system physics, planetary science, and astrophysics. The program shares its facilities and coursework with the highly successful Engineering Physics program, the largest of its kind in the United States.

Admission Requirements

To enter this program, students must have completed four years of high school science and mathematics, demonstrating a high level of competency. Successful candidates for this program will be prepared to enter Calculus I and Chemistry for Engineers.

Degree Requirements

The Bachelor of Science in Space Physics degree program requires 120 credit hours. The program can be completed in eight semesters. The courses necessary to earn this degree are listed below. Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing. A grade of C or better is required in MA 241, MA 242, MA 243, PS 208, PS 215, and PS 219.

FRESHMAN YEAR

Course	Title	Credits
EP 101	Current Topics in Space Sciences	1
	Communication Theory and Skills*	6
	Lower-Level Humanities*	3
	Lower-Level Social Sciences*	3
MA 241	Calculus & Analytic Geometry I	4
MA 242	Calculus & Analytic Geometry II	4
PS 140	Chemistry for Engineers	4
PS 141	Chemistry for Engineers Laboratory	1
PS 215	Physics I	3
PS 216	Physics Laboratory I	1
Total Credits		30

Academic Programs at the Daytona Beach Campus

SOPHOMORE YEAR

Course	Title	Credits
	Communication Theory and Skills*	3
	Upper-Level Humanities*	3
EGR 115	Introduction to Computing for Engineers	3
MA 243	Calculus & Analytic Geometry III	
MA 345	Differential Equations and Matrix Methods	4
PS 208	Physics II	3
PS 219	Physics III	3
PS 220	Physics Laboratory III	1
	Open Electives	6
Total Credits		30

JUNIOR YEAR

Course	Title	Credits
	Technical Elective	3
EP 393	Spaceflight Dynamics	2
EP 400	Thermodynamics and Statistical Mech.	3
MA 441	Advanced Engineering Mathematics I	3
MA 442	Advanced Engineering Mathematics II	3
	Upper-Level Social Sciences*	3
PS 303	Modern Physics	3
PS 305	Modern Physics Laboratory	1
PS 320	Classical Mechanics	3
PS 401	Astrophysics	3
	Open Elective	3
Total Credits		30

SENIOR YEAR

Course	Title	Credits
	Technical Electives	6
EP 410	Space Physics	3
EP 420	Planetary Science	3
EP 440	Engineering Electricity and Magnetism	3
EP 455	Quantum Physics	3
PS 400	Senior Physics Laboratory	3
PS 405	Atomic/Nuclear Physics	3
PS 408	Astrophysics II	3
	Open Elective	3
Total Credits		30
TOTAL DEGREE CREDITS		120

* Embry-Riddle courses in the general education categories of Communication Theory and Skills, Humanities and Social Sciences, and the Technical Electives may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified in the Space Physics vertical outline.

COMMUNICATION THEORY AND SKILLS

COM 122, 219, 221, 222, 351, 360

HUMANITIES

LOWER-LEVEL:

HU 140-146, 250

UPPER-LEVEL:

HU 300-400 level

SOCIAL SCIENCES

LOWER-LEVEL:

EC 200,

PSY 101, SS 110, 120, 130, 204, 210

UPPER-LEVEL:

HF 300

PSY 350

SS 302, 305, 310, 320, 325, 331, 335, 340, 350, 352,

360

TECHNICAL ELECTIVES

AE/AEL/CEC/CIV/CS/CC/EGR/EL/EP/ES/
ME/SE/MA/PS 300-400 level

Students may take other HU/SS courses with the approval of the department chair/program coordinator.

Academic Programs at the Daytona Beach Campus

College of Aviation

Dr. Tim Brady, Dean

The College of Aviation integrates into one unit the departments of Aeronautical Science, Aviation Maintenance Science, Applied Aviation Sciences, and the Flight Training Department, which is the flight laboratory component for the Aeronautical Science degree. This cohesive unit takes advantage of the various talents and expertise of faculty and staff in these related programs. By having these programs in one complex composed of the Aviation Building, the Simulation Center, the Flight Laboratory, and the Maintenance complex, the College provides an atmosphere in which students are able to immerse themselves in an environment designed to provide them with the best resources available for the highest quality degree possible.

The Aviation Building, a strikingly beautiful state-of-the-art facility that opened in 2002, houses the academic departments, classrooms, and laboratories, including the Air Traffic Simulation laboratory, which provides a unique experience for students in various curricula. The Simulation Center contains the most advanced ab-initio aircraft simulation devices on the planet: aircraft-specific Cessna 172, Diamond Twin Star, and Piper Seminole flight training devices (FTDs), plus a CRJ FTD. Each of these devices exactly simulates the aircraft, including the flying qualities, sounds, etc., and each has powerful, realistic visuals.

The College of Aviation complex also serves as a living laboratory that can research all elements of an air transportation system, including dynamic modeling of air traffic control interfaces, security systems, and safety systems through its highly sophisticated aircraft and air traffic simulation laboratories. These simula-

tions can then be incorporated into the real world, where a fleet of airplanes can bring the simulation scenarios to life in an actual in-flight laboratory.

Academic degree programs offered through the College of Aviation include the following undergraduate degrees:

- Aeronautical Science (Professional Pilot)
- Aeronautics
- Aviation Maintenance Science
- Aerospace Electronics
- Applied Meteorology
- Air Traffic Management
- Homeland Security
- Safety Science

In addition, the College offers the Master of Science degree in Aeronautics with specializations in Air Traffic Management, Aviation/Aerospace Education Technology, Aviation/Aerospace Management, Aviation/Aerospace Operations, or Aviation/Aerospace Safety Systems.

The College of Aviation has an enrollment of approximately 2,247 students, many of whom are in the Aeronautical Science degree, which has the largest enrollment of any similar undergraduate degree program in the nation. The College has a fleet of 61 aircraft, including Cessna C-172s, Piper PA-28R Arrows, and Piper PA-44 Seminoles.

Embry-Riddle has positioned the College of Aviation to serve its students with distinction while investigating and developing new education and programs for pilots, air traffic managers, meteorologists, and safety and security professionals of the new century.

Academic Programs at the Daytona Beach Campus

Aeronautical Science (Professional Pilot)

Bachelor of Science

Specialties: Airline Pilot, Commercial Pilot, Military Pilot

The Aeronautical Science degree program blends flight training with rigorous academic study in a unique manner that provides a strong foundation for a career as a leader in the aviation industry, including airlines, corporate and commercial aviation, or the military. This approach to aviation education gives the student added value over traditional flight training programs by focusing on the skills and knowledge required by today's industry. The curriculum provides skills in mathematics, physics, communications, business, and aeronautics, including FAA certification as a multi-engine instrument rated commercial pilot. Unmanned aerial vehicles are becoming an important part of aviation. While not manned, these vehicles will have an increasingly important role in aviation in the years ahead. Aeronautical science students will have the opportunity to learn about UAVs, fly them, and incorporate them into the U.S. airspace. The last two years of matriculation include extensive professional-level Aeronautical Science and flight courses that prepare the graduate for a career as a professional pilot, including airline flight crew operations in multi-crewmember jet transport aircraft. Critical thinking and problem-solving skills are developed via computer simulations in aircraft performance, navigation, and aircraft systems operation. Effective resource management, human factors, and safety awareness are constantly emphasized throughout the curriculum.

Degree Requirements

The Bachelor of Science degree in Aeronautical Science may be attained in eight semesters. To earn the degree, successful completion of a minimum of 120 credit hours is required. The purpose of the Aeronautical Science degree program is to prepare the graduate for a productive career as a professional pilot and for responsible citizenship in support of aviation and aerospace industries. Upon completion of the curriculum, the student will possess an FAA Commercial Pilot Certificate with multi-engine and instrument ratings. Optional advanced flight training includes upset training, certification as a flight instructor and instrument flight instructor, and training as a flight crewmember in a jet transport aircraft.

Students pursuing the Aeronautical Science degree will select one of three specializations after matriculation. Students entering under this catalog may select from the Airline Pilot, Commercial Pilot, or Military Pilot specialization. Please see the section concerning the restrictions imposed by the Aviation Transportation and Security Act. All students must complete the general education courses, the Aeronautical Science core courses, the flight core courses, and the courses required to complete one specialization in order to complete the requirements for the Aeronautical Science degree.

Academic Programs at the Daytona Beach Campus

Bachelor of Science Degree in Aeronautical Science

	Credits
General Education	39
Aeronautical Science Core	51
Flight Core	4
Specialty Courses	26
TOTAL DEGREE CREDITS	120

University General Education

Course	Title	Credits
	Communication Theory and Skills*	9
	Lower-Level Humanities*	3
	Lower-Level Social Sciences*	6
	Upper-Level Humanities -OR- Social Sciences*	3
	Computer Science Elective*	3
	Management Elective*	3
MA 111	College Mathematics for Aviation I	3
MA 112	College Mathematics for Aviation II	3
PS 103	Technical Physics I with Laboratory	3
PS 104	Technical Physics II with Laboratory	3
Total Credits		39

Aeronautical Science Core Courses

Course	Title	Credits
AS 121	Private Pilot Operations	5
ASC 101	Aeronautical Science Success	1
AS 221	Instrument Pilot Operations	3
AS 321	Commercial Pilot Operations	3
AS 309	Aerodynamics	3
AS 310	Aircraft Performance	3
AS 311	Aircraft Engines-Turbine	3
AS 340	Instructional Design in Aviation -OR- FA 417 Flight Instructor Rating**	3
AS 350	Domestic and International Navigation	3
AS 356	Systems and Components	3
AS 357	Flight Physiology	3
AS 358	Advanced Avionics	3
AS 387	Crew Resource Management	3
AS 408	Flight Safety	3
AS 435	Electronic Flight Management System	3
WX 201	Survey of Meteorology	3
WX 301	Aviation Weather	3
Total Credits		51

Flight Core Courses**

SINGLE-ENGINE FLIGHT TRACK

Course	Title	Credits
FA 121	Private Single Flight	1
FA 221	Instrument Single Flight	1
FA 321	Commercial Single Flight	1
FA 323	Commercial Multi Add On	1
-OR-		

MULTI-ENGINE FLIGHT TRACK

Course	Title	Credits
FA 121	Private Single Flight	1
FA 122	Private Multi Flight with Laboratory	1
FA 222	Instrument Multi Flight	1
FA 322	Commercial Multi Flight	1
Total Credits		4

Airline Pilot Specialty

Course	Title	Credits
AS 254	Aviation Legislation -OR-	
AS 405	Aviation Law	3
AS 380	Pilot Career Planning and Interviewing	1
AS 402	Airline Operations -OR-	
AS 410	Airline Dispatch Operations	3
AS 411	Jet Transport Systems	3
AS 420	Flight Technique Analysis	3
FA 420	Airline Flight Crew Techniques and Procedures	2
	Electives	11
Total Credits		26

Commercial Pilot Specialty

Course	Title	Credits
AS 254	Aviation Legislation -OR-	
AS 405	Aviation Law	3
AS 380	Pilot Career Planning and Interviewing	1
BA/AES 300/400 level	3
	Minor	9-18
	Electives	1-10
Total Credits		26

Academic Programs at the Daytona Beach Campus

Military Pilot Specialty

Course	Title	Credits
AS 420	Flight Technique Analysis	3
SS 340	American Foreign Policy	3
	ROTC	16
	Electives	4
Total Credits		26
TOTAL DEGREE CREDITS		120

Aeronautical Science Notes

*Embry-Riddle courses in the general education categories of Communication Theory and Skills, Computer Science, Humanities, Social Sciences, and Management may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified in the Aeronautical Science vertical outline.

Communication Theory and Skills:
COM 122, 219, and 221, 222, or 410

Computer Science:
IT 109 or CS 117 or 118

Humanities/Social Sciences:

LOWER-LEVEL:

HU 140, 141, 142, 143, 144, 145, 146

LOWER-LEVEL:

PSY 101 and EC 200, SS 110, 120, 130, 204 or 210

(Military Pilot Specialty may take only PSY 101 and SS 110, 120, or 130.)

UPPER-LEVEL:

HU/SS 300-400 level or PSY 350

Management:

BA 201

**Flight:

Students have a choice of either the Single-Engine Flight Track or Multi-Engine Flight Track. Both result in certification as a Commercial Pilot with Multi-Engine and Instrument ratings. The Single-Engine Flight Track is selected by most students. In this track, single-engine aircraft and flight-training devices are used for the majority of training. Students who select this track do so primarily because it will allow certification as a flight instructor sooner, allowing for the opportunity to flight instruct part-time while completing their degree. The Single-Engine Track also provides an opportunity to complete the required flight education with reduced flight fees when compared to the Multi-Engine Flight Track.

The Multi-Engine Flight Track emphasizes multi-engine aircraft operations. This track is selected by students who do not necessarily desire to attain their flight instructor certificate and prefer to complete their flight education with more multi-engine flight time. Students who are in the Multi-Engine Flight Track who wish to attain their Certified Flight Instructor certificate must complete their single-engine add-on to their commercial multi certificate before they can be certified to instruct in single-engine aircraft.

Flight education is a continuous process that normally begins sometime during the student's first year of attendance and will progress until culminating in a multi-engine commercial certificate with an instrument rating. The curriculum is designed to allow students to meet core objectives in a reasonable amount of time.

Various factors influence students' progress. These factors include student academic preparation, student availability, student determination and dedication, the availability of aircraft and instructor pilots, and the cooperation of the weather. Consequently, some students will finish before others. After completing the core curriculum, students may take an additional semester or more to acquire additional advanced certificates and ratings, including those for single-engine commercial, certified flight instructor airplane and instrument, and/or they may enroll in the Airline Flight Crew Simulation course.

Refer to page 46 for credit for flight training at other institutions.

Cooperative Education credits may be used as open electives.

Aircraft Dispatcher Certification Program

For the student interested in airline flight operations management, Embry-Riddle offers a program to prepare the student for Aircraft Dispatcher certification testing. The FAA awards the Aircraft Dispatcher Airman Certificate to graduates of the approved program after the successful completion of a standardized written examination and a practical test.

Licensed dispatchers are employed by airlines to manage the ground-based tasks vital to a successful airline flight. Dispatchers share responsibility with the captain for pre-flight planning and preparation of the dis-

Academic Programs at the Daytona Beach Campus

patch release, and they are included in the decision loop on equipment failures, weather variations, or traffic delays for monitoring the progress of the flight, issuing safety-of-flight information to the crew, and canceling or re-dispatching the flight.

To carry out these tasks properly, dispatchers must be knowledgeable in aircraft performance capabilities, meteorology, operating regulations, air traffic control, and instrument flight procedures. They must also be able to make sound decisions that incorporate the company's economic and scheduling considerations.

Certification Requirements

The Aircraft Dispatcher Certification program is available at the Daytona Beach Campus. Dispatcher preparation is based on the successful completion of the following Aeronautical Science courses and the applicable prerequisites.

Course	Title	Credits
AS 221	Instrument Pilot Operations	3
AS 321	Commercial Pilot Operations	3
AS 310	Aircraft Performance	3
AS 410	Airline Dispatch Operations*	3
AT 200	Air Traffic Management I	3
WX 201	Survey of Meteorology	3
WX 301	Aviation Weather	3
Total Credits		21

* AS 410 serves as the capstone course for the Aircraft Dispatcher program. Students cannot enroll in this class until they have completed and passed all other required Aeronautical Science courses for the Aircraft Dispatcher Program. Students must be 21 years of age to take this examination.

This program is offered in the pursuit of a degree and not as separate training. To receive credit for any of the courses listed above toward the Aircraft Dispatcher certification program, the student must sign up in each required course, maintain a record of 100 percent attendance throughout each course, and obtain a grade of at least 70 percent. For more information, contact the Aeronautical Science Department.

Academic Programs at the Daytona Beach Campus

Aeronautics

Bachelor of Science

The Aeronautics degree is designed specifically for students who work, have worked, or desire to work in aviation-related careers. For students with existing aviation-related knowledge and skills, this degree acknowledges a student's valuable acquired experience through the award of advanced standing prior-learning credit. The curriculum then builds on those skills and knowledge. The program also provides an opportunity for those students new to aviation to acquire aviation-specific knowledge through aviation-related coursework. This combination of a student's aviation learning, aviation courses, business, computer science, economics, humanities, communications, social sciences, mathematics, and physical sciences, along with professional development elective courses and a minor course of study, will prepare graduates for a career in an aviation-related field.

Aviation Area of Concentration

The Aviation Area of Concentration is the degree component that lets students select courses from various aviation-related fields. In addition, the AOC portion of the degree is where credit for prior aviation learning is applied. Thirty-six hours of credit are needed to satisfy the requirements of this portion of the Aeronautics degree. All or part of the credit needed for this degree requirement may be awarded based on prior aviation training or experience. To complete the AOC, in addition to any prior learning credit, students may select from courses in Aeronautical

Science, Aerospace Electronics, Air Traffic Management, Applied Meteorology (aviation-related), Aviation Maintenance Science, Cooperative Education, Electronics, Flight, Homeland Security, Safety (aviation-related), Simulation, or Space Studies.

Evidence of Prior Aviation Learning

Applicants who qualify for admission to and matriculate in the degree program may be eligible for credit for prior learning. Applicants must be able to prove competence in an aviation occupation with authentic documentary evidence. Training and experience in closely related occupations can be combined.

Just as official transcripts are required to transfer credit from one university to another, original or authenticated documentation of prior learning from professional training and experience must be presented to qualify for award of Aviation Area of Concentration credit. Documentary evidence must be from objective third-party sources and must clearly describe the applicant's professional training, duties, and achievements in detail. Advanced standing credit will be awarded in accordance with the applicable Embry-Riddle Aeronautical University Curriculum Manual.

Duplicate Credit

Many Embry-Riddle courses are designed to teach the same skills and knowledge that Aeronautics students have acquired through experience and training. Students who com-

Academic Programs at the Daytona Beach Campus

plete courses in the same aviation specialty for which they were granted Aviation Area of Concentration credit would be duplicating coverage of the same subject matter. Credit for completion of such courses will not be applied to degree requirements. Credit for prior learning granted in the Aeronautics degree program may not be transferable to any other Embry-Riddle degree program.

Minor

Students must select and complete one minor field of study. Total credits in the minor will vary depending on which minor is chosen. Students typically select a minor that will enhance their aviation career. Courses required for the minor field of study may be used to fill Area of Concentration, Professional Development, or Open Elective degree requirements. See Minor Courses of Study in this catalog.

Aeronautics Curriculum

The curriculum to be followed by each student will vary depending on any AOC prior learning or transfer credits granted.

Curriculum

Course	Credits
Aviation Area of Concentration	36
Advanced standing credit and/or non-duplicating credit from AEL, AMS, AS, AT, CEA, EL, FA, HS, SF, SIM, SP, or WX courses.	
Communication Theory and Skills*	9
Humanities/Social Sciences*	12
Lower-Level Humanities Elective	3
Lower-Level Social Sciences Elective (PSY 101 and/or Lower-Level SS)	6
Upper-Level HU or SS Elective	3
Computer Science Elective	3
Mathematics**	6
College Algebra or Higher-Level Mathematics	3
MA 112 College Mathematics for Aviation II -OR-	

MA 222 Business Statistics -OR- Higher-Level Mathematics	3
Physical Sciences**	6
Physical and Life Sciences Elective	
One course must include a laboratory.	
Program Support	12
AS 254 Aviation Legislation	3
AS 405 Aviation Law	3
BA 201 Principles of Management -OR-	
BA 210 Financial Accounting	3
EC 200 An Economic Survey -OR-	
EC 210 Macroeconomics -OR-	
EC 211 Macroeconomics	3
Professional Development Electives	21
Select from Upper-Division (300-400) courses in AEL, AMS, AS, AT, BA, CEA, CS, EC, EL, HS, IT, LET, SF, SIM, SP, WX	
Open Electives	15
TOTAL DEGREE CREDITS	120

* Embry-Riddle courses in the general education categories of Communication Theory and Skills, Humanities, and Social Sciences may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified in the Aeronautics vertical outline. Other courses may also be used with permission of the undergraduate program coordinator.

Communication Theory and Skills
COM 122, 219, 221, 222

Humanities
HU 140 to HU 146

Social Sciences
LOWER-LEVEL:
100-200 Level
UPPER-LEVEL:
300-400 Level
HF 300, PSY 350

Dependent on the amount of upper-level Aviation Area of Concentration credit applied, some of the open or Communication/Humanities/Social Sciences electives in the B.S. degree may have to be 300-400 level courses to satisfy the graduation requirement of 39 credits of upper-level courses.

Cooperative Education credits may be used as open electives; however, assignments may not be in the student's occupational specialty.

** Students need to ascertain Mathematics and Physical Science pre/corequisites that are required for other courses. For example, PS 103/4 and MA 112 are required for many upper-division AS and WX courses.

Academic Programs at the Daytona Beach Campus

Aerospace Electronics

Bachelor of Science

The Aerospace Electronics degree program is designed to provide the requisite knowledge required to excel in the field of aerospace electronics in support of aerospace vehicles and systems. The general education requirements include mathematics, science, communications, and other applicable subjects. This balanced approach to education enables the graduate to apply techniques of critical thinking and problem-solving to a logical result in challenging situations. The primary focus of the degree program is entry positions in commercial off-the-shelf systems (COTS) development, test and evaluation, and integrated logistics support (ILS) with aerospace electronics manufacturers, aircraft manufacturers, and related space industries.

Admissions Requirements

Students entering this program should have a basic background in math, physics, and chemistry. College algebra and trigonometry are the entry-level math courses. Students wishing to strengthen their background in math and the basic sciences before enrolling in the prescribed courses should contact the department chair or the program coordinator for guidance.

Several courses in each academic year have prerequisites and/or corequisites. Check the course description section at the back of this catalog before registering for classes to ensure requisite sequencing.

Degree Requirements

The Bachelor of Science in Aerospace Electronics requires successful completion of 120 credits as outlined in the following course list. A minimum cumulative grade point average of 2.00 is required of all aerospace electronic related courses.

Suggested Program of Study

FRESHMAN YEAR

Course	Title	Credits
COM122	English Composition and Literature	3
EGR 111	Engineering Drawing	2
EC 200	An Economic Survey	3
EL 107	Direct and Alternating Current Fundamentals and Circuit Analysis.	4
EL 108	Direct and Alternating Current Laboratory	1
HU	Lower-Level Humanities*	3
MA 145	College Algebra and Trigonometry	5
MA 241	Calculus and Analytic Geometry	4
PS 101	Basic Chemistry	3
PS 150	Physics I for Engineers	3
Total Credits		31

SOPHOMORE YEAR

Course	Title	Credits
EGR 115	Introduction to Computing for Engineers -OR-	
CS 223	Scientific Programming in C	3
EL 203	Microelectronics Fundamentals and Circuit Analysis	4
EL 204	Microelectronics Laboratory	1
EL 212	Digital Circuit Systems Analysis	4
EL 213	Digital Circuits Laboratory	1
EL 307	Microprocessor Systems	3
EL 308	Microprocessor Systems Laboratory	1
MA 242	Calculus and Analytic Geometry	4
MA 245	Applied Differential Equations	3
PS 160	Physics II for Engineers	3
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
Total Credits		31

Academic Programs at the Daytona Beach Campus

JUNIOR YEAR

Course	Title	Credits
AEL 315	Linear Systems and Signals Analysis	3
AEL 316	Elements of Engineering Design and Laboratory Procedures.	3
AEL 321	Advanced Communications Systems Analysis.	4
AEL 322	Advanced Communications, Microwave and Control Laboratory Systems Analysis.	1
AEL 323	Applied Control System Analysis	2
AEL 324	Microwave and Radar System Analysis	2
COM219	Speech.	3
COM221	Technical Report Writing.	3
HF 210	Human Factors I: Principles and Fundamentals	3
HU/SS	Upper-Level Elective	3
MET 200	Machine Shop Laboratory	1
PSY 101	Introduction to Psychology.	3
Total Credits		31

SENIOR YEAR

Course	Title	Credits
	Open Elective (Upper Level).	3
AEL 411	Communications and Navigation Systems.	3
AEL 412	Surveillance and Control Systems	3
AEL 413	Satellite Communications and Navigation Systems	4
AEL 414	System Test Evaluation Laboratory	1
AEL 421	Aerospace Electronic System Integration and Design	3
AEL 422	Integrated Logistics Support.	3
AEL 423	Test System Development Laboratory.	1
AEL 424	Senior Project.	3
MA 412	Probability and Statistics.	3
Total Credits		27
TOTAL DEGREE CREDITS		120

* HUMANITIES:

HU: 140, 141, 142, 143, 144, 145, 146

Academic Programs at the Daytona Beach Campus

Air Traffic Management

Bachelor of Science

The Applied Aviation Sciences Department offers a Bachelor of Science degree in Air Traffic Management (ATM). This degree is designed for students whose goal is to become air traffic controllers or seek employment in a related industry. The academic courses are designed to provide exposure to procedures and operations consistent with those found in Federal Aviation Administration (FAA) air traffic control facilities. The ATM curriculum provides the knowledge and foundation designated by the FAA for eventual student entry into the FAA Academy where they will be integrated with graduates of other Collegiate Training Initiative (CTI) schools for additional air traffic control training.

Degree Requirements

The Bachelor of Science degree in Air Traffic Management requires successful completion of a minimum of 120 credit hours, normally completed in eight semesters. This includes a minor course of study as approved by the Applied Aviation Sciences Department.

Suggested Program of Study

Students should be aware that several courses in each academic year might have prerequisites and/or corequisites. Please check the course descriptions in this catalog before registering for classes to ensure requisite sequencing.

FRESHMAN YEAR

Course	Title	Credits
	Communication Theory and Skills	6
	Computer Science Elective*	3
	Physical Science with Laboratory	3
	Lower-Level Humanities	3
MA 111	College Mathematics for Aviation I	3
MA 112	College Mathematics for Aviation II	3
WX 201	Survey of Meteorology	3
	Open Elective	6
Total Credits		30

SOPHOMORE YEAR

Course	Title	Credits
	Communication Theory and Skills	3
	Physical Science*	3
	Lower-Level Humanities	3
AT 200	Air Traffic Management I	3
AT 302	Air Traffic Management II	3
BA 201	Principles of Management	3
EC 200	An Economic Survey	3
PSY 101	Introduction to Psychology	3
SF 201	Introduction to Health, Occupational Safety, and Transportation -OR-	
SF 210	Introduction to Aerospace Safety	3
SF 320	Human Factors in Aviation Safety	3
Total Credits		30

JUNIOR YEAR

Course	Title	Credits
AT 305	Air Traffic Management III	3
AT 315	VFR Control Tower	3
AT 401	Air Traffic Management IV	3
BA 314	Human Resource Management	3
HU/SS	300-400 Level Elective	3
	Upper-Level Open Elective	6
SF 462	Health, Safety, and Aviation Law	3
WX 301	Aviation Weather	3
	Open Elective	3
Total Credits		30

Academic Programs at the Daytona Beach Campus

SENIOR YEAR

Course Title	Credits
AT 405 Air Traffic Management V.....	3
AT 406 Non Radar Air Traffic Control	3
Required courses necessary to complete one minor course of study approved by the Applied Aviation Sciences Department.	15-24
Open Electives to meet the requirement of 40 hours of upper-level courses and 120 total hours to complete the degree.....	9-18
TOTAL DEGREE CREDITS	120

* Embry-Riddle courses in the general education categories of Communication Theory and Skills, Computer Science, Humanities, Social Sciences, Mathematics, and Physical Science may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified in the Air Traffic Management vertical outline.

Communication Theory and Skills:

COM: 122, 219, 221, 222, 410

Humanities:

140, 141, 142, 143, 144, 145

Social Sciences:

Lower-Level

SS: 110, 120, 130, 204, 210

Upper-Level

SS: 310, 325, 350, 351, 352

Physical Science:

PS: 101, 102, 103, 104, 105, 106, 107, 108, 111, 112,
142, 208, 215, 219, 240, 301, 302, 303, 304, 306, 308,
309, 310, 411, 312, 313, 320, 400, 401, 403, 405, 408,
410, 412, 414 (1 laboratory)

Mathematics

MA: 111, 112, 140, 142, 241; MA 145, 241

Students enrolled in the Army, Navy, or Air Force ROTC program may substitute MY, NSC, or AF courses for open elective courses.

Academic Programs at the Daytona Beach Campus

Applied Meteorology

Bachelor of Science

The Applied Aviation Sciences Department offers a Bachelor of Science degree in Applied Meteorology. This program offers those students with a passion for weather the opportunity to study, observe, and explore atmospheric phenomena ranging from global climate to tornadoes in our new state-of-the-art Weather Center and computer-equipped classrooms. Besides mastering the essentials of meteorology, students will acquire the communication skills necessary to translate information about complex atmospheric features into the practical language of operational decision makers. The program aims to produce graduates with the necessary knowledge, analytical skills, and operational expertise to add value to any decision impacted by the weather. Graduates will be competitive for jobs ranging from the aviation and aerospace industry to radio and television to business and government/military operations of the 21st century.

Degree Requirements

The Bachelor of Science Degree in Applied Meteorology requires successful completion of a minimum of 120 credit hours and can be attained in eight semesters. Students pursuing the Applied Meteorology degree will select one of five areas of concentration (AOC) from among Flight Weather, Media Weather, Commercial Weather,

Meteorological Computer Applications, or Research AOC, generally by the end of their fourth semester. All students must complete the general education courses, Applied Meteorology core courses, and the required courses for one AOC in order to graduate with a Bachelor of Science in Applied Meteorology. A student wishing to become eligible for employment with the U.S. government as a meteorologist must complete the Research or Meteorological Computer Applications AOC in order to meet U.S. Office of Personnel Management Qualification Standards. All students entering the Applied Meteorology program must take a math placement test or show suitable advanced placement. Because many courses have prerequisites or co-requisites, students in the Research and Meteorological Computer Applications AOCs should prepare to begin the required calculus sequence as soon as they are eligible.

Bachelor of Science Degree in Applied Meteorology

	Credits
General Education	36/37
Applied Meteorology Core	47
Area of Concentration	29/32
Open Electives	3/8
TOTAL DEGREE CREDITS REQUIRED	120

Academic Programs at the Daytona Beach Campus

University General Education

Course Title	Credits
Communication Theory and Skills	9
Computer Science Elective	3
Lower-Level Humanities (HU)	3
Lower-Level Social Sciences (SS)	6
Upper-Level HU/SS Elective	3
Mathematics (see specific AOC)	6/7
Physics (see specific AOC)	6
Total Credits	36/37

Applied Meteorology Core

Course Title	Credits
UNIV 101 College Success	1
CE AAS Co-op/Internship or Approved Electives	6
PS 105 General Chemistry	4
WX 201 Survey of Meteorology	3
WX 261 Applied Climatology	3
WX 270 Weather Information Systems	3
WX 353 Thermodynamics of the Atmosphere	3
WX 354 Dynamics of the Atmosphere	3
WX 356 Synoptic Meteorology	3
WX 365 Satellite & Radar Weather Interpretation	3
WX 390 Atmospheric Physics	3
WX 427 Forecasting Techniques	3
WX 422 Statistical Applications for Meteorological Data Analysis	3
WX 456 Advanced Weather Analysis	3
WX 457 Weather Operations Seminar	3
Total Credits	47

Flight Weather Area of Concentration

Course Title	Credits
AS 121 Private Pilot Operations	5
AS 221 Instrument Pilot Operations*	3
AS 321 Commercial Pilot Operations*	3
AS 309 Aerodynamics	3
AS 310 Aircraft Performance*	3
AS 410 Air Dispatch Operations*	3
AT 200 Air Traffic Management I*	3
WX 301 Aviation Weather	3
WX 364 Weather for Aircrews	3
Total Credits	29

* Indicates courses in the Aircraft Dispatcher Certification Program.

Media Weather Area of Concentration

Course Title	Credits
AS 120 Principles of Aviation Science	3
COM225 Science & Technology Communications	3
COM260 Introduction to Media	3
COM265 Introduction to News Writing	3
COM320 Communications Law & Ethics -OR-	
HU 330 Values and Ethics	3
COM350 Environmental Communication	3
COM360 Media Relations I	3
WX 265 Climate Change	3
WX 280 Introduction to TV Weathercasting	3
WX 380 Advanced TV Weathercasting	3
Total Credits	30

Commercial Weather Area of Concentration

Course Title	Credits
AS 120 Principles of Aviation Science	3
BA 220 Marketing	3
BA 221 Advanced Computer Based Systems	3
BA 325 Social Responsibility and Ethics Management	3
EC 210 Microeconomics	3
EC 420 Economics of Air Transportation	3
WX 265 Climate Change	3
Applied Meteorology Electives	3
Business Electives	6
Total Credits	30

Meteorological Computer Applications Area of Concentration

Course Title	Credits
AS 120 Principles of Aviation Sciences	3
CS 225 Computer Science II	4
MA 242 Calculus and Analytical Geometry II	4
MA 243 Calculus and Analytical Geometry III	4
MA 345 Differential Equations and Matrix Methods	4
PS 250 Physics III for Engineers	3
PS 253 Physics Laboratory for Engineers	1
SE 300 Software Engineering Practices	4
CS/SE/CEC Upper-Level Electives	6
Total Credits	33

Academic Programs at the Daytona Beach Campus

Research Area of Concentration

Course	Title	Credits
AS 120	Principles of Aviation Science	3
CS 225	Computer Science II	4
MA 242	Calculus and Analytic Geometry II	4
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 250	Physics for Engineers III	3
PS 253	Physics Laboratory for Engineers	1
WX 420	Advanced Atmospheric Thermodynamics	3
WX 490	Advanced Dynamic Meteorology I	3
WX 491	Advanced Dynamic Meteorology II	3
Total Credits		32

Suggested Program of Study

A word about math and physics requirements: meteorology is an application of math and physics to the sea of air in which we live. Students who wish to pursue graduate studies in the atmospheric sciences or who want to work for the federal government or who are on U.S. Air Force ROTC scholarship should enroll in the Research or Meteorology Computer Applications AOC's and complete the math sequence MA 242, MA 243, and MA 345 by their junior year. Those students should also enroll in the physics sequence PS 150, PS 160, and PS 250. Students pursuing other AOCs should complete MA 111 and MA 112, and PS 103 and PS 104 with labs. Students who are undecided about their futures should begin with MA 140 and PS 150.

Flight Weather Area of Concentration

Students interested in providing weather services to the aviation/aerospace industry should follow this course of study. The mix of courses will enhance the student's ability to communicate with people who build, fly, and control airplanes and flight activities. Courses designated with (*) are required for

the Aircraft Dispatcher Certification Program.

FRESHMAN YEAR

Course	Title	Credits
UNIV 101	College Success	1
AS 121	Private Pilot Operations	5
COM122	English Composition and Literature	3
COM219	Speech	3
HU 14X	Lower-Level Humanities	3
MA 111	College Mathematics for Aviation I	3
MA 112	College Mathematics for Aviation II	3
PS 103	Technical Physics I	3
PS 103L	Technical Physics I Laboratory	0
SS	Lower-Level Social Sciences Elective	3
WX 201	Survey of Meteorology	3
Total Credits		30

SOPHOMORE YEAR

Course	Title	Credits
AS 221	Instrument Pilot Operations	3
COM221	Technical Report Writing	3
EGR 115	Introduction to Computing for Engineers	3
SS	Social Sciences Elective	3
PS 104	Technical Physics II	3
PS 104L	Technical Physics II Laboratory	0
WX 261	Applied Climatology	3
WX 270	Weather Information Systems	3
WX 301	Aviation Weather	3
WX 353	Thermodynamics of the Atmosphere	3
WX 354	Dynamics of the Atmosphere	3
Total Credits		30

JUNIOR YEAR

Course	Title	Credits
HU/SS	Upper-Level Humanities or Social Science Elective	3
AS 309	Basic Aerodynamics	3
AS 321	Commercial Pilot Operations	3
AT 300	Air Traffic Management	3
PS 105	General Chemistry	4
WX 356	Synoptic Meteorology	3
WX 365	Satellite and Radar Weather Interpretation	3
WX 390	Atmospheric Physics	3
WX 422	Statistical Application for Meteorology	3
	Open Electives	3
Total Credits		31

SENIOR YEAR

Course	Title	Credits
AS 310	Aircraft Performance*	3
AS 410	Air Dispatch Operations*	3
CE AAS	Co-op/Internship	6

Academic Programs at the Daytona Beach Campus

WX	364	Weather for Aircrews	3
WX	427	Forecasting Techniques	3
WX	456	Advanced Weather Analysis	3
WX	457	Weather Operations Seminar	3
		Open Electives	6
Total Credits			30

Media Weather Area of Concentration

Students interested in journalism, radio, and television will combine meteorology with studies in verbal and written communications. Internships may be conducted with newspapers, radio stations, or network/cable television channels.

FRESHMAN YEAR

Course	Title		Credits
UNIV101	College Success		1
AS	120	Principles of Aeronautical Science	3
COM122	English Composition and Literature		3
COM219	Speech		3
HU	14X	Lower-Level Humanities	3
MA	111	College Mathematics for Aviation I	3
MA	112	College Mathematics for Aviation II	3
PS	103	Technical Physics I	3
PS	103L	Technical Physics I Laboratory	0
SS		Lower-Level Social Sciences Elective	3
WX	201	Survey of Meteorology	3
WX	261	Applied Climatology	3
Total Credits			31

SOPHOMORE YEAR

Course	Title		Credits
COM221	Technical Report Writing		3
COM260	Introduction to Media		3
SS		Social Sciences Elective	3
EGR	115	Introduction to Computing for Engineers	3
PS	104	Technical Physics II	3
PS	104L	Technical Physics II Laboratory	0
PS	105	General Chemistry	4
WX	270	Weather Information Systems	3
WX	353	Thermodynamics of the Atmosphere	3
WX	365	Satellite and Radar Weather Interpretation	3
WX	265	Climate Change	3
Total Credits			28

JUNIOR YEAR

Course	Title		Credits
COM265	Introduction to News Writing		3
COM320	Mass Communication Law and Ethics		3
COM360	Media Relations I		3
SS		Social Science Elective	3
WX	280	Introduction to TV Weathercasting	3
WX	354	Dynamics of the Atmosphere	3
WX	356	Synoptic Meteorology	3
WX	390	Atmospheric Physics	3
		Open Electives	4
Total Credits			28

SENIOR YEAR

Course	Title		Credits
CE AAS	Co-op/Internship		6
COM225	Science and Technology Communications		3
COM330	Environmental Communications		3
WX	380	Advanced TV Weathercasting	3
WX	422	Statistical Applications for Meteorology	3
WX	427	Forecasting Techniques	3
WX	456	Advanced Weather Analysis	3
WX	457	Weather Operations Seminar	3
		Open Elective	3
Total Credits			30

Commercial Weather Area of Concentration

To meet the growing demand for meteorologists by the private sector, students who select this option will be prepared to provide meteorological expertise to a wide range of weather-dependent industries. By selecting appropriate courses in this highly flexible AOC, students can also complete a Minor in Business Administration.

FRESHMAN YEAR

Course	Title		Credits
UNIV101	College Success		1
AS	120	Principles of Aeronautical Science	3
COM122	English Composition and Literature		3
COM219	Speech		3
HU	14X	Lower-Level Humanities	3
MA	111	College Mathematics for Aviation I	3
MA	112	College Mathematics for Aviation II	3
PS	103	Technical Physics I	3
PS	103L	Technical Physics I Laboratory	0
SS		Lower-Level Social Sciences Elective	3

Academic Programs at the Daytona Beach Campus

WX 201	Survey of Meteorology	3
WX 261	Applied Climatology	3
Total Credits		31

SOPHOMORE YEAR

Course	Title	Credits
BA 221	Advanced Computer Based Systems	3
COM221	Technical Report Writing	3
EC 210	Microeconomics	3
SS	Social Sciences Elective	3
EGR 115	Introduction to Computing for Engineers	3
PS 104	Technical Physics II	3
PS 104L	Technical Physics II Laboratory	0
PS 105	General Chemistry	4
WX 270	Weather Information Systems	3
WX 353	Thermodynamics of the Atmosphere	3
WX 365	Satellite and Radar Weather Interpretation	3
Total Credits		31

JUNIOR YEAR

Course	Title	Credits
BA 220	Marketing	3
HU/SS	Upper-Level Humanities -OR- Social Sciences Elective	3
WX 265	Climate Change	3
WX 356	Synoptic Meteorology	3
WX 390	Atmospheric Physics	3
WX 354	Dynamics of the Atmosphere	3
WX 422	Statistical Applications for Meteorology	3
	Applied Meteorology Electives	3
	Business Elective	3
	Open Electives	3
Total Credits		30

SENIOR YEAR

Course	Title	Credits
BA 325	Social Responsibility and Ethics in Management	3
CE	AAS Co-op/Internship	6
EC 420	Economics of Air Transportation	3
WX 427	Forecasting Techniques	3
WX 456	Advanced Weather Analysis	3
WX 457	Weather Operations Seminar	3
	Business Elective	3
Total Credits		28

Meteorological Computer Applications Area of Concentration

Students wishing to pursue a career in developing applications in meteorology should choose the Meteorological Computer

Applications Area of Concentration. The math, physics, and core Meteorology courses are the same as in the Research Area of Concentration. A minor in Computer Science is incorporated into this AOC. Students who choose the Meteorological Computer Applications Area of Concentration should follow the suggested four-year plan outlined below:

FRESHMAN YEAR

Course	Title	Credits
UNIV	101 College Success Seminar	1
AS 120	Principles of Aeronautical Science	3
COM122	English Composition and Literature	3
MA 142	Trigonometry	3
MA 241	Calculus and Analytical Geometry	4
MA 242	Calculus and Analytical Geometry II	4
PS 105	General Chemistry	4
PS 150	Physics I	3
WX 201	Survey of Meteorology	3
WX 261	Applied Climatology	3
Total Credits		31

SOPHOMORE YEAR

Course	Title	Credits
COM219	Speech	3
COM221	Technical Report Writing	3
EGR 115	Introduction to Computing for Engineers	3
HU 14X	Lower-Level Humanities	3
MA 243	Calculus and Analytical Geometry III	4
PS 160	Physics for Engineers II	3
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
WX 353	Thermodynamics of the Atmosphere	3
WX 354	Dynamics of the Atmosphere	3
Total Credits		29

JUNIOR YEAR

Course	Title	Credits
CE	Applied Aviation Science Co-op/Internship	6
CS 225	Computer Science II	4
MA 345	Differential Equations and Matrix Methods	4
SS	Social Sciences Elective	3
WX 270	Weather Information Systems	3
SE 300	Software Engineering Practices	4
WX 356	Synoptic Meteorology	3
WX 365	Satellite and Radar Weather Interpretation	3
Total Credits		30

Academic Programs at the Daytona Beach Campus

SENIOR YEAR

Course	Title	Credits
HU/SS	Upper-Level Elective	3
SS	Lower-Level Elective	3
WX	390 Atmospheric Physics	3
WX	422 Statistical Applications for Meteorology..	3
WX	427 Forecasting Techniques	3
WX	456 Advanced Weather Analysis	3
WX	457 Weather Operations Seminar	3
CS/SE/CEC	Upper-Level Electives.....	6
	Open Electives.....	3
Total Credits		30
TOTAL DEGREE CREDITS		120

Research Area of Concentration

Students wishing to go to graduate school in Meteorology, or wishing to become eligible for Meteorology employment with the U.S. government, or who are on ROTC Meteorology scholarships should choose the Research Area of Concentration. Students who choose the Research Area of Concentration should follow the four-year plan outlined below:

FRESHMAN YEAR

Course	Title	Credits
UNIV	101 College Success Seminar	1
AS	120 Principles of Aeronautical Science.....	3
COM	122 English Composition and Literature.....	3
MA	142 Trigonometry.....	3
MA	241 Calculus and Analytical Geometry	4
MA	242 Calculus and Analytical Geometry II	4
PS	105 General Chemistry	4
PS	150 Physics for Engineers I.....	3
WX	201 Survey of Meteorology.....	3
WX	261 Applied Climatology	3
Total Credits		31

SOPHOMORE YEAR

Course	Title	Credits
COM	219 Speech.....	3
COM	221 Technical Report Writing.....	3
EGR	115 Introduction to Computing for Engineers	3
HU	14X Lower-Level Humanities.....	3
SS	Social Sciences Elective	3
MA	243 Calculus and Analytical Geometry III.....	4
PS	160 Physics for Engineers II.....	3
PS	250 Physics for Engineers III	3
PS	253 Physics Laboratory for Engineers	1
WX	353 Thermodynamics of the Atmosphere	3
WX	354 Dynamics of the Atmosphere	3
Total Credits		32

JUNIOR YEAR

Course	Title	Credits
SS	Lower-Level Elective	3
CE	AAS Co-op/Internship	6
CS	225 Computer Science II.....	4
MA	345 Differential Equations and Matrix Methods.....	4
WX	270 Weather Information Systems.....	3
WX	356 Synoptic Meteorology	3
WX	420 Advanced Atmospheric Thermodynamics	3
WX	365 Satellite and Radar Weather Interpretation.....	3
Total Credits		29

SENIOR YEAR

Course	Title	Credits
HU/SS	Upper-Level Elective	3
WX	390 Atmospheric Physics	3
WX	422 Statistical Applications for Meteorology..	3
WX	427 Forecasting Techniques	3
WX	456 Advanced Weather Analysis.....	3
WX	457 Weather Operations Seminar	3
WX	490 Dynamic Meteorology I.....	3
WX	491 Dynamic Meteorology II.....	3
	Open Electives.....	4
Total Credits		28
TOTAL DEGREE CREDITS		120

Academic Programs at the Daytona Beach Campus

Aviation Maintenance Science

Associate of Science

At the heart of every flight of every commercial, private, or military aircraft is the work of the professional aviation maintenance expert. Without the devotion of these very special people, the air travel system would cease to function. The demand for degreed aircraft maintenance specialists in the aviation/aerospace world has never been greater than it is today. The Aviation Maintenance Science (AMS) program at Embry-Riddle produces these aviation professionals, the best in the world.

The Aviation Maintenance Science associate's degree is made up of general education courses and technical courses and labs that lead to FAA Airframe and Powerplant (A&P) mechanic's certification. The degree is composed of 66 credit hours, 18 hours of general education coursework, and 48 hours of airframe and powerplant technical courses. The associate's degree will flow seamlessly into the AMS bachelor of science degree.

The courses taken in the Aviation Maintenance Science Department lead to a student being approved for the A&P certification exams. Credit will be granted for any student who enters the University already in possession of the A&P certification. International certification, which may be equivalent to the Airframe and Powerplant certification, will be evaluated on a case-by-case basis and, if approved, may be used for academic credit.

General Education Core

Course	Title	Credits
COM122	English Composition & Literature	3
COM219	Speech - OR -	
COM221	Technical Report Writing	3
IT 109	Introduction to Computers and Applications - OR -	
EGR 115	Introduction to Computing for Engineers** - OR -	
CS 223	Scientific Programming in C**	3
HU 140	Series (Lower-Level Humanities)	3
MA 111	College Mathematics for Aviation I	3
PSY 101	Introduction to Psychology	3

Total Credits **18**

** One of these courses should be taken if the student plans on completing an AMS bachelor's degree with an AOC in Aerospace Electronics.

Aviation Maintenance Science Courses (leading to A&P certification)

Course	Title	Credits
AMS 101	Maintenance Mathematics and Physics . . .	2
AMS 102	Aircraft Familiarization	2
AMS 103	Tools, Materials, and Processes	2
AMS 111	Regulations, Documentation, and Drawing	3
AMS 112	Fundamentals of Electricity	3
AMS 121	Electrical Power Systems I	2
AMS 122	Metallic Structures	2
AMS 123	Instruments and Avionics	2
AMS 131	Composite Materials and Processes	2
AMS 132	Aircraft Systems I	2
AMS 133	Aircraft Systems II	2
AMS 242	Airframe Maintenance Practices	3
AMS 243	Electrical Power Systems II	3
AMS 251	Introduction to Powerplants	2
AMS 252	Fuel, Air, and Exhaust Systems	2
AMS 253	Powerplant Electrical Systems	2
AMS 361	Turbine Engines	3

Academic Programs at the Daytona Beach Campus

AMS 362 Propeller Systems	3
AMS 371 Powerplant Inspection and Line Maintenance	3
AMS 372 Engine Maintenance, Repair, and Overhaul.	3

Total Credits 48

Tuition for the AMS courses is less than for the other courses in the degree, and is billed separately from the University block tuition. Contact the AMS program coordinator for additional information.

Suggested Course of Study

SEMESTER 1

Course Title	Credits
AMS 101 Maintenance Mathematics & Physics	2
AMS 102 Aircraft Familiarization	2
AMS 103 Tools, Materials, and Processes.	2
AMS 111 Regulations, Documentation, & Drawing	3
AMS 112 Fundamentals of Electricity	3

Total Credits 12

SEMESTER 2

Course Title	Credits
AMS 121 Electrical Power Systems I	2
AMS 122 Metallic Structures	2
AMS 123 Instruments and Avionics	2
AMS 131 Composite Materials and Processes.	2
AMS 132 Aircraft Systems I	2
AMS 133 Aircraft Systems II	2

Total Credits 12

SEMESTER 3

Course Title	Credits
AMS 242 Airframe Maintenance Practices	3
AMS 243 Electrical Power Systems II	3
AMS 251 Introduction to Powerplants.	2
AMS 252 Fuel, Air, and Exhaust Systems	2
AMS 253 Powerplant Electrical Systems	2

Total Credits 12

SEMESTER 4

AMS 361 Turbine Engines	3
AMS 362 Propeller Systems	3
AMS 371 Powerplant Inspection and Line Maintenance	3
AMS 372 Engine Maintenance, Repair, and Overhaul.	3
COM 122 English Composition & Literature	<u>3</u>

Total Credits 15

SEMESTER 5

Course Title	Credits
HU 140 Series Class	3
MA 111 College Math for Aviation I.	3
COM 219 Speech.	3
IT 109 Introduction to Computers and Applications.	3
PSY 101 Introduction to Psychology.	3

Total Credits 15

TOTAL DEGREE CREDITS 66

Academic Programs at the Daytona Beach Campus

Aviation Maintenance Science

Bachelor of Science

At the heart of every flight of every commercial, private, or military aircraft is the work of the professional aviation maintenance expert. Without the devotion of these very special people, the air travel system would cease to function. The demand for degreed aircraft maintenance specialists in the aviation/aerospace world has never been greater than it is today. The Aviation Maintenance Science (AMS) program at Embry-Riddle produces these aviation professionals, the best in the world.

The Aviation Maintenance Science bachelor's degree is made up of general education courses, technical courses and labs that lead to FAA Airframe and Powerplant (A&P) mechanic's certification, and a group of courses known as an area of concentration (AOC). There are four areas of concentration, from which a student picks one, as follows:

- Aerospace Electronics
- Flight
- Information Technology
- Maintenance Management

The degree is composed of 132 credit hours for the AOCs in Flight, Information Technology, and Maintenance Management.

The AOC in Aerospace Electronics is 138 credit hours.

The Maintenance Management AOC is optimized for those who wish to use their maintenance skills as a platform for advancing into a management position in one of the many aviation maintenance environments. The Flight AOC is for those students who wish to combine a maintenance background with the qualifications of a commercial pilot. The Information Technology AOC is designed for the student who is interested in the application of computer technology to aviation technical support operations. The Aerospace Electronics AOC is for students who have an interest in combining their aerospace electronics skills with the A&P certificate or a minor course of study that supports their career objectives. The Maintenance Management area of concentration and the Aerospace Electronics area of concentration are accredited by Aviation Accreditation Board International (AABI, formerly Council on Aviation Accreditation), 3410 Skyway Drive, Auburn, AL 86830, telephone: (334) 844-2431.

Academic Programs at the Daytona Beach Campus

	Maintenance Management	Aerospace Electronics	Flight	Information Technology
General Education Core	36	36	36	36
Common Core	6	6	6	6
Area of Concentration	42	48	42	42
A&P Technical Courses ¹	48	*	48	48
Open Electives	0	**	0	0
Total	132	120-138***	132	132

1. If a student transfers to Embry-Riddle with the A&P mechanic's certification, 48 credit hours will be awarded and entered on the student's transcript, 36 as lower level credits and 12 as upper level credits.

*In the Aerospace Electronics AOC, a student has the option of taking the A&P technical courses, or in their place, completing a minor course of study. There are many minors available at the Daytona Beach Campus, a list of which can be found in this catalog.

**If a student chooses to complete a minor course of study instead of taking the A&P technical courses, some additional open elective credits may need to be taken to complete the

degree requirements. The number of credit hours of open electives needed will vary depending on the number of credit hours in the minor. Some of the open electives may need to be 300 to 400 level courses.

***The AMS degree with the Aerospace Electronics AOC and the A&P technical courses is 138 credit hours. If a student chooses to complete a minor course of study, instead of taking the A&P technical courses, it may be possible to finish the degree in 120 credits (dependent on which minor is chosen).

Academic Programs at the Daytona Beach Campus

The courses taken in the Aviation Maintenance Science Department lead to a student being approved for the A&P certification exams. Credit will be granted for any student who enters the University already in possession of the A&P certification. The Aerospace Electronics AOC allows the student to complete a minor course of study in place of the A&P certification.

International certification, which may be equivalent to the Airframe and Powerplant certification, will be evaluated on a case-by-case basis and, if approved, may be used for academic credit.

General Education Core

Course	Title	Credits
COM 122	English Composition & Literature	3
COM 219	Speech	3
COM 221	Technical Report Writing	3
IT 109	Introduction to Computers and Applications - OR -	
EGR 115	Introduction to Computing for Engineers** - OR -	
CS 223	Scientific Programming in C**	3
HU 140	Series (Lower-Level Humanities)	3
HU/SS	Upper-Level Humanities or Social Sciences	3
MA 111	College Mathematics for Aviation I	3
MA 112	College Mathematics for Aviation II	3
PS 103	Technical Physics I & Laboratory	3
PS 104	Technical Physics II & Laboratory	3
PSY 101	Introduction to Psychology	3
	Lower-Level Social Sciences Elective	3
Total Credits		36

** The Aerospace Electronics Area of Concentration requires EGR 115 or CS 223.

Common Core Curriculum

Course	Title	Credits
BA 201	Principles of Management	3
SF 201	Introduction to Health, Occupational, and Transportation Safety -OR-	
SF 210	Introduction to Aerospace Safety	3
Total Credits		6

Aviation Maintenance Science Courses (leading to A&P certification)

Course	Title	Credits
AMS 101	Maintenance Mathematics & Physics	2
AMS 102	Aircraft Familiarization	2
AMS 103	Tools, Materials, and Processes	2
AMS 111	Regulations, Documentation, & Drawing	3
AMS 112	Fundamentals of Electricity	3
AMS 121	Electrical Power Systems I	2
AMS 122	Metallic Structures	2
AMS 123	Instruments and Avionics	2
AMS 131	Composite Materials and Processes	2
AMS 132	Aircraft Systems I	2
AMS 133	Aircraft Systems II	2
AMS 242	Airframe Maintenance Practices	3
AMS 243	Electrical Power Systems II	3
AMS 251	Introduction to Powerplants	2
AMS 252	Fuel, Air, and Exhaust Systems	2
AMS 253	Powerplant Electrical Systems	2
AMS 361	Turbine Engines	3
AMS 362	Propeller Systems	3
AMS 371	Powerplant Inspection and Line Maintenance	3
AMS 372	Engine Maintenance, Repair, & Overhaul	3
Total Credits		48

Tuition for the AMS courses is less than for the other courses in the degree, and is billed separately from the University block tuition. Contact the AMS program coordinator for additional information.

Aerospace Electronics Area of Concentration

Course	Title	Credits
AEL 311	Airborne Pulse Systems	3
AEL 312	Airborne Communications and Navigation Systems	3
AEL 313	Airborne Electronics Maintenance Operations	2
AEL 401	Airborne Surveillance Systems	3
AEL 402	Airborne Electronics Systems Integration	3
AEL 403	Advanced Space and Airborne Electronics Systems	3
AEL 404	Airborne Electronics Maintenance Operations II	2
EGR 120	Graphical Communications	3
EL 107	Direct and Alternating Current Fundamentals and Circuit Analysis	4

Academic Programs at the Daytona Beach Campus

EL 108	Direct and Alternating Current Laboratory	1
EL 203	Microelectronics Fundamentals and Circuit Analysis.	4
EL 204	Microelectronics Laboratory	1
EL 212	Digital Circuit and Systems Analysis	4
EL 213	Digital Circuits Laboratory	1
EL 301	Electronic Communication Systems	3
EL 302	Electronic Communications Laboratory . . .	1
EL 303	Pulse Components and Circuit Applications.	2
EL 304	Pulse Circuits Laboratory	1
EL 307	Microprocessor Systems	3
EL 308	Microprocessor Systems Laboratory	1
	Open Electives.	0 to 15*

*Depending on whether A&P certification track is chosen or another minor course of study. Open electives may need to be upper level in some cases.

Total Credits 48-63

Suggested Course of Study

SEMESTER 1

Course Title	Credits
AMS 101 Maintenance Mathematics & Physics	2
AMS 102 Aircraft Familiarization	2
AMS 103 Tools, Materials, and Processes.	2
AMS 111 Regulations, Documentation, & Drawing	3
AMS 112 Fundamentals of Electricity	3
Total Credits	<u>12</u>

SEMESTER 2

Course Title	Credits
AMS 121 Electrical Power Systems I	2
AMS 122 Metallic Structures	2
AMS 123 Instruments and Avionics	2
AMS 131 Composite Materials and Processes.	2
AMS 132 Aircraft Systems I	2
AMS 133 Aircraft Systems II	2
COM122 English Composition & Literature	3
Total Credits	<u>15</u>

SEMESTER 3

Course Title	Credits
AMS 242 Airframe Maintenance Practices	3
AMS 243 Electrical Power Systems II.	3
AMS 251 Introduction to Powerplants.	2
AMS 252 Fuel, Air, and Exhaust Systems	2
AMS 253 Powerplant Electrical Systems	2
Lower-Level Social Sciences (SS 110, 120, 130)	3
Total Credits	<u>15</u>

SEMESTER 4

Course Title	Credits
AMS 361 Turbine Engines	3
AMS 362 Propeller Systems	3
AMS 371 Powerplant Inspection and Line Maintenance	3
AMS 372 Engine Maintenance, Repair & Overhaul	3
MA 111 College Math for Aviation I.	3
Total Credits	<u>15</u>

SEMESTER 5

Course Title	Credits
BA 201 Principles of Management.	3
EL 107 Direct and Alternating Current Fundamentals and Circuit Analysis.	4
EL 108 Direct and Alternating Current Laboratory	1
Lower-Level Humanities(140 Series).	3
PSY 101 Introduction to Psychology	3
EGR 120 Graphical Communications	3
Total Credits	<u>17</u>

SEMESTER 6

Course Title	Credits
COM219 Speech.	3
MA 112 College Math for Aviation II.	3
EL 203 Microelectronics Fundamentals and Circuit Analysis.	4
EL 204 Microelectronics Laboratory	1
EL 212 Digital Circuit and Systems Analysis	4
EL 213 Digital Circuits Laboratory	1
Total Credits	<u>16</u>

SEMESTER 7

Course Title	Credits
PS 103 Technical Physics I and Laboratory	3
EGR 115 Introduction To Computing For Engineers.	3
EL 301 Electronic Communication Systems	3
EL 302 Electronic Communications Laboratory . . .	1
EL 303 Pulse Components and Circuit Applications.	2
EL 304 Pulse Circuits Laboratory	1
EL 307 Microprocessor Systems	3
EL 308 Microprocessor Systems Laboratory	1
Total Credits	<u>17</u>

SEMESTER 8

Course Title	Credits
COM221 Technical Report Writing.	3
SF 201 Introduction to Health, Occupational & Transportation Safety	3
AEL 311 Airborne Pulse Systems.	3

Academic Programs at the Daytona Beach Campus

AEL 312	Airborne Communications and Navigation Systems	3
AEL 313	Airborne Electronics Maintenance Operations	2
Total Credits		14
SEMESTER 9		
Course Title		Credits
	HU or SS Upper Level	3
PS 104	Technical Physics II and Laboratory	3
AEL 401	Airborne Surveillance Systems	3
AEL 402	Airborne Electronics Systems Integration	3
AEL 403	Advanced Space and Airborne Electronics Systems	3
AEL 404	Airborne Electronics Maintenance Operations II	2
Total Credits		17
TOTAL DEGREE CREDITS		138

Flight Area of Concentration

Course Title		Credits
Single Track:		
FA 121	Private Single Flight	1
FA 221	Instrument Single Flight	1
FA 321	Commercial Single Flight	1
FA 323	Commercial Multi Add On	1
-OR-		
Multi-Track:		
FA 121	Private Single Flight	1
FA 122	Private Multi Flight With Lab	1
FA 222	Instrument Multi Flight	1
FA 322	Commercial Multi Flight	1
-AND-		
AS 121	Private Pilot Operations	5
AS 221	Instrument Pilot Operations	3
AS 321	Commercial Pilot Operations	3
WX 201	Survey of Meteorology	3
AS 309	Aerodynamics	3
AS 310	Aircraft Performance	3
AS 357	Flight Physiology	3
AS 387	Crew Resource Management	3
AS 402	Airline Operations	3
AS 408	Flight Safety	3
-AND- any two of the following:		
AS 358	Advanced Avionics	3
AS 350	Domestic and International Navigation	3
AS 420	Flight Technique Analysis	3
AS 435	Electronic Flight Management Systems	3
Total Credits		42

Suggested Course of Study

(Assumes Single Engine Flight Track)

SEMESTER 1

Course Title		Credits
AMS 101	Maintenance Mathematics & Physics	2
AMS 102	Aircraft Familiarization	2
AMS 103	Tools, Materials, and Processes	2
AMS 111	Regulations, Documentation, & Drawing	3
AMS 112	Fundamentals of Electricity	3
Total Credits		12

SEMESTER 2

AMS 121	Electrical Power Systems I	2
AMS 122	Metallic Structures	2
AMS 123	Instruments and Avionics	2
AMS 131	Composite Materials and Processes	2
AMS 132	Aircraft Systems I	2
AMS 133	Aircraft Systems II	2
Total Credits		12

SEMESTER 3

Course Title		Credits
AMS 242	Airframe Maintenance Practices	3
AMS 243	Electrical Power Systems II	3
AMS 251	Introduction to Powerplants	2
AMS 252	Fuel, Air, and Exhaust Systems	2
AMS 253	Powerplant Electrical Systems	2
COM122	English Composition & Literature	3
Total Credits		15

SEMESTER 4

Course Title		Credits
AMS 361	Turbine Engines	3
AMS 362	Propeller Systems	3
AMS 371	Powerplant Inspection & Line Maintenance	3
AMS 372	Engine Maintenance, Repair & Overhaul	3
	Humanities Lower Level (140 Series)	3
Total Credits		15

SEMESTER 5

Course Title		Credits
AS 121	Private Pilot Operations	5
COM219	Speech	3
FA 121	Private Single Flight	1
MA 111	College Math for Aviation I	3
PSY 101	Introduction to Psychology	3
Total Credits		15

Academic Programs at the Daytona Beach Campus

SEMESTER 6

Course Title	Credits
COM221 Technical Report Writing	3
MA 112 College Math for Aviation II	3
IT 109 Introduction to Computers & Applications	3
PS 103 Technical Physics I and Laboratory	3
WX 201 Survey of Meteorology	3
Total Credits	15

SEMESTER 7

Course Title	Credits
AS 221 Instrument Pilot Operations	3
BA 201 Principles of Management	3
FA 221 Instrument Single Flight	1
AS 309 Aerodynamics	3
PS 104 Technical Physics II and Laboratory	3
AS 357 Flight Physiology	3
Total Credits	16

SEMESTER 8

Course Title	Credits
SF 201 Introduction to Health, Occupational & Transportation Safety	3
SS Lower-Level Social Sciences (SS 110, 120, 130)	3
AS 321 Commercial Pilot Operations	3
FA 321 Commercial Single Flight	1
AS 402 Airline Operations	3
AS 310 Performance	3
Total Credits	16

SEMESTER 9

Course Title	Credits
HU or SS Upper Level	3
AS 387 Crew Resource Management	3
AS 408 Flight Safety	3
AS 350 Domestic and International Navigation	3
AS 420 Flight Technique Analysis	3
FA 323 Commercial Multi Add On	1
Total Credits	16

TOTAL DEGREE CREDITS **132**

Information Technology Area of Concentration

Course Title	Credits
BA 221 Advanced Computer Based Systems	3
BA 317 Organizational Behavior	3
BA 320 Business Information Systems	3
COM411 Publishing on the Internet	3
CS 118 Fundamentals of Computer	

	Programming	3
CS 223 Scientific Programming in C -OR-		
EGR 115 Introduction to Computing for Engineers		3
HF 201 Introduction to Human Factors		3
HF 310 Human-Computer Interaction		3
IT 210 Web Page Authoring and Design		3
IT 220 Introduction to Networking		3
IT 310 Web Site Management		3
IT 320 Network Configurations		3
IT 330 Programming for the Web		3
IT 340 WAN Theory and Design		3
Total Credits		42

Suggested Course of Study

SEMESTER 1

Course Title	Credits
AMS 101 Maintenance Mathematics & Physics	2
AMS 102 Aircraft Familiarization	2
AMS 103 Tools, Materials, and Processes	2
AMS 111 Regulations, Documentation, & Drawing	3
AMS 112 Fundamentals of Electricity	3
Total Credits	12

SEMESTER 2

Course Title	Credits
AMS 121 Electrical Power Systems I	2
AMS 122 Metallic Structures	2
AMS 123 Instruments and Avionics	2
AMS 131 Composite Materials and Processes	2
AMS 132 Aircraft Systems I	2
AMS 133 Aircraft Systems II	2
Total Credits	12

SEMESTER 3

Course Title	Credits
AMS 242 Airframe Maintenance Practices	3
AMS 243 Electrical Power Systems II	3
AMS 251 Introduction to Powerplants	2
AMS 252 Fuel, Air, and Exhaust Systems	2
AMS 253 Powerplant Electrical Systems	2
COM122 English Composition & Literature	3
Total Credits	15

SEMESTER 4

Course Title	Credits
AMS 361 Turbine Engines	3
AMS 362 Propeller Systems	3
AMS 371 Powerplant Inspection & Line Maintenance	3

Academic Programs at the Daytona Beach Campus

AMS 372 Engine Maintenance, Repair & Overhaul	3
Humanities Lower Level (140 Series)	3

Total Credits 15

SEMESTER 5

Course Title	Credits
HF 201 Introduction to Human Factors	3
MA 111 College Math for Aviation I	3
PSY 101 Introduction to Psychology	3
IT 109 Introduction to Computers & Applications	3
BA 201 Principles of Management	3

Total Credits 15

SEMESTER 6

Course Title	Credits
COM219 Speech	3
MA 112 College Math for Aviation II	3
SS Lower-Level Social Sciences (SS 110, 120, 130)	3
CS 118 Fundamentals of Computer Programming	3
IT 210 Web Page Authoring and Design	3

Total Credits 15

SEMESTER 7

Course Title	Credits
PS 103 Technical Physics I and Lab	3
BA 221 Advanced Computer Based Systems	3
EGR 115 Introduction to Computing for Engineers	3
IT 220 Introduction to Networking	3
IT 310 Web Site Management	3

Total Credits 15

SEMESTER 8

Course Title	Credits
BA 317 Organizational Behavior	3
BA 320 Business Information Systems	3
PS 104 Technical Physics II and Laboratory	3
COM221 Technical Report Writing	3
IT 320 Network Configurations	3
IT 330 Web Programming	3

Total Credits 18

SEMESTER 9

Course Title	Credits
IT 340 WAN Theory & Design	3
SF 201 Introduction to Health, Occupational & Transportation Safety	3
HU/SS Upper-Level Humanities/Social Sciences	3
HF 310 Human-Computer Interaction	3

COM411 Publishing on the Internet	3
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Total Credits 15

TOTAL DEGREE CREDITS 132

Maintenance Management Area of Concentration

Course Title	Credits
BA 210 Financial Accounting	3
BA 221 Advanced Computer Based Systems	3
BA 220 Marketing	3
BA 225 Business Law	3
BA 312 Managerial Accounting	3
BA 317 Organizational Behavior	3
BA 320 Business Information Systems	3
BA 324 Aviation Labor Relations	3
BA 325 Social Responsibility and Ethics in Management	3
BA 419 Aviation Maintenance Management	3
BA 420 Management of Production and Operations	3
BA 422 Life Cycle Analysis for Systems and Programs in Aviation/Aerospace	3
BA 424 Project Management in Aviation Operations	3
MA 222 Business Statistics	3

Total Credits 42

Suggested Course of Study

SEMESTER 1

Course Title	Credits
AMS 101 Maintenance Mathematics & Physics	2
AMS 102 Aircraft Familiarization	2
AMS 103 Tools, Materials, and Processes	2
AMS 111 Regulations, Documentation, & Drawing	3
AMS 112 Fundamentals of Electricity	3

Total Credits 12

SEMESTER 2

Course Title	Credits
AMS 121 Electrical Power Systems I	2
AMS 122 Metallic Structures	2
AMS 123 Instruments and Avionics	2
AMS 131 Composite Materials and Processes	2
AMS 132 Aircraft Systems I	2
AMS 133 Aircraft Systems II	2

Total Credits 12

Academic Programs at the Daytona Beach Campus

SEMESTER 3

Course Title	Credits
AMS 242 Airframe Maintenance Practices	3
AMS 243 Electrical Power Systems II	3
AMS 251 Introduction to Powerplants	2
AMS 252 Fuel, Air, and Exhaust Systems	2
AMS 253 Powerplant Electrical Systems	2
COM122 English Composition & Literature	3
Total Credits	15

SEMESTER 4

Course Title	Credits
AMS 361 Turbine Engines	3
AMS 362 Propeller Systems	3
AMS 371 Powerplant Inspection & Line Maintenance	3
AMS 372 Engine Maintenance, Repair & Overhaul	3
Humanities Lower Level (140 Series)	3
Total Credit	15

SEMESTER 5

Course Title	Credits
COM219 Speech	3
MA 111 College Math for Aviation I	3
Lower-Level Social Science (SS 110, 120, 130)	3
IT 109 Introduction to Computers & Applications	3
BA 201 Principles of Management	3
Total Credits	15

SEMESTER 6

Course Title	Credits
COM221 Technical Report Writing	3
PSY 101 Introduction to Psychology	3
MA 112 College Math for Aviation II	3
BA 210 Financial Accounting	3
Humanities/Social Sciences Upper Level 3	3
Total Credits	15

SEMESTER 7

Course Title	Credits
BA 220 Marketing	3
BA 221 Advanced Computer Based Systems	3
BA 312 Managerial Accounting	3
PS 103 Technical Physics I and Laboratory	3
MA 222 Business Statistics	3
Total Credits	15

SEMESTER 8

Course Title	Credits
BA 320 Business Information Systems	3
BA 419 Aviation Maintenance Management	3
BA 424 Project Management in Aviation Operations	3
PS 104 Technical Physics II and Lab	3
SF 201 Introduction to Health, Occupational and Transportation Safety	3
Total Credits	15

SEMESTER 9

Course Title	Credits
BA 225 Business Law	3
BA 317 Organizational Behavior	3
BA 324 Aviation Labor Relations	3
BA 325 Social Responsibility & Ethics in Management	3
BA 420 Management of Production and Operations	3
BA 422 Life Cycle Analysis for Systems and Programs in Aviation/Aerospace	3
Total Credits	18

TOTAL DEGREE CREDITS

132

Academic Programs at the Daytona Beach Campus

Homeland Security

Bachelor of Science

The Applied Aviation Sciences Department offers a Bachelor of Science degree in Homeland Security that is based on the needs of the United States and its citizens. It combines the University's General Education requirements with a solid core of security courses. This degree allows the student to take maximum advantage of transfer credits and University course offerings to create areas of specialization in which the student has an interest and in which there is a demonstrated need by industry.

The Homeland Security degree is designed for students who have an interest in obtaining a strong foundation in security and safety-related subjects. The goal of the degree is to produce graduates with entry-level skills who can provide security expertise in a variety of transportation and industrial settings, with an emphasis on those entities involved with aviation and aerospace. This program will produce security professionals who are skilled at securing and protecting the critical infrastructure of our nation, states, cities, and municipalities, and protection of the lives and property of its citizens. Graduates of this program will be able to secure industry infrastructure and provide effective planning and response to, and emergency management of, events resulting from acts of terrorism or natural and man-made disasters.

Degree Requirements

The Bachelor of Science degree in Homeland Security requires successful completion of a minimum of 120 credit hours and is normally completed in eight semesters.

Students are required to complete 36 credit hours of General Education courses, 22 credit hours of core security courses, 16 credit hours of specified electives, 34 credit hours of supporting courses, and 12 credit hours in the chosen Area of Concentration.

Students transferring into the program who have earned academic credits in homeland security-related coursework or professional experience can be granted up to 16 credit hours from the specified elective areas per approval from the program coordinator.

	Hours
General Education	36
Homeland Security Core	22
Specified Electives	16
Supporting Courses	34
Area of Concentration	12
Total Degree Credits	120

General Education

Course	Title	Credits
COM	Communication Skills (122, 219, 221, 222, 410, HU 362, 420).	9
HU	English II (141, 142, 144, 145).	3
MA	Math Sequence (MA 111 and 112 OR 140 & 142).	6
PS	Physical Science (One laboratory required)	6
CS	Computer Science Elective	3
PSY 101	Introduction to Psychology	3
	Lower-Level SS	3
HU/SS	Upper-Level HU or SS	3
Total Credits		36

Embry-Riddle courses in general education categories of Communication Theory and Skills, Humanities, and Social Sciences may be chosen from those listed below, assuming prerequisite requirements are met. Courses from other institutions are acceptable if they fall into these broad categories.

Communication Theory and Skills

Academic Programs at the Daytona Beach Campus

COM: 122, 219, 221, 222, 410
 HU: 362, 420

Computer Science/Information Technology
 CS: Elective

Humanities

Lower Level: HU 141, 142, 144, 145
 Upper Level: HU 330, 338, 345, 361

Mathematics

MA 111 -OR- MA 140
 -AND-
 MA 112 -OR- MA 141

Physical and Life Sciences

PS 101 - OR- PS 107 or equivalent

Social Sciences

Lower-Level: PSY 101
 Upper-Level: SS 307, 325, 336, 340

Homeland Security Core Courses

Course	Title	Credits
HS 201	Introduction to Homeland Security	3
HS 301	Fundamentals of Transportation Security 3	
HS 302	Fundamentals of Occupational Security	
	-OR-	
SF 311	Industrial Security	3
HS 306	Legal and Investigative Issues of Security	3
HS 307	Law Enforcement in Security	3
HS 401	Fundamentals of Emergency Management	3
HS 402	Security and Risk Analysis	3
HS 415	Business Skills for the Homeland Security Professional	1
Total Credits		22

Program Support

Course	Title	Credits
AS 120	Principles of Aeronautical Science	3
BA 201	Principles of Management	3
HU/SS	Humanities*	15
MA 222	Business Statistics	3
SF 201	Introduction to Health, Occupational, and Transportation Safety	3
SF 355	Industrial Hygiene and Toxicology	3
SF 410	Design of Engineering Hazard Controls	3
UNIV 101	College Success	1

*Suggested list of courses to fill this requirement: HU 330, HU 338, HU 345, HU 361 - OR- SS 307, SS 325, SS 336, SS 340.

Total Credits **34**

Specified Electives

Students must select 16 credits from the following list. Other courses may be available with advisor approval.

BA 408	Airport Management	3
BA 410	Management of Air Cargo	3
BA 415	Airline Management	3
BA 425	Trends and Current Problems in Air Transportation	3
HF 201	Introduction to Human Factors	3
SF 315	Environmental Compliance and Safety	3
SF 320	Human Factors in Aviation Safety	3
SF 345	Safety Program Management	3
SF 350	Aircraft Crash and Emergency Management	3
SF 365	Fire Protection	3
SF 399/499	Special Topics in Aviation Safety	1-3
SS 310	Personality Development	3
SS 331	Current Issues in America	3
Total Credits		16

TOTAL CREDIT HOURS **120**

Emergency Management Area of Concentration

The Emergency Management Area of Concentration will build on emergency planning and response by including an in-depth course of study in incident control and command systems (ICS) and the national incident management system (NIMS). Students will engage in planning, implementing and evaluating community-based table top or field emergency readiness exercises. Students will also be introduced to the role of the Emergency Operations Center (EOC) in the community as well as continuity of operations planning.

Course	Title	Credits
HS 405	Emerging Issues in Homeland Security	3
HS 408	Control and Command Structures and Processes in Emergency Management	3
HS 410	The EOC's Role in Emergency	3
HS 490	Senior Project in Homeland Security	3
Total Credits		12

Academic Programs at the Daytona Beach Campus

Transportation Security Area of Concentration

The Transportation Security Area of Concentration will build on the fundamentals of transportation security, including post-911 aviation security and domestic, maritime, rail, pipeline, and land-based security.

Course Title	Credits
HS 405 Emerging Issues in Homeland Security . . . 3	
HS 412 Aviation and Transportation Security: 911 and Beyond 3	
HS 417 Transportation Security Issues at Sea and on Land 3	
HS 490 Senior Project in Homeland Security. . . . 3	
Total Credits	12

Suggested Program of Study

FRESHMAN YEAR

Course Title	Credits
AS 120 Principles of Aeronautical Science 3	
COM122 English Composition and Literature 3	
CS Computer Science Elective 3	
HU 141 Western Humanities II 3	
MA 111 College Mathematics for Aviation I -OR-	
MA 140 College Algebra 3	
MA 112 College Mathematics for Aviation II -OR-	
MA 142 Trigonometry 3	
PS 101 Basic Chemistry (or equivalent) 3	
PS 107 Elements of Biological Science (or equivalent) 3	
SF 201 Introduction to Health, Occupational, and Transportation Safety 3	
UNIV 101 College Success 1	
Total Credits	28

SOPHOMORE YEAR

Course Title	Credits
COM219 Speech 3	
COM221 Technical Report Writing 3	
EC 200 An Economic Survey (or equivalent) . . . 3	
HS 201 Introduction to Homeland Security 3	
HS 301 Fundamentals of Transportation Security 3	
HU 362 Communication and Organizational Culture (or equivalent) 3	
HS 302 Fundamentals of Occupational Security -OR-	
SF 311 Industrial Security 3	

MA 222 Business Statistics 3	
SF 355 Industrial Hygiene 3	
PSY 101 Introduction to Psychology 3	

Total Credits **30**

JUNIOR YEAR

Course Title	Credits
BA 201 Principles of Management 3	
HS 306 Legal and Investigative Issues of Security 3	
HS 307 Law Enforcement and Security 3	
HS 401 Fundamentals of Emergency Management 3	
HS 402 Security and Risk Analysis 3	
HU 338 Traversing the Borders: Interdisciplinary Explorations (or equivalent) 3	
HU 345 Comparative Religions (or equivalent) . . . 3	
HU 361 Interpersonal Communication in the Workgroup 3	
SF 410 Design of Engineering Hazard Controls. 3	
Specified Elective 3	
Total Credits	30

SENIOR YEAR

The Senior year is dedicated to completion of AOC requirements and specified electives.

Emergency Management AOC and Electives

Course Title	Credits
HU 330 Values and Ethics 3	
HS 405 Emerging Issues in Homeland Security . . 3	
HS 408 Control and Command Structures and Processes in Emergency Management. . . . 3	
HS 410 The EOC's Role in Emergency 3	
HS 415 Business Skills for the Homeland Security Professional 1	
HS 490 Senior Project in Homeland Security. . . . 3	
Specified Electives 16	
Total Credits	32

Transportation Security AOC and Electives

Course Title	Credits
HU 330 Values and Ethics (or equivalent). 3	
HS 405 Emerging Issues in Homeland Security . . 3	
HS 412 Aviation and Transportation Security . . . 3	
HS 415 Business Skills for the Homeland Security Professional 1	
HS 417 Transportation Security Issues on Sea and on Land 3	
HS 490 Senior Project in Homeland Security. . . . 3	
Specified Electives 16	
Total Credits	32

TOTAL DEGREE CREDITS **120**

Academic Programs at the Daytona Beach Campus

Safety Science

Bachelor of Science

The Applied Aviation Sciences Department offers a Bachelor of Science degree in Safety Science that is based on the needs of the marketplace. It combines a solid core designed to meet the Aviation Accreditation Board International (AABI) standards and the University's General Education requirements. With a complete offering of Safety Science courses through two areas of concentration (AOCs), students can prepare to work in the aerospace industry as well as in non-aerospace industries.

The Safety Science degree is designed for students interested in obtaining a strong safety foundation. The goal of the degree is to produce graduates who are skilled in providing safety expertise in a variety of aviation, aerospace, and other industrial settings. This program will produce safety professionals who are skilled in providing safety management expertise and who can provide technical guidance in compliance issues involving FAA, EPA, OSHA, DOT, and state health, hygiene, and workplace standards.

Degree Requirements

The Bachelor of Science degree in Safety Science requires successful completion of a minimum of 120 credit hours and is normally completed in eight semesters.

Students are required to complete 36 hours of General Education courses as well as 46 hours of a Safety Science core curriculum. The Transportation AOC and Occupational Safety AOC each require 24 hours of AOC related safety courses with the final 14 hours

available as open electives. There are numerous minor fields of study for the student to choose from in order to meet specific desires.

Students enrolled in the Air Force, Army, or Naval ROTC program may substitute AF, MY, or NSC courses for open elective courses.

	Hours
General Education	36
Safety Science Core	46
Area of Concentration	
(Air Transportation/Occupational)	24/24
Open Electives	
(Air Transportation/Occupational)	14/14
TOTAL DEGREE CREDITS	120

General Education

Course	Title	Credits
CS	Computer Science Elective	3
EC 200	An Economic Survey	3
HU	Humanities (HU 140-146)	3
COM	Communications Skills (COM 122, 219, 221)	9
HU/SS	Upper-Level Elective	3
MA	Math Sequence (MA 111, 112)	6
PS	Physics Sequence (PS 103/PS 104) (one laboratory required)	6
PSY 101	Introduction to Psychology	3
Total Credits		36

Safety Science Core

Course	Title	Credits
UNIV 101	College Success	1
AS 120	Principles of Aeronautical Science	3
AT 200	Air Traffic Management I	3
BA 201	Principles of Management	3
HF 201	Introduction to Human Factors	3
MA 222	Business Statistics	3
PS 101	Basic Chemistry	3
SF 201	Introduction to Health, Occupational, and Transportation Safety	3
SF 315	Environmental Compliance and Safety ...	3

Academic Programs at the Daytona Beach Campus

SF	345	Safety Program Management	3
SF	355	Industrial Hygiene and Toxicology	3
SF	365	Fire Protection	3
SF	410	Design of Engineering Hazard Controls	3
SF	445	System Safety in Aviation	3
SF	462	Health, Safety, and Aviation Law	3
WX	201	Survey of Meteorology	3
Total Credits			46

Transportation Safety (Air) Area of Concentration

Course	Title	Credits	
AS	309 Aerodynamics	3	
AS	310 Aircraft Performance -OR-		
SF	350 Air Crash and Emergency Management	3	
AS	356 Aircraft Systems and Components	3	
SF	320 Human Factors in Aviation	3	
SF	330 Aircraft Accident Investigation	3	
SF	335 Mechanical and Structural Factors in Aviation	3	
SF	375 Propulsion Plant Investigation	3	
SF	435 Aircraft Crash Survival Analysis and Design	3	
	Open Electives	14	
Total Credits			38
TOTAL DEGREE CREDITS			120

Suggested Program of Study

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Please check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

FRESHMAN YEAR

Course	Title	Credits
AAS	101 Applied Aviation Science College Success Seminar	1
AS	120 Principles of Aeronautical Science	3
COM	122 English Composition and Literature	3
HU	14X Lower-Level Humanities	3
IT	109 Introduction to Computers and Applications	3
MA	111 College Math for Aviation I	3
MA	112 College Math for Aviation II	3
PS	101 Basic Chemistry	3

PS	103	Technical Physics I	3
PSY	101	Introduction to Psychology	3
SF	201	Introduction to Health, Occupational, and Transportation Safety	3
Total Credits			31

SOPHOMORE YEAR

Course	Title	Credits	
AT	300 Air Traffic Management I	3	
BA	201 Principles of Management	3	
COM	219 Speech	3	
COM	221 Technical Report Writing	3	
EC	200 An Economic Survey	3	
HF	201 Introduction to Human Factors	3	
MA	222 Business Statistics	3	
PS	104 Technical Physics II	3	
SF	315 Environmental Compliance and Safety	3	
WX	201 Survey of Meteorology	3	
Total Credits			30

JUNIOR YEAR

Course	Title	Credits	
AS	309 Aerodynamics	3	
AS	356 Aircraft Systems and Components	3	
SF	320 Human Factors in Aviation	3	
SF	330 Aircraft Accident Investigation	3	
SF	345 Safety Program Management	3	
SF	355 Industry Hygiene and Toxicology	3	
SF	365 Fire Protection	3	
	Open Electives	9	
Total Credits			30

SENIOR YEAR

Course	Title	Credits	
AS	310 Aircraft Performance -OR-		
SF	350 Aircraft Crash and Emergency Management	3	
HU/SS	Upper-Level Elective*	3	
SF	335 Mechanical and Structural Factors in Aviation	3	
SF	375 Propulsion Plant Investigation	3	
SF	410 Design of Engineering Hazard Controls	3	
SF	435 Aircraft Crash Survival Analysis and Design	3	
SF	445 System Safety in Aviation	3	
SF	462 Health, Safety, and Aviation Law	3	
	Open Electives	5	
Total Credits			29

*The recommended elective is HU 330 Values and Ethics.

Academic Programs at the Daytona Beach Campus

Occupational Safety Area of Concentration

Course	Title	Credits
BA 420	Management of Production and Operations	3
PS 107	Elements of Biological Science	3
SF 311	Industrial Security - OR-	
HS 302	Fundamentals of Occupational Security . . .	3
SF 316	Workers' Compensation and Risk Management	3
SF 380	Internship I -OR-	
SF 350	Aircraft Crash and Emergency Management	3
SF 405	Applications in Industrial Hygiene	3
SF 440	Design of Engineering Hazard Controls II	3
SF 450	Internship II -OR-	
SF 330	Aircraft Accident Investigation	3
	Open Electives	14
Total Credits		38
TOTAL DEGREE CREDITS		120

Suggested Program of Study

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Please check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

FRESHMAN YEAR

Course	Title	Credits
AAS 101	Applied Aviation Science College Success Seminar	1
AS 120	Principles of Aeronautical Science	3
COM122	English Composition and Literature*	3
HU 14X	Lower-Level Humanities*	3
IT 109	Introduction to Computers and Applications	3
MA 111	College Math for Aviation I	3
MA 112	College Math for Aviation II	3
PS 101	Basic Chemistry	3
PS 103	Technical Physics I	3
PSY 101	Introduction to Psychology	3
SF 201	Introduction to Health, Occupational and Transportation Safety	3
Total Credits		31

SOPHOMORE YEAR

Course	Title	Credits
AT 300	Air Traffic Management I	3
BA 201	Principles of Management	3
COM219	Speech	3
COM221	Technical Report Writing	3
EC 200	An Economic Survey	3
MA 222	Business Statistics	3
PS 104	Technical Physics II	3
PS 107	Elements of Biological Science	3
SF 315	Environmental Compliance and Safety . . .	3
WX 201	Survey of Meteorology	3
Total Credits		30

JUNIOR YEAR

Course	Title	Credits
HF 201	Introduction to Human Factors	3
SF 311	Industrial Security -OR-	
HS 302	Fundamentals of Occupational Security . . .	3
SF 316	Workers' Compensation, Insurance, and Risk Management	3
SF 345	Safety Program Management	3
SF 355	Industrial Hygiene and Toxicology	3
SF 365	Fire Protection	3
SF 380	Internship I -OR-	
SF 350	Aircraft Crash and Emergency Management	3
Open Electives		9
Total Credits		30

SENIOR YEAR

Course	Title	Credits
BA 420	Management of Production and Operations	3
HU/SS	Upper-Level Elective*	3
SF 405	Applications in Industrial Hygiene	3
SF 410	Design and Engineering Hazard Controls	3
SF 440	Design and Engineering Hazard Controls II	3
SF 445	System Safety in Aviation	3
SF 450	Internship II -OR-	
SF 330	Aircraft Accident Investigation	3
SF 462	Health, Safety, and Aviation Law	3
Open Electives		5
Total Credits		29

** The recommended elective is HU 330 Values and Ethics.

Master of Science in Aeronautics (MSA)

Department Chair: *Mark Friend*
 Program Coordinator: *Marvin Smith*

Introduction

The Master of Science in Aeronautics (MSA) degree program is designed to provide the aviation/aerospace professional with a rigorous academic approach to a generalist education oriented degree. It provides an unequalled opportunity for flight crew members, air traffic control personnel, flight operations specialists, industry technical representatives, and aviation educators to enhance their knowledge and pursue additional career opportunities.

Entry into the MSA program requires possession of an undergraduate foundation, with a minimum GPA of 3.0, in the areas of college-level mathematics, introduction to computers, economics, and behavioral science.

The program consists of a total of 36 credits. Students must complete the Advanced Aviation/Aerospace Science Core consisting of 12 credits and then complete the 12 credits that make up the selected specialization in one of five areas: Air Traffic Management, Aviation/Aerospace Education Technology, Aviation/Aerospace Management, Aviation/Aerospace Operations, or Aviation/Aerospace Safety Systems. Students must then complete 12 credits of coursework and a comprehensive examination or six hours of coursework and a thesis. MSA students can also complete courses leading to a multiple specialization. The multiple specialization must be

declared prior to the completion of the degree program. **Students wishing to complete multiple specializations must have 12 unduplicated credits in each of the specializations and a minimum of 39 credit hours.**

Degree Requirements

Air Traffic Management Specialization

Track 1: For students with NO ATC experience or education.

Required Undergraduate Foundation (18 Credits)

Course	Title	Credits
AS 120	Principles of Aeronautical Science	
-OR-		
AS 132	Basic Aeronautics I	3
WX 201	Survey of Meteorology.	3
AT 200	Air Traffic Management I	
-OR-		
MSA 606	Aviation/Aerospace Communications/ Control Systems	3
AT 302	Air Traffic Management II.	3
AT 305	Air Traffic Management III	3
AT 401	Air Traffic Management IV	3

MSA Core Requirements (12 Credits)

Required Course:

Course	Title	Credits
MSA 605	Research Methods and Statistics	3
Core Courses (choose 3)		
MSA 602	The Air Transportation System.	3
MSA 604	Human Factors in Aviation/ Aerospace Industry	3
MSA 606	Aviation/Aerospace Communications/ Control Systems	3
MSA 610	Applied Aviation Safety Programs	3

Academic Programs at the Daytona Beach Campus

Specialization Requirements (12 Credits)

Course Title	Credits
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
MSA 508 Advanced Airport Modeling	3
MSA 515 Aviation/Aerospace Simulation Systems	3
MSA 608 Aviation/Aerospace Accident Investigation and Safety Systems	3
MSA 615 Applied Aviation Research Methods	3
MSA 616 Air Traffic Management Leadership and Critical Decision Making	3
MSA 617 Air Traffic Management V	3
MSA 618 Air Traffic Management VI	3
MSA 627 Air Traffic Management in the NAS	3
MSA 636 Advanced Aviation/Aerospace Planning Systems	3
MSA 696 Graduate Internship in Aeronautical Science	1-3

Electives (12 Credits)

Option I

Course Title	Credits
MSA/BA Electives (500-600 Level)	6
-AND-	
MSA 700 Thesis	6
-OR-	

Option II

MSA 700 Thesis	6
Electives	6
-OR-	
Comprehensive Examination and Electives	12
Total Required	36

Air Traffic Management Specialization

Track 2: For students with an Embry-Riddle undergraduate degree in Air Traffic Management.

MSA Core Requirements (12 Credits)

Required Course:

Course Title	Credits
MSA 605 Research Methods and Statistics	3
Core Courses (choose 3)	
Course Title	Credits
MSA 602 Air Transportation System	3
MSA 604 Human Factors in the Aviation/Aerospace Industry	3

MSA 606 Aviation/Aerospace Communications/Control Systems	3
MSA 610 Applied Aviation Safety Programs	3

Specialization Requirements (12 Credits)

Course Title	Credits
MSA 616 Air Traffic Management Leadership and Critical Decision Making	3
MSA 627 Air Traffic Management in the NAS	3

Core Courses

Course Title	Credits
BA 520 Organizational Behavior, Theory and Applications in Aviation	3
MSA 508 Advanced Airport Modeling	3
MSA 515 Aviation/Aerospace Simulation Systems	3
MSA 608 Aviation/Aerospace Investigation and Safety Programs	3
MSA 615 Applied Aviation Research Methods	3
MSA 636 Advanced Aviation/Aerospace Planning Systems	3
MSA 696 Graduate Internship in Aeronautical Science	1-3

Electives (12 Credits)

Option I

Course Title	Credits
MSA/BA Electives (500-600 Level)	6
-AND-	
MSA 700 Thesis	6
-OR-	

Option II

MSA 700 Thesis	6
Electives	6
-OR-	
Comprehensive Examination and Electives	12
Total Required	36

Course substitutions with approval of MSA Program Coordinator.

Aviation/Aerospace Education Technology Specialization

MSA Core Requirements (12 Credits)

Required Course

Course Title	Credits
MSA 605 Research Methods and Statistics	3
Core Courses (choose 3)	

Academic Programs at the Daytona Beach Campus

Course	Title	Credits
MSA 602	Air Transportation System	3
MSA 604	Human Factors in the Aviation/ Aerospace Industry	3
MSA 606	Aviation/Aerospace Communications/ Control Systems	3
MSA 610	Applied Aviation Safety Programs	3

Specialization Requirements (12 Credits)

Course	Title	Credits
MSA 514	Computer-Based Instruction	3
MSA 515	Aviation/Aerospace Simulation Systems	3
MSA 550	Aviation Education Foundations	3
MSA 614	Advanced Aviation/Aerospace Curriculum Development	3
MSA 652	Continuing Education's Role in Aviation	3
MSA 654	Adult Teaching and Learning Techniques	3
MSA 663	Memory and Cognition	3

Electives (12 Credits)

Option I

Course	Title	Credits
MSA/BA	Electives (500-600 Level)	6
	-AND-	
MSA 700	Thesis	6
	-OR-	

Option II

MSA 700	Thesis	6
	Electives	6
	-OR-	
Comprehensive Examination and Electives		12

Total Required **36**

Aviation/Aerospace Management Specialization

MSA Core Requirements (12 Credits)

Required Course

Course	Title	Credits
MA 605	Research Methods and Statistics	3
	Core Courses (choose 3)	

Course	Title	Credits
MSA 602	Air Transportation System	3
MSA 604	Human Factors in the Aviation/ Aerospace Industry	3

MSA 606	Aviation/Aerospace Communications/ Control Systems	3
MSA 610	Applied Aviation Safety Programs	3

Specialization Requirements (12 Credits)

Course	Title	Credits
BA 511	Operations Research	3
BA 521	Global Information and Technology Management	3
BA 607	Human Resource Development	3
BA 632	Seminar in Aviation Labor Relations	3
BA 645	Airport Operations and Management	3
MSA 508	Advanced Airport Modeling	3
MSA 609	Aircraft Maintenance Management	3
MSA 611	Aviation/Aerospace System Safety	3
MSA 612	Aviation/Aerospace Industrial Safety Management	3
MSA 615	Applied Aviation Research Methods	3
MSA 616	Air Traffic Management Leadership and Critical Decision Making	3
MSA 627	Air Traffic Management in the NAS	3
MSA 636	Advanced Aviation/Aerospace Planning Systems	3
MSA 641	Production and Procurement Management in the Aviation/ Aerospace Industry	3
MSA 643	Management of Research and Development for the Aviation/ Aerospace Industry	3
MSA 644	Integrated Logistics Support in Aviation/ Aerospace	3

Electives (12 Credits)

Course	Title	Credits
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Option I

MSA/BA	Electives (500-600 Level)	6
	-AND-	
MSA 700	Thesis	6
	-OR-	

Option II

MSA 700	Thesis	6
	Electives	6
	-OR-	

Comprehensive Examination and Electives		12
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Total Required **36**

(At least 18 credits must be MAS courses)

Academic Programs at the Daytona Beach Campus

Aviation/Aerospace Operations Specialization

Advanced Aviation/Aerospace Science Core

Course Title	Credits
MSA 602 Air Transportation System	3
MSA 604 Human Factors in the Aviation/ Aerospace Industry	3
MSA 606 Aviation/Aerospace Communications/ Control Systems	3
MSA 610 Applied Aviation Safety Programs	3

Students must choose 12 credit hours from the following list.

Specialization Requirement

Course Title	Credits
BA 511 Operations Research.	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
MSA 508 Advanced Airport Modeling	3
MSA 515 Aviation/Aerospace Simulation Systems.	3
MSA 516 Applications in Crew Resource Management	3
MSA 603 Aircraft and Spacecraft Development ...	3
MSA 606 Aviation/Aerospace Communication/ Control Systems	3
MSA 608 Aviation/Aerospace Accident Investigation and Safety Systems.	3
MSA 620 Air Carrier Operations.	3
MSA 622 Corporate Aviation Operations	3

Electives (12 Credits)

Course Title	Credits
<i>Option I</i>	
MSA/BA Electives (500-600 Level)	6
-AND-	
MSA 700 Thesis	6
-OR-	
<i>Option II</i>	
MSA 700 Thesis	6
Electives	6
-OR-	
Comprehensive Examination and Electives	12
Total Required	36

Aviation/Aerospace Safety Systems Specialization

Required Course:

Course Title	Credits
MA 605 Research Methods and Statistics	3

Core Courses (choose 3)

Course Title	Credits
MSA 602 The Air Transportation System.	3
MSA 604 Human Factors in the Aviation/Aerospace Industry	3
MSA 606 Aviation/Aerospace Communications/ Controls Systems.	3
MSA 610 Applied Aviation Safety Programs	3

Specialization Requirement (12 Credits)

Course Title	Credits
MSA 508 Advanced Airport Modeling	3
MSA 608 Aviation/Aerospace Accident Investigation and Safety Systems.	3
MSA 611 Aviation/Aerospace System Safety	3
MSA 612 Aviation/Aerospace Industrial Safety Management	3
MSA 613 Airport Operations Safety.	3
MSA 634 Aviation/Aerospace Psychology	3

Electives (12 Credits)

Course Title	Credits
<i>Option I</i>	
MSA/BA Electives	6
-AND-	
MSA 700 Thesis	6
-OR-	
<i>Option II</i>	
MSA 700 Thesis	6
Electives	6
-OR-	
Comprehensive Examination and Electives	12
Total Required	36

College of Business

Dr. Daniel Petree, Dean

Our aim is to provide a world-class business and management education in an aviation/aerospace context. That means we have assembled a community of faculty scholars with global reputations and reach. That means we have designed curricula at the graduate and undergraduate levels that set the standard in aviation/aerospace management education. That means our faculty and students have the opportunity to focus on cutting-edge solutions to real-world problems and opportunities found in aviation, aerospace, and transportation-related industries and organizations. Our dedication to excellence is manifested by our accreditation by ACBPS (the Association of Collegiate Business Programs and Schools) for all our degree programs and by AABI (Aviation Accreditation Board International) for our undergraduate degree program in Business Administration.

The College consists of two departments: the Department of Management, Marketing, and Operations and the Department of Economics, Finance, and

Information Systems. Both departments are responsible for designing and delivering our undergraduate and graduate degrees. The Bachelor of Science in Business Administration combines a rigorous business/management core with depth of focus through the two majors in Management and Air Transportation. This degree program offers graduates the specialized knowledge desired in the aviation industry along with the management and business general knowledge valuable to employers in any industry.

The Master in Business Administration is intended to give individuals who already hold undergraduate degrees, often in technical areas like engineering, the tools necessary to become a credible professional manager in aviation, aerospace, or related industries. The program of study combines common general management courses with specializations in Airline Management, Airport Management, Aviation Human Resources, Aviation Systems Management, and Finance.

Academic Programs at the Daytona Beach Campus

Business Administration

Bachelor of Science

The Bachelor of Science degree in Business Administration requires successful completion of a minimum of 120 credit hours and is normally completed in eight semesters. Designed for students interested in obtaining a strong business foundation with emphasis on specific aviation applications, the degree lets the student select a Major in Management or Air Transportation. Students should declare their Major at the beginning of their sophomore year. Students who participate in the Cooperative Education program may substitute up to 6 credit hours, if approved, toward the specified courses required in their Major.

This program is accredited by the Aviation Accreditation Board International (AABI) and the Association of Collegiate Business Schools and Programs (ACBSP).

Students enrolled in the Air Force, Army, or Naval ROTC program may substitute AF, MY, or NSC courses for the open elective courses.

Students should be aware that several courses in each academic year may require prerequisite subject knowledge and/or class standing. Check the course descriptions at the back of this catalog before registering for classes to ensure appropriate placement.

General Education	36
Program Support.	12
Business Core.	36
Major.	21
Open Electives.	15
TOTAL DEGREE CREDITS	120

General Education*

Communication Theory and Skills COM 122, 219, 222, -OR- 221	9
Mathematics MA 111 -OR- MA 120, MA 112 -OR- MA 220	6
Computer Science BA 120 -OR- IT 109	3
Physical and Life Sciences (One course must include a laboratory.) PS 101-109, PS 142, PS 302, PS 308, PS 309 One course must be either chemistry or physics.	6
Humanities Lower-Level Course HU 140 Series	3
Social Sciences Lower-Level Course EC 210, EC 211	6
Humanities/Social Sciences Upper-Level Course HU 300-400 Level, HF 300, PSY 350, SS 302-360	3
TOTAL CREDITS	36

Embry-Riddle courses in the general education categories of Communication Theory and Skills, Mathematics, Computer Science, Physical and Life Sciences, Humanities, and Social Sciences may be chosen from those listed below, assuming prerequisite requirements are met and with the permission of the advisor. Courses from other institutions are acceptable if they fall into these broad categories and are at the level specified above in the Aviation Business Administration vertical outline. Other courses may also be used with the permission of a department chair.

Academic Programs at the Daytona Beach Campus

Program Support

Course Title	Credits
AS 120 Principles of Aeronautical Science	3
BA 221 Advanced Computer Based Systems	3
MA 222 Business Statistics	3
MA 320 Decision Math	3
Total Credits	12

Business Core

Course Title	Credits
BA 201 Principles of Management	3
BA 210 Financial Accounting	3
BA 220 Marketing	3
BA 225 Business Law	3
BA 312 Managerial Accounting	3
BA 317 Organizational Behavior	3
BA 320 Business Information Systems	3
BA 325 Social Responsibility and Ethics	3
BA 332 Corporate Finance	3
BA 335 International Business	3
BA 420 Management of Production and Operations	3
BA 436 Strategic Management	3
Total Credits	36

Management Major

Course Title	Credits
BA 314 Human Resource Management	3
BA 427 Management of the Multicultural Workforce	3
BA 334 Investment Analysis -OR-	
BA 326 Marketing Management -OR-	
BA 327 Airline-Airport Operations	3
EC 315 Managerial Economics	3
Specified Electives	9
Total Credits	21

Courses Available as Management Electives:

BA 310 Airport Management	3
BA 315 Airline Management	3
BA 318 Entrepreneurial Small Business	3
BA 322 Aviation Insurance	3
BA 324 Aviation Labor Relations	3
BA 326 Marketing Management	3
BA 327 Airline-Airport Operations	3

BA 334 Investment Analysis	3
BA 340 International Accounting	3
BA 405 General Aviation Marketing	3
BA 410 Management of Air Cargo	3
BA 412 Airport Planning and Design	3
BA 418 Airport Administration and Finance	3
BA 419 Aviation Maintenance Management	3
BA 422 Life Cycle Analysis for Systems and Programs in Aviation/Aerospace	3
BA 424 Project Management in Aviation Operations	3
BA 425 Trends and Current Problems in Air Transportation	3
BA 426 International Aviation Management	3
BA 430 International Trade and Regulations	3
BA 450 Airline/Airport Marketing	3
EC 420 Economics of Air Transportation	3
BA/EC 300/400 Level Experimental Courses	3
COM415 Non-Verbal Communications	3
HF 210 Human Factors I: Principles and Fundamentals	3

Air Transportation Major

Course Title	Credits
BA 215 Transportation Principles	3
BA 310 Airport Management	3
BA 315 Airline Management	3
EC 420 Economics of Air Transportation	3
BA 426 International Aviation Management	3
BA Electives (from list below)	6
Total Credits	21

Courses Available as Air Transportation Electives:

BA 314 Human Resource Management	3
BA 318 Entrepreneurial Small Business	3
BA 322 Aviation Insurance	3
BA 324 Aviation Labor Relations	3
BA 326 Marketing Management	3
BA 327 Airline-Airport Operations	3
BA 334 Investment Analysis	3
BA 340 International Accounting	3
BA 405 General Aviation Marketing	3
BA 410 Management of Air Cargo	3
BA 412 Airport Planning and Design	3
BA 418 Airport Administration and Finance	3
BA 419 Aviation Maintenance Management	3
BA 422 Life Cycle Analysis for Systems and Programs in Aviation/Aerospace	3
BA 424 Project Management in Aviation Operations	3

Academic Programs at the Daytona Beach Campus

BA	425	Trends and Current Problems in Air Transportation.....	3
BA	427	Management of the Multicultural Workplace	3
BA	430	International Trade and Regulations.....	3
BA	450	Airline/Airport Marketing	3
EC	315	Managerial Economics.....	3
BA/EC	300/400	Level Experimental Courses	3

Open Electives:

Students select a minor or complete open electives of their choice.

Total Credits	15
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TOTAL DEGREE REQUIREMENTS	120
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Suggested Program of Study

FRESHMAN YEAR

Course	Title		Credits
AS	120	Principles of Aeronautical Science	3
		Communication Theory and Skills	3
		Lower-Level Humanities.....	3
BA	120	Introduction to Computer-Based Systems.....	3
		Mathematics.....	6
BA	201	Principles of Management.....	3
BA	221	Advanced Computer-Based Systems	3
EC	210	Microeconomics	3
EC	211	Macroeconomics	3
Total Credits			30

SOPHOMORE YEAR

Course	Title		Credits
		Communication Theory and Skills	6
		Physical and Life Sciences.....	3
BA	210	Financial Accounting	3
BA	220	Marketing.....	3
BA	320	Business Information Systems	3
MA	222	Business Statistics	3
MA	320	Decision Mathematics	3
		Open Elective	3
Management Major:			
BA	225	Business Law	3
Air Transportation Major:			
BA	215	Transportation Principles	3
Total Credits			30

JUNIOR YEAR

Course	Title		Credits
		Upper-Level Humanities -OR- Social Sciences*	3
		Physical Sciences.....	3
BA	312	Managerial Accounting	3
BA	317	Organizational Behavior	3
BA	332	Corporate Finance I	3
		Open Elective	3
Management Major:			
BA	314	Human Resource Management	3
BA	427	Management of the Multicultural Workforce	3
EC	315	Managerial Economics.....	3
BA	334	Investment Analysis -OR-	
BA	326	Marketing Management -OR-	
BA	327	Airline-Airport Operations	3
Air Transportation Major:			
BA	225	Business Law	3
BA	310	Airport Management	3
BA	315	Airline Management	3
EC	420	Economics of Air Transportation	3
Total Credits			30

SENIOR YEAR

Course	Title		Credits
BA	325	Social Responsibility and Ethics.....	3
BA	335	International Business	3
BA	420	Production and Operations.....	3
BA	436	Strategic Management	3
		Open Electives.....	9
Management Major:			
		Specified Electives	9
Air Transportation Major:			
BA	426	International Aviation Management	3
		Specified Electives	6
Total Credits			30
TOTAL DEGREE CREDITS			120

*See general education on page 143.

Master of Business Administration (MBA)

Associate Dean - Dawna Rhoades
Program Coordinator - Blaise Waguespack

Introduction

The Master of Business Administration degree program is designed to emphasize the application of modern management concepts, methods, and tools to the challenges of aviation and general business. The special intricacies of aviation are woven into a strong, traditional business foundation and examined in greater detail through a wide variety of specified electives. By combining these focused electives into a distinct set, students may select a unique area of specialization in the MBA program.

The demand for professional managers continues to grow in response to the increasing need to improve the efficient and effective use of scarce resources, of operating in an atmosphere of heightened national and international competition, of accommodating the expansion of emerging nations, and of responding to the call to preserve our fragile environment. The MBA curriculum is oriented toward the needs of the strategic decision-maker in the management hierarchy.

Versatility and analytical resourcefulness are two of the key aims of the MBA. For students wishing to study a wide range of aviation subject matter, the MBA allows flexibility in elective choices across a range of aviation fields and business subject matter. For those wishing to specialize in a unique area of avia-

tion or aerospace, part of the program can be individually molded to satisfy personal interests. Residential students may select from specializations in Airport Management, Airline Management, Aviation Human Resources, Aviation System Management, and Finance. New students enrolled in the online education option via a technology mediated format are enrolled in the MBA with specialization in Aviation Management. Students are allowed to select only one specialization, and not all specializations are offered at all campus locations or through every mode of delivery.

Specific prerequisite knowledge for each graduate course in the MBA is contained in the Course Description section of this catalog. Students should assume responsibility to see that prerequisites are satisfied. However, students who still lack prerequisite knowledge in one of the following areas may be required to register for one or all of the modules contained in BA 503 (A through F): management, quantitative methods, marketing, accounting, economics, and/or finance. The prerequisite subject knowledge for a specific graduate course must be satisfied before enrollment in that specific course is permitted. Students may enroll in other graduate-level courses as they meet any specific prerequisite knowledge required.

Academic Programs at the Daytona Beach Campus

Degree Requirements

Master of Business Administration

Aviation Business Core	Credits
BA 511 Operations Research	3
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making	3
BA 518 Managerial Finance	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3
BA 523 Advanced Aviation Economics	3
BA 635 Business Policy and Decision Making	3
Total Core Hours	27

Specified Electives Credits

Students must complete a combination of 12 hours from the courses listed below:

BA 590 Graduate Seminar	1-3
BA 603 Aerospace Production and Operations Management	3
BA 604 International Management and Aviation Policy	3
BA 607 Human Resource Development	3
BA 609 Airline Operations and Management	3
BA 610 Airline Optimization and Simulation Systems	3
BA 615 Investments	3
BA 618 Advanced Corporate Finance	3
BA 620 Organizational Theory	3
BA 625 Airline Marketing	3
BA 630 Aviation/Aerospace Systems Analysis	3
BA 632 Seminar in Aviation Labor Relations	3
BA 645 Airport Operations and Management	3
BA 646 Air-Cargo Logistics Management	3
BA 650 Airline/Airport Relations	3
BA 651 Strategic Airport Planning	3
BA 655 Aviation Law and Insurance	3
BA 696 Internship**	1-3
BA 699 Special Topics in Business Administration	1-3
BA 700 Thesis	6
Total Credits Required	39

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Master of Business Administration Specialization in Airport Management

Aviation Business Core	Credits
BA 511 Operations Research	3
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making	3
BA 518 Managerial Finance	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3
BA 523 Advanced Aviation Economics	3
BA 635 Business Policy and Decision Making	3

Core Credits Required 27

Specialization Required Courses Credits

Students must complete these six hours.	
BA 645 Airport Operations and Management	3
BA 651 Strategic Airport Planning	3

Electives Credits

Students must complete a combination of six hours from the courses listed below.

BA 590 Graduate Seminar	1-3
BA 603 Aerospace Production and Operations Management	3
BA 604 International Management and Aviation Policy	3
BA 607 Human Resource Development	3
BA 609 Airline Operations and Management	3
BA 610 Airline Optimization and Simulation Systems	3
BA 615 Investments	3
BA 618 Advanced Corporate Finance	3
BA 620 Organizational Theory	3
BA 625 Airline Marketing	3
BA 630 Aviation/Aerospace Systems Analysis	3
BA 646 Air Cargo and Logistics Management	3
BA 650 Airline/Airport Relations	3
BA 655 Aviation Law and Insurance	3
BA 696 Internship**	1-3
BA 699 Special Topics in Business Administration	1-3
BA 700 Thesis	6
MSA 508 Advanced Airport Planning	3
MSA 613 Airport Operations Safety	3
Total Credits Required	39

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Academic Programs at the Daytona Beach Campus

Master of Business Administration Specialization in Airline Management

Aviation Business Core		Credits
BA 511	Operations Research	3
BA 514	Strategic Marketing Management in Aviation	3
BA 517	Accounting for Decision Making	3
BA 518	Managerial Finance	3
BA 520	Organizational Behavior, Theory, and Applications in Aviation	3
BA 521	Global Information and Technology Management	3
BA 522	Business Research Methods	3
BA 523	Advanced Aviation Economics	3
BA 635	Business Policy and Decision Making	3

Core Credits Required 27

Specialization Required Courses Credits

Students must complete these six hours.

BA 609	Airline Operations and Management	3
BA 650	Airline/Airport Relations	3

Electives Credits

Students must complete a combination of six hours from the courses listed below.

BA 590	Graduate Seminar	1-3
BA 603	Aerospace Production and Operations Management	3
BA 604	International Management and Aviation Policy	3
BA 607	Human Resource Development	3
BA 610	Airline Optimization and Simulation Systems	3
BA 615	Investments	3
BA 618	Advanced Corporate Finance	3
BA 620	Organizational Theory	3
BA 625	Airline Marketing	3
BA 630	Aviation/Aerospace Systems Analysis	3
BA 632	Seminar in Aviation Labor Relations	3
BA 645	Airport Operations and Management	3
BA 646	Air Cargo and Logistics Management	3
BA 655	Aviation Law and Insurance	3
BA 696	Internship**	1-3
BA 699	Special Topics in Business Administration	1-3
BA 700	Thesis	6

Total Credits Required 39

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Master of Business Administration Specialization in Aviation Human Resources

Aviation Business Core		Credits
BA 511	Operations Research	3
BA 514	Strategic Marketing Management in Aviation	3
BA 517	Accounting for Decision Making	3
BA 518	Managerial Finance	3
BA 520	Organizational Behavior, Theory, and Applications in Aviation	3
BA 521	Global Information and Technology Management	3
BA 522	Business Research Methods	3
BA 523	Advanced Aviation Economics	3
BA 635	Business Policy and Decision Making	3

Core Credits Required 27

Specialization Required Courses Credits

Students must complete these six hours.

BA 607	Human Resources Development	3
BA 632	Seminar in Aviation Labor Relations	3

Electives Credits

Students must complete a combination of six hours from the courses listed below.

BA 590	Graduate Seminar	1-3
BA 603	Aerospace Production and Operations Management	3
BA 604	International Management and Aviation Policy	3
BA 609	Airline Operations and Management	3
BA 615	Investments	3
BA 618	Advanced Corporate Finance	3
BA 625	Airline Marketing	3
BA 630	Aviation/Aerospace Systems Analysis	3
BA 645	Airport Operations and Management	3
BA 655	Aviation Law and Insurance	3
BA 696	Internship**	1-3
BA 699	Special Topics in Business Administration	1-3
BA 700	Thesis	6
MSA 516	Applications in Crew Resource Management	3
MSA 604	Human Factors in Aviation/Aerospace Applications	3

Total Credits Required 39

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Academic Programs at the Daytona Beach Campus

Master of Business Administration Specialization in Aviation System Management

Aviation Business Core	Credits
BA 511 Operations Research.....	3
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making.....	3
BA 518 Managerial Finance	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3
BA 523 Advanced Aviation Economics.....	3
BA 635 Business Policy and Decision Making.....	3

Core Credits Required **27**

Specialization Required Courses Credits

Students must complete these six hours.

BA 610 Airline Optimization and Simulation Systems.....	3
BA 630 Airline/Aerospace Systems Analysis	3

Electives Credits

Students must complete a combination of six hours from the courses listed below.

BA 590 Graduate Seminar.....	1-3
BA 603 Aerospace Production and Operations Management	3
BA 604 International Management and Aviation Policy	3
BA 607 Human Resource Development	3
BA 609 Airline Operations and Management	3
BA 615 Investments	3
BA 618 Advanced Corporate Finance	3
BA 645 Airport Operations and Management.....	3
BA 655 Aviation Law and Insurance.....	3
BA 696 Internship**	1-3
BA 699 Special Topics in Business Administration	1-3
BA 700 Thesis	6
MSA 603 Aircraft and Spacecraft Development.....	3
MSA 609 Aircraft Maintenance Management.....	3
MSA 641 Production and Procurement Management in Aviation/Aerospace Industry	3

Total Credits Required **39**

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Master of Business Administration Specialization in Finance

Aviation Business Core	Credits
BA 511 Operations Research.....	3
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making.....	3
BA 518 Managerial Finance	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3
BA 523 Advanced Aviation Economics.....	3
BA 635 Business Policy and Decision Making.....	3

Core Credits Required **27**

Specialization Required Courses Credits

Students must complete these six hours.

BA 615 Investments	3
BA 618 Advanced Corporate Finance.....	3

Electives Credits

Students must complete a combination of six hours from the courses listed below.

BA 590 Graduate Seminar.....	1-3
BA 603 Aerospace Production and Operations Management.....	3
BA 604 International Management and Aviation Policy	3
BA 607 Human Resource Development	3
BA 609 Airline Operations and Management	3
BA 610 Airline Optimization and Simulation Systems.....	3
BA 620 Organizational Theory	3
BA 625 Airline Marketing	3
BA 630 Aviation/Aerospace Systems Analysis.....	3
BA 632 Seminar in Aviation Labor Relations.....	3
BA 645 Airport Operations and Management.....	3
BA 646 Air Cargo & Logistics Management	3
BA 650 Airline/Airport Relations	3
BA 651 Strategic Airport Planning.....	3
BA 655 Aviation Law and Insurance.....	3
BA 696 Internship**	1-3
BA 699 Special Topics in Business Administration	1-3
BA 700 Thesis	6

Total Credits Required **39**

** Students may petition for an internship credit with prior approval of the Associate Dean or graduate program coordinator as appropriate.

Academic Programs at the Daytona Beach Campus

Master of Business Administration Specialization in Aviation Management*

Aviation Business Core	Credits
BA 511 Operations Research	3
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making	3
BA 518 Managerial Finance	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3
BA 523 Advanced Aviation Economics	3
BA 635 Business Policy and Decision Making	3

Core Credits Required 27

Specialization Aviation Management Courses

BA 604 International Management and Aviation Policy	3
BA 609 Airline Operations and Management	3
BA 645 Airport Operations and Management	3
BA 646 Air Cargo & Logistics Management	3

Total Credits Required 39

* This specialization is only for students enrolled in the technology mediated delivery format. All classes are located within the Embry-Riddle electronic portal and do not meet on the residential campus.

Master of Business Administration Five-Year Programs

Bachelor of Science in Aerospace Studies/Master of Business Administration
Bachelor of Science in Communication/Master of Business Administration
Bachelor of Science in Human Factors/Master of Business Administration

Dean - Daniel Petree

Associate Dean - Dawna Rhoades

Program Coordinator - Blaise Waguespack

Introduction

The five-year program options allow exceptional students to complete a baccalaureate degree (B.S.) in either Aerospace Studies, Communication, or Human Factors, and a Master of Business Administration (M.B.A.). The objective of these five-year degrees is to provide the opportunity for students to build a well-rounded undergraduate education and then further prepare themselves as professional managers in the aviation/aerospace industry.

Admission Requirements

Students interested in pursuing one of these five-year programs must:

- Maintain at least a 3.2 cumulative GPA throughout the undergraduate course of study.
- Maintain at least a 3.0 cumulative GPA throughout the graduate course of study.
- Take the Graduate Management Admission Test (GMAT) during their junior year earning a score at least at the 50th percentile and apply for admission to the program through the Office of Graduate Admissions.

- Complete a minimum of 100 credit hours, including the required Business Administration minor courses, before enrollment in the Business Administration graduate transition classes are allowed.

Students should review the undergraduate degree program sections for the recommended course of study and program requirements.

Aerospace Studies/MBA Suggested Course of Study

The Business Administration minor must be selected as one of the three minor fields of study to prepare the student for this degree option. Entry in this program will be approved by the College of Business late in the student's junior year after the GMAT and other required admission processes are complete. The undergraduate course options shown below are the recommended classes for students to prepare for this degree option. Not following the suggested course of study will require the student to take additional courses to prepare for the MBA.

Academic Programs at the Daytona Beach Campus

Aerospace Studies/MBA

MATHEMATICS

Course	Title	Credits
MA 111	College Mathematics for Aviation I	3
MA 222	Business Statistics	3

SOCIAL SCIENCE

Course	Title	Credits
EC 210	Microeconomics	3
EC 211	Macroeconomics	3
-OR-		
EC 200	An Economic Survey	3
-And one of the following-		
SS 110	World History	3
SS 120	American History	3
SS 130	History of Aviation in America	3
PSY 101	Introduction to Psychology	3

TWO MINOR COURSES OF STUDY

	Credits
Minor requirements are based upon the catalog of the declaring year; must earn a 2.0 GPA or higher within each minor	38-40

MINOR IN BUSINESS ADMINISTRATION

Course	Title	Credits
BA 210	Financial Accounting	3
BA 220	Marketing	3
BA 221	Advanced Computer Based Systems	3
BA 332	Corporate Finance	3

BUSINESS ADMINISTRATION TRANSITION

Nine credits are required from the list below.

Course	Title	Credits
BA 511	Operations Research	3
BA 520	Organizational Behavior, Theory, and Applications in Aviation	3
BA 521	Global Information and Technology Management	3
BA 522	Business Research Methods	3

YEAR FIVE (30 CREDIT HOURS)

Students must fulfill the required MBA core classes listed below and any remaining course from the transitional courses that have not been completed.

Course	Title	Credits
BA 514	Strategic Marketing Management in Aviation	3
BA 517	Accounting for Decision Making	3
BA 518	Managerial Finance	3
BA 523	Advanced Aviation Economics	3

BA 635	Business Policy and Decision Making	3
	Specified Electives	12

TOTAL DEGREE CREDITS	147
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** More hours may be required if the recommendations above are not followed and due to hours required in the additional minors selected.

If a student chooses to leave the Daytona Beach Campus before the MBA course of study is complete, the student may transfer to the technology mediated MBA with a specialization in Aviation Management to complete the required BA graduate courses. Students, however, will not be recognized as having completed an undergraduate and graduate degree until all program track requirements are met.

If the student chooses to leave the program before the completion of the MBA program and has acquired the minimal hours required for graduation with the BS in Aerospace Studies, any MBA transition courses used to meet graduation requirements will be noted as undergraduate courses for the purpose of graduation.

Communication/MBA - Suggested Course of Study

The Business Administration minor must be selected as the minor field of study to prepare the student for this degree option. Entry in this program will be approved by the College of Business late in the student's junior year after the GMAT and other required admission processes are complete. The undergraduate course options shown below are the recommended classes for students to prepare for this degree option. The BA transition courses listed are to be taken in place of the open electives noted in the BS in Communication undergraduate degree plan. Not following the suggested course of study will require the student to take additional courses to prepare for the MBA.

Academic Programs at the Daytona Beach Campus

Communication/MBA

MATHEMATICS

Course Title	Credits
MA 111 College Mathematics for Aviation I	3
MA 222 Business Statistics	3

SOCIAL SCIENCE

Course Title	Credits
EC 210 Microeconomics	3
EC 211 Macroeconomics	
-OR-	
Lower-Level Social Science	3

MINOR IN BUSINESS ADMINISTRATION

Course Title	Credits
BA 210 Financial Accounting	3
BA 221 Advanced Computer Based Systems.	3
BA 220 Marketing.	3
BA 332 Corporate Finance	3

OPEN ELECTIVES

One class MUST be:

Course Title	Credits
BA 201 Principles of Management.	3

BUSINESS ADMINISTRATION TRANSITION

Nine credits are required from the list below:

Course Title	Credits
BA 511 Operations Research.	3
BA 520 Organizational Behavior, Theory, and Applications in Aviation	3
BA 521 Global Information and Technology Management	3
BA 522 Business Research Methods	3

YEAR FIVE (30 CREDIT HOURS)

Students must fulfill the required MBA core classes listed below and any remaining courses from the transitional period that have not been completed:

Course Title	Credits
BA 514 Strategic Marketing Management in Aviation	3
BA 517 Accounting for Decision Making	3
BA 518 Managerial Finance	3
BA 523 Advanced Aviation Economics.	3
BA 635 Business Policy and Decision Making.	3
Specified Electives	12

Total Degree Credits **147****

**There may be additional hours if the recommendations above are not followed or if an additional minor is taken.
If a student chooses to leave the Daytona Beach

Campus before the MBA course of study is complete, the student may transfer to the technology mediated MBA with a specialization in Aviation Management to complete the required BA graduate courses. Students, however, will not be recognized as having completed an undergraduate and graduate degree until all program track requirements are met.

If the student chooses to leave the program before the completion of the MBA program and has acquired the minimal hours required for graduation with the BS in Communication, any MBA transition courses used to meet graduation requirements will be noted as undergraduate courses for the purpose of graduation.

Human Factors/MBA Suggested Course of Study

The Business Administration undergraduate and transition classes recommended in the outline below are taken in place of the open electives within the BS in Human Factors Psychology to prepare the student for this degree option. Entry in this program will be approved by the College of Business late in the student's junior year after the GMAT and other required admission processes are complete. Not following the suggested course of study will require the student to take additional courses to prepare for the MBA.

Human Factors/MBA

MATHEMATICS

Course Title	Credits
MA 111 College Mathematics for Aviation I	3
MA 222 Business Statistics	3

SOCIAL SCIENCE

One class must be:

Course Title	Credits
EC 210 Microeconomics	3
PSY 101 Introduction to Psychology.	3

SPECIFIED ELECTIVES (15 CREDITS)

One course MUST be:

Course Title	Credits
PSY 340 Industrial Organizational Psychology*	3

Academic Programs at the Daytona Beach Campus

BUSINESS ADMINISTRATION COURSES

(In place of open elective courses)

Course	Title	Credits
BA 210	Financial Accounting	3
BA 220	Marketing.	3
BA 332	Corporate Finance	3

BUSINESS ADMINISTRATION TRANSITION

Nine credits are required from the list below:

Course	Title	Credits
BA 511	Operations Research.	3
BA 514	Strategic Marketing Management in Aviation	3
BA 520	Organizational Behavior, Theory, and Applications in Aviation	3
BA 521	Global Information and Technology Management	3

YEAR FIVE (27 CREDIT HOURS)

Students must fulfill the required MBA core classes listed below and any remaining courses from the transitional period that have not been completed:

Course	Title	Credits
BA 517	Accounting for Decision Making	3
BA 518	Managerial Finance	3
BA 523	Advanced Aviation Economics.	3
BA 635	Business Policy and Decision Making.	3
	Specified Electives	12

TOTAL DEGREE CREDITS **153****

* PSY 340 taken in lieu of BA 201

**May be additional hours if the recommended classes above are not taken. BA 522 is waived for this degree option with completion of HF 302, 305, 312, 400 and PSY 322.

If a student chooses to leave the Daytona Beach Campus before the MBA course of study is complete, the student may transfer to the technology mediated MBA with a specialization in Aviation Management to complete the required BA graduate courses. Students, however, will not be recognized as having completed an undergraduate and graduate degree until all program track requirements are met.

If the student chooses to leave the program before the completion of the MBA program and has acquired the minimal hours required for graduation with the BS in Human Factors Psychology, any MBA transition courses used to meet graduation requirements will be noted as undergraduate courses for the purpose of graduation.

Executive Master of Business Administration (EMBA)

(The Executive MBA is closed to new students.)

Dean - Daniel Petree
Associate Dean - Dawna Rhoades
Program Coordinator - Blaise Waguespack

Introduction

The Executive MBA is a 14-month program designed to accelerate career progression and to prepare promising executives to assume leadership roles in their organizations. The program is conducted in large part on Embry-Riddle's Daytona Beach campus. The program includes a series of six two-week residency sessions, held approximately every 10 weeks. Between these residency sessions, participants are expected to complete course-related reading, individual and group assignments, and the comprehensive Executive Project. During these interim periods, participants remain in contact with professors and one another via phone, fax, and email, and through discussion forums and chat rooms on course Web pages.

Prior to each module, EMBA participants receive a packet of instructional materials, giving them sufficient time to prepare for the classes. During residency sessions, classes meet during the normal business day so that evenings can be devoted to individual study and group projects.

The curriculum of the EMBA embodies the goals of the University's MBA in Aviation by providing a solid foundation of knowledge in such areas as strategic management, leader-

ship, communication, and teamwork, as well as other mainstream executive disciplines, all presented in the context of the aviation and aerospace industry. Four specific areas of focus drive the curriculum: Organizational Evolution, Cross-Functional Competencies, Leadership and Entrepreneurship, and Global Strategic Thinking.

The Executive Project, as the program's capstone activity, is designed to benefit both the participant and the sponsoring organization by giving the participant the opportunity to apply the knowledge and diagnostic competencies learned throughout the program to a specific business issue of the sponsor. Issues are selected by the sponsor and participant and are approved by the faculty project advisor in module #3. Working from the perspective of a consultant, the participant thoroughly investigates the issue and proposes specific actions, using the analysis, planning, and management tools developed during each course. Continuous guidance and feedback are provided by the faculty advisor and sponsor during the project. The completed project requires a comprehensive written report, as well as a formal oral presentation.

Academic Programs at the Daytona Beach Campus

Degree Requirements

Required Courses

Credits

Module #1

EMBA 540	Organizational Communication and Information Systems	3
EMBA 544	Quantitative Analysis for Management Decision Making I	2
EMBA 662	Personal Communication and Teamwork	3

Module #2

EMBA 542	Accounting for Decision Making	3
EMBA 545	Quantitative Analysis for Management Decision Making II	2
EMBA 548	Global Economic Analysis for Managers	3

Module #3

EMBA 546	Production/Operations Management	3
EMBA 550	Global Marketing Management	3
EMBA 552	Managerial Finance I	2
EMBA 700	Executive Project	3

Module #4

EMBA 553	Managerial Finance II	2
EMBA 660	Applications of Organizational Behavior	3
EMBA 664	Global Market Forces and Ethical Responsibility	3

Module #5

EMBA 554	Leadership and Entrepreneurship	3
EMBA 668	Culture and the Diverse Workforce	3
EMBA 674	Strategic Management I	2
EMBA 670	Technology and Innovation Management	3
EMBA 672	Designing the High Performance Organization	3
EMBA 675	Strategic Management II	2

Total Credits Required **51**

College of Engineering

Dean: Dr. Maj Dean Mirmirani

The College of Engineering at Embry-Riddle offers Bachelor of Science degrees in Aerospace Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Mechanical Engineering, and Software Engineering. Each of the degrees in the College of Engineering gives students the opportunity to acquire a depth of understanding in the degree while allowing unique aerospace strengths in each curriculum.

Embry-Riddle's Aerospace Engineering program is the largest in the country and has been ranked by *U.S. News & World Report* as the # 1 program among non-Ph.D. granting institutions. The College of Engineering ranks among the top 10 best undergraduate programs among non-Ph.D. granting schools. In addition, the College of Engineering offers master degrees in Aerospace Engineering, Mechanical Engineering, and Software Engineering.

The College of Engineering empha-

sizes high-quality education and research activities that bring to the students the latest developments in the field. Students are continually encouraged and supported by faculty to strive for ingenious and creative solutions to today's technological problems through research projects on their own as well as joint projects with faculty.

Students acquire valuable hands-on experience using cutting-edge technology in the Design, Composites, Wind Tunnel, and Real Time labs among others. The College also holds many seminars and workshops for engineering students with both academic and industry speakers. This interaction with industry enables students to stay abreast of current industry conditions and advancements. College of Engineering graduates are regarded as some of the most knowledgeable and best-trained professionals entering their chosen fields.

Academic Programs at the Daytona Beach Campus

Freshman Engineering

The Freshman Engineering Program is designed to prepare students for entry into the engineering degrees offered by the College of Engineering. The first-year curriculum allows engineering students to take coursework that is common to every engineering degree in the College, allowing students flexibility in choosing engineering degrees without affecting the progress toward graduation.

The Freshman Engineering Program is designed to introduce students to the interdisciplinary aspects of engineering. Engineering, mathematics, computing, and physics courses are integrated to prepare students to work in teams for solving aerospace-related problems that reach across the broad areas of engineering.

Students entering the Freshman Engineering Program should have demonstrated a competence in mathematics and science. They should be prepared to enter Calculus I, having demonstrated proficiency in algebra and trigonometry. If necessary, students can prepare for entry into the Freshman Engineering Program by taking College Algebra (MA 140) and Trigonometry (MA 142) before taking Calculus and Analytic Geometry I (MA 241).

General Education Electives For Engineers

Embry-Riddle courses in the general education categories of Humanities and Social Sciences may be chosen from those listed below, assuming prerequisite and other listed requirements are met. Courses from other institutions are acceptable if they fall into these categories and are at the level specified in the particular engineering program.

FRESHMAN YEAR

Course	Title	Credits
COM 122	English Composition and Literature I	3
COM 219*	Speech	3
EGR 101	Introduction to Engineering	2
EGR 115	Introduction to Computing for Engineers	3
HU 14X	Humanities	3
MA 241	Calculus I	4
MA 242	Calculus II	4
PS 150	Physics I	3
PS 160	Physics II	3
SS	Lower-Level Social Sciences Elective	3
UNIV 101	College Success	1
Total Credits		32

* COM 219 is required in every degree for graduation. However, students are advised to postpone COM 219 during the first year in favor of one of the following courses based on the field of interest of the student:

Aerospace Engineering, Civil Engineering, or Mechanical Engineering: EGR 120, Graphical Communications, 3 credits.

Computer Engineering or Software Engineering: CS 225, Computer Science II, 4 credits.

Electrical Engineering: CEC 220/2, Digital Circuit Design with lab, 4 credits.

Please refer to the specific Area of Concentration (AOC) in the Computer Science degree for specific Science requirements.

Humanities: Any HU course at the required level.

Social Sciences: Any SS, EC, or PSY course at the required level. HF 201 is also acceptable.

Exceptions: Language courses must not be the student's native language. EC 200 is not acceptable together with EC 210 or EC 211 or their equivalent. Registering in a Special Topics course must be approved by the appropriate engineering department **before** taking the course.

Aerospace Engineering

Bachelor of Science

The Aerospace Engineering program exists in partial fulfillment of the University's purpose "to provide a comprehensive education to prepare graduates for productive careers and responsible citizenship with special emphasis on the needs of aviation, aerospace engineering, and related fields." The program's focus is primarily on the engineering of mission-oriented vehicles for atmospheric and space flight. The goal of the Aerospace Engineering program is to produce graduates who are ready for constructive roles in society, who qualify for entry-level engineering jobs in the aerospace industry or aviation-related fields, who qualify for admission to graduate programs in Aerospace Engineering (or related engineering fields), and who are prepared to continue learning throughout their lives.

In order to achieve these objectives, the following are the expected outcomes:

1. **Engineering responsibilities and methodology.** From their first semester onward, students will be made aware of what engineering is and what will be expected of them as engineers, including a commitment to continuing education and to engineering ethics. This will be accomplished through interdisciplinary team activities and design projects, workshops, and seminars, and the consistent assignment of open-ended problems throughout the curriculum.
2. **Professional activity and development.** Students will be encouraged throughout their Embry-Riddle careers to actively participate in professional organizations, to stay abreast of industry activity, and to continue their professional development.
3. **Technical communication.** Throughout the curriculum, wherever appropriate, student teams will make professional-quality oral and written presentations.
4. **General education.** Students will satisfy the University's general education requirements to broaden the student's education, develop effective communication skills, and obtain awareness of social and ethical issues.
5. **Basic science and mathematics.** Students will demonstrate a knowledge of chemistry fundamentals (including oxidation/reduction, the essentials of physical chemistry, and the basics of organic compounds as related to composite materials), basic physics (mechanics, heat, sound, electricity, and optics), and mathematics (differential and integral calculus, differential equations, matrix algebra, and vector calculus) to use as tools in support of their studies of engineering topics and beyond.
6. **Engineering mechanics.** Students will demonstrate a knowledge of the fundamentals of classical engineering mechanics (as applied to rigid, elastic, and fluid media) to provide a foundation for the professional component of the curriculum as well as to become familiar with basic engineering problem-solving techniques, including team approaches.

Academic Programs at the Daytona Beach Campus

7. ***Aerodynamics and aeronautics.*** Students will demonstrate a knowledge of topics in aerodynamics, to include a majority of the following: the aerospace environment; applications of mass, momentum, energy, and entropy principles to one- and two-dimensional flows; potential flow; viscous flow and boundary layers; aerodynamics of airfoils in incompressible and compressible flows; steady state aircraft performance; static stability; propeller and rotary wing fundamentals; applications of the concept of panel methods; supersonic flow; and aerodynamic heating.
 8. ***Thermal sciences.*** Students will demonstrate knowledge of a sequence of topics in thermodynamics, heat transfer, and propulsion so as to be able to assess the operational capabilities and analyze the performance of air-breathing and rocket engines.
 9. ***Structures.*** Students will demonstrate a knowledge of topics in aerospace structures and materials, to include as a minimum the equilibrium of forces and moments in three dimensions; shear and bending moment diagrams; stresses and deflections due to elastic tension, compression, shear, and torsion on stable cross sections; compression and shear buckling; composite materials; basics of the finite element method; and vibration, fatigue, and fracture mechanics concepts.
 10. ***Electronics.*** Students will demonstrate a knowledge of topics in electric circuits, analog and digital electronic fundamentals, electromechanical devices, and instrumentation fundamentals.
 11. ***Astronautics.*** Students will demonstrate a knowledge of topics in orbital mechanics, gyroscopic motion, and control systems with aerospace applications.
 12. ***Laboratories and data interpretation.*** Students will demonstrate an ability to perform laboratory work, including statistical processing of data and error analysis, in materials, structures, aerodynamics, power and energy systems, electronics, and instrumentation.
 13. ***Design.*** Students will carry out and defend the conceptual design of an aircraft or a spacecraft in an industry-like environment, in teams, using realistic constraints and considerations of cost, safety, manufacturability and maintainability, and the needs of the public. Students will likewise also carry out the detail design of an aircraft or a spacecraft system.
 14. ***Support hardware and software.*** The program will be supported throughout by the use of modern equipment and the most relevant modern tools and techniques of engineering analysis, design, and production, including student experience with industry-level solid modeling (CAD/CAM), finite element, and computational fluid mechanics software.
- To enter this program, students should have demonstrated competence in mathematics, physics, and chemistry in high school.
- The Aerospace Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21202-4012; Telephone: (410) 347-7700; <http://www.abet.org>).

Academic Programs at the Daytona Beach Campus

Degree Requirements

The Bachelor of Science in Aerospace Engineering program requires successful completion of a minimum of 129 credit hours. The program may be completed in eight semesters assuming appropriate background and full-time enrollment.

First-Year Requirement

A student must attain a minimum cumulative grade point average of 2.25 in those courses prescribed by the College of Engineering Freshman Program (see page 158) before continuing the pursuit of an Aerospace Engineering degree.

Remaining on Track for AE

Aerospace Engineering students must complete MA 241, MA 242, PS 150, PS 160, and EGR 115 with a C or better within three attempts (including audits and withdrawals) before attending any ES courses. Students should be aware that many courses have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure required sequencing.

FRESHMAN YEAR

See the common Freshman Year outline on page 158.

Total Credits	32
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SOPHOMORE YEAR

Course	Title	Credits
COM221	Technical Report Writing	3
COM219	Speech -OR-	
EGR 120	Graphical Communications	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3

ES 206	Fluid Mechanics	3
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 105	General Chemistry I	4
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
Total Credits		34

JUNIOR YEAR (AERONAUTICS OPTION)

Course	Title	Credits
AE 301	Aerodynamics I	3
AE 302	Aerodynamics II	3
AE 304	Aerospace Structures I	3
AE 313	Space Mechanics	3
AE 314	Experimental Aerodynamics I	1
AE 315	Experimental Aerodynamics Laboratory	1
AE 316	Aerospace Engineering Materials	3
AE 404	Aerospace Structures II	3
AE 413	Airplane Stability and Control	3
ES 305	Thermodynamics	3
EE 335	Electrical Engineering	2
EE 336	Electrical Engineering Laboratory	1
MA 441	Advanced Engineering Mathematics I	3
Total Credits		32

JUNIOR YEAR (ASTRONAUTICS OPTION)

Course	Title	Credits
AE 301	Aerodynamics I	3
AE 302	Aerodynamics II	3
AE 304	Aerospace Structures I	3
AE 313	Space Mechanics	3
AE 314	Experimental Aerodynamics I	1
AE 315	Experimental Aerodynamics Laboratory	1
AE 316	Aerospace Engineering Materials	3
AE 404	Aerospace Structures II	3
ES 305	Thermodynamics	3
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering Laboratory	1
MA 441	Advanced Engineering Math I	3
	Technical Elective	3
Total Credits		32

JUNIOR YEAR (AEROSPACE PROPULSION OPTION)

Course	Title	Credits
AE 301	Aerodynamics I	3
AE 302	Aerodynamics II	3
AE 304	Aerospace Structures I	3

Academic Programs at the Daytona Beach Campus

AE 313	Space Mechanics	3
AE 314	Experimental Aerodynamics I	1
AE 315	Experimental Aerodynamics Laboratory	1
AE 316	Aerospace Engineering Materials	3
AE 404	Aerospace Structures II	3
AE 413	Airplane Stability and Control	3
ES 305	Thermodynamics	3
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering Laboratory	1
MA 441	Advanced Engineering Math I	3

Total Credits **32**

SENIOR YEAR (AERONAUTICS OPTION)

Course	Title	Credits
AE 408	Turbine and Rocket Engines	3
AE 416	Aerospace Structures and Instrumentation	1
AE 417	Aerospace Structures and Instrumentation Laboratory	1
AE 420	Aircraft Preliminary Design	4
AE 421	Aircraft Detail Design	4
AE 432	Flight Dynamics and Control	3
ES 405	Electrical Engineering II	3
HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Electives	6

Total Credits **31**

SENIOR YEAR (ASTRONAUTICS OPTION)

Course	Title	Credits
AE 408	Turbine and Rocket Engines	3
AE 416	Aerospace Structures and Instrumentation	1
AE 417	Aerospace Structures and Instrumentation Laboratory	1
AE 426	Spacecraft Attitude Dynamics and Control	3
AE 427	Spacecraft Preliminary Design	4
AE 434	Spacecraft Control	3
AE 445	Spacecraft Detail Design	4
ES 405	Electrical Engineering II	3
HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Elective	3

Total Credits **31**

SENIOR YEAR (AEROSPACE PROPULSION OPTION)

Course	Title	Credits
AE 408	Turbine and Rocket Engines	3
AE 416	Aerospace Structures and Instrumentation	1
AE 417	Aerospace Structures and Instrumentation Laboratory	1
AE 432	Flight Dynamics and Control	3
AE 435	Air-Breathing Propulsion Preliminary Design	4
AE 440	Air-Breathing Propulsion Component Design	4
ES 405	Electrical Engineering	3
HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Elective	6

Total Credits **31**

TOTAL DEGREE CREDITS

129

Technical Electives:

AE: 350, 395*, 399*, 401, 409, 411, 415, 425, 433, 495*, 499*, 5XXU
 CEAE: With prior approval of the Aerospace Engineering Department
 CEC: 300, 315, 320/322**, 460
 CIV: 311, 362
 CS: 335, 344, 350
 EGR: 305
 EP: 320, 391, 394
 ES: 306, 315, 395*, 399*, 403, 412, 495*, 499*
 MA: 412, 432, 438, 442, 443, 5XXU
 ME: 304/305** (was 300/L), 302, 303, 425
 PS: 301, 303, 320
 SE: 300
 SYS: 301

Students may substitute upper-level AF, NSC, and MY courses or aeronautical certificates for the 6 credits of technical electives.

Students may take courses that are not listed above with prior approval of the Aerospace Engineering Department.

* Need approval of Aerospace Engineering Department Chairperson before enrolling.

** Lecture/Lab courses must be taken at the same time.

Academic Programs at the Daytona Beach Campus

Accelerated Program in Aerospace Engineering

Bachelor of Science

Master of Aerospace Engineering

The accelerated program allows students with strong academic backgrounds to complete both B.S. and M.A.E. degrees in Aerospace Engineering. The goal of the program is to produce graduates who are prepared for careers in the aerospace industry and in research and development. The program augments the students' undergraduate background with graduate-level study and with course offerings in the areas of aerodynamics, structures, propulsion, and astronautics.

Degree Requirements

Students enrolled in the Bachelor of Science program in Aerospace Engineering may apply for entry into the accelerated program when they have completed about 90 hours of coursework. Students should have a CGPA of 3.20 (out of a possible 4.00) in AE/ES courses, at a minimum, for selection. For continued enrollment, a CGPA of 3.00 must be maintained. Each student is required to conduct an independent study in a topic of current interest in aerospace engineering under the guidance of an advisor, with a formal report due at the end. Three graduate credits are earned through this work.

FRESHMAN YEAR

See the common Freshman Year outline on page 158.

Total Credits 32

SOPHOMORE YEAR

Course	Title	Credits
COM221	Technical Report Writing	3
COM219	Speech - OR-	
EGR 120	Graphical Communications	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
ES 206	Fluid Mechanics	3
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods.	4
PS 105	General Chemistry I.	4
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
Total Credits		<u>34</u>

JUNIOR YEAR (AERONAUTICS AND PROPULSION OPTIONS)

Course	Title	Credits
AE 301	Aerodynamics I.	3
AE 302	Aerodynamics II.	3
AE 304	Aerospace Structures I.	3
AE 313	Space Mechanics.	3
AE 314	Experimental Dynamics I	1
AE 315	Experimental Dynamics I Laboratory	1
AE 316	Aerospace Engineering Materials	3
AE 404	Aerospace Structures II	3
AE 413	Airplane Stability and Control	3
ES 305	Thermodynamics	3
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering I Laboratory.	1
MA 441	Advanced Engineering Mathematics I	3
Total Credits		<u>32</u>

JUNIOR YEAR (ASTRONAUTICS OPTION)

Course	Title	Credits
AE 301	Aerodynamics I.	3
AE 302	Aerodynamics II.	3
AE 304	Aerospace Structures I.	3
AE 314	Experimental Dynamics I	1
AE 315	Experimental Dynamics I Laboratory	1
AE 316	Aerospace Engineering Materials	3
AE 313	Space Mechanics.	3
AE 404	Aerospace Structures II	3

Academic Programs at the Daytona Beach Campus

ES 305	Thermodynamics	3
EE 335	Electrical Engineering I	2
EE 336	Electrical Engineering I Laboratory	1
MA 441	Advanced Engineering Math I	3
	Technical Elective	3

Total Credits 32

SENIOR YEAR (AERONAUTICS OPTION)

Course	Title	Credits
HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Electives †	6
AE 408	Turbine and Rocket Engines	3
AE 420	Aircraft Preliminary Design	4
AE 421	Aircraft Detail Design	4
AE 430	Control Systems Analysis and Design	3
ES 405	Electrical Engineering II	3
AE 416	Aerospace Structures and Instrumentation Lab	1
AE 417	Aerospace Structures and Instrumentation Lab	1

Total Credits 31

SENIOR YEAR (PROPULSION OPTION)

Course	Title	Credits
HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Electives †	6
AE 408	Turbine and Rocket Engines	3
AE 416	Aerospace Structures and Instrumentation	1
AE 417	Aerospace Structures and Instrumentation Laboratory	1
AE 430	Control Systems Analysis and Design	3
AE 435	Air-Breathing Propulsion Preliminary Design	4
AE 440	Air-Breathing Propulsion Component Design	4
ES 405	Electrical Engineering II	3

Total Credits 31

SENIOR YEAR (ASTRONAUTICS OPTION)

Course	Title	Credits
AE 408	Turbine and Rocket Engines	3
AE 416	Aerospace Structures and Instrumentation	1
AE 417	Aerospace Structures and Instrumentation Laboratory	1
AE 426	Spacecraft Attitude Dynamics and Control	3
AE 427	Spacecraft Preliminary Design	4
AE 430	Control Systems Analysis and Design	3
AE 445	Spacecraft Detail Design	4
ES 405	Electrical Engineering II	3

HU/SS	Lower-Level Elective	3
HU/SS	Upper-Level Elective	3
	Technical Elective †	3

Total Credits 31

TOTAL UNDERGRADUATE CREDITS 129

GRADUATE-LEVEL STUDY

Course	Title	Credits
MA 502	Boundary Value Problems (or equivalent)	3
AE 699	Special Topics in Aerospace Engineering	3
	Core Courses	6
	Electives †	9

Total Credits (at least nine hours 600-level) 21

TOTAL DEGREE CREDITS 150

†Technical Electives: Students may satisfy this requirement by selecting from the 500-level graduate courses listed in this section.

‡Electives: The following should be selected as electives at the graduate level. The elective list has been grouped into areas of concentration.

Areas of Concentration

Structures

This area includes Structural Analysis, Vibration, Nondestructive Testing, Composite Materials, Elasticity, Flight Dynamics, Controls, and Design Optimization.

Core Course for Structures Concentration

Course	Title	Credits
AE 502	Strength and Fatigue of Materials	3

Electives for Structures Concentration

AE 506	Airplane Dynamic Stability	3
AE 514	Introduction to the Finite Element Method	3
AE 518	Acoustic Emission Nondestructive Testing	3
AE 520	Perturbation Methods in Engineering	3
AE 522	Analysis of Aircraft Composite Materials	3
AE 612	Analysis of Aircraft Plate and Shell Structures	3
AE 616	Advanced Aircraft Structural Dynamics	3
AE 699	Special Topics in Aerospace Engineering	3

Academic Programs at the Daytona Beach Campus

Aerodynamics and Propulsion

This area includes Aerodynamics, Propulsion, Computational Aero and Fluid Dynamics, Transition and Turbulence, Aeroacoustics, Heat Transfer, and Combustion.

Core Course for Aerodynamics and Propulsion Concentration

Course	Title	Credits
AE 504	Advanced Compressible Flow	3

Electives for Aerodynamics and Propulsion Concentration

AE 508	Heat Transfer	3
AE 512	Combustion I.	3
AE 516	Computational Aeronautical Fluid Dynamics	3
AE 528	Advanced Incompressible Aerodynamics	3
AE 530	Aeroacoustics.	3
AE 610	Advanced Computational Fluid Dynamics.	3
AE 620	Boundary Layer Theory.	3
AE 640	Turbine Engine Propulsion Systems	3
AE 648	Thermal Stresses in Aerospace Engineering	3
AE 699	Special Topics in Aerospace Engineering	3
AE 652	Turbulent Flows	3

Astronautics and Control

This area includes Space Vehicles, Space Power, and Systems Control.

Electives for Astronautics Concentration

AE 508	Heat Transfer
AE 524	Rocket Engine Propulsion Systems
AE 526	Engineering Optimization
AE 606	Finite Element Aerospace Applications
AE 620	Boundary Layer Theory
AE 646	Nonlinear Dynamical Systems and Chaos

A 3 credit hour graduate internship, AE 695, may be taken as an elective course.

Master of Science in Aerospace Engineering (MSAE) *Master of Aerospace Engineering (MAE)*

Master of Science in Aerospace Engineering

Master of Aerospace Engineering

Introduction

The Master of Science in Aerospace Engineering (MSAE) and the Master of Aerospace Engineering (MAE) provide formal advanced study, preparing students for careers in the aerospace industry and in research and development. Both degree programs are planned to augment the individual student's engineering and science background with adequate depth in areas of aeroacoustics, nondestructive testing, aerodynamics, design

and optimization, propulsion, aerospace structures, composites, computational fluid dynamics, or other areas of aerospace engineering. Candidates for both degree programs can select courses that prepare them for the aerospace engineering profession or that prepare them to continue on to doctoral studies.

Both degree programs require a minimum of 30 credit hours of graduate-level work.

Degree Requirements

MSAE (Thesis option)

3 hours	MA 502 or Equivalent
6 hours	Core courses
12 hours	Electives
9 hours	Thesis
<hr/>	
30 hours	

MAE (Nonthesis option)

3 hours	MA 502 or equivalent
6 hours	Core courses
21 hours	Electives
(at least six hours should be 600-level)	
30 hours	

Academic Programs at the Daytona Beach Campus

Areas of Concentration

Aerospace Structures

This area includes Structural Analysis, Vibration, Nondestructive Testing, Composite Materials, Elasticity, Flight Dynamics, Controls, and Design Optimization.

Core Courses for Structures Concentration

Course Title	Credits
AE 502 Strength and Fatigue of Materials	3
AE 504 Advanced Compressible Flow	3

Electives for Structures Concentration

AE 506 Airplane Dynamic Stability	3
AE 510 Aircraft Structural Dynamics	3
AE 514 Introduction to the Finite Element Method	3
AE 518 Acoustic Emission Nondestructive Testing	3
AE 520 Perturbation Methods in Engineering	3
AE 522 Analysis of Aircraft Composite Materials	3
AE 526 Engineering Optimization	3
AE 606 Finite Element Aerospace Applications	3
AE 612 Analysis of Aircraft Plate and Shell Structures	3
AE 616 Advanced Aircraft Structural Dynamics	3
AE 646 Nonlinear Dynamical Systems and Chaos	3
AE 648 Thermal Stresses in Aerospace Engineering	3
AE 699 Special Topics in Aerospace Engineering*	3

* No more than 3 hours of AE 699 should be taken.

Aerodynamics and Propulsion

This area includes Aerodynamics, Propulsion, Computational Aero and Fluid Dynamics, Transition and Turbulence, Aeroacoustics, Heat Transfer, and Combustion.

Core Courses for Aerodynamic and Propulsion Concentration

Course Title	Credits
AE 502 Strength and Fatigue of Materials	3
AE 504 Advanced Compressible Flow	3

Electives for Aerodynamics and Propulsion Concentration

AE 508 Heat Transfer	3
AE 512 Combustion	3
AE 516 Computational Aeronautical Fluid Dynamics	3
AE 524 Rocket Engine Propulsion Systems	3
AE 528 Advanced Incompressible Aerodynamics	3
AE 530 Aeroacoustics	3
AE 610 Advanced Computational Fluid Dynamics	3
AE 620 Boundary Layer Theory	3
AE 640 Turbine Engine Propulsion Systems	3
AE 652 Turbulent Flows	3
AE 699 Special Topics in Aerospace Engineering*	3

* No more than 3 hours of AE 699 should be taken.

A 3 credit hour graduate internship, AE 695, may be taken as an elective course.

Academic Programs at the Daytona Beach Campus

Civil Engineering

Bachelor of Science

The demand for civil engineers educated in the fields of airports, transportation, aviation and aerospace planning, and analysis and design is strong and is expected to grow rapidly in the future. Air and ground transportation systems have substantially expanded in the last few years and are expected to continue to grow at an increasing pace. Space utilization and exploration initiatives are certain to produce further demand for civil engineers with aerospace interests. The Civil Engineering program at Embry-Riddle is uniquely designed to produce graduates with the types of skills and experiences that employers in these lucrative fields find highly desirable.

Graduates of the Civil Engineering program will leave the University with an understanding of the classical areas of civil engineering with emphasis on transportation, structural design, and materials science in aviation and aerospace fields developed through a carefully planned series of courses and laboratories. Small class size and personal attention allow the interjection of practical interdisciplinary design projects throughout the curriculum. The objectives of the program are to produce graduates who:

- Are prepared for the challenges of contemporary civil engineering practice and have the ability to adapt to changes in the civil engineering profession.
- Have developed problem-solving skills, have acquired team-building abilities, and have demonstrated leadership talent.
- Are capable of participating in interdisciplinary projects, of applying their

knowledge of engineering theory to actual problems, and have the skills to perform technical research.

- Have experienced the facilities, equipment, and academic environment necessary to encourage learning.
- Have developed a love of learning and a quest for understanding that will last throughout their professional careers.

As graduates of a program fully accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700, <http://www.abet.org>), students will have the necessary background to further their formal education through graduate school if desired.

Admission Requirements

To enter this program, students should have demonstrated competence in mathematics, physics, and chemistry in high school. They should be prepared to enter Calculus I, having demonstrated proficiency in algebra and trigonometry. Students who wish to strengthen their background in mathematics and physical science should consult the program chair for guidance before enrolling in the prescribed courses.

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

Academic Programs at the Daytona Beach Campus

Degree Requirements

The Bachelor of Science in Civil Engineering program requires successful completion of a minimum of 128 semester hours. The program may be completed in eight regular semesters, assuming appropriate background and full-time enrollment. A minimum cumulative grade point average of 2.00 is needed for all required CIV, AE, EE, EGR, and ES courses, including engineering electives.

FIRST YEAR

See the common Freshman Year outline on page 158.

Total Credits 32

SECOND YEAR

Course	Title	Credits
CIV 140	Engineering Measurements	2
CIV 140L	Engineering Measurements Laboratory	0
CIV 370	Computational Methods in Civil Engineering	3
COM221	Technical Report Writing	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
MA 243	Calculus and Analytical Geometry III	4
MA 345	Differential Equations	4
PS 105	General Chemistry with Laboratory	4
PS 250	Physics III	3
PS 253	Physics Laboratory for Engineers	1
Total Credits		<u>33</u>

THIRD YEAR

Course	Title	Credits
CIV	Structures Elective	3
CIV	Transportation Elective	3
CIV 304	Structural Analysis	3
CIV 307	Civil Engineering Materials I	4
CIV 307L	Civil Engineering Materials I Laboratory	0
CIV 311	Introduction to Transportation Engineering	3
CIV 316	Hydraulics	3

CIV 320	Soil Mechanics	4
CIV 320L	Soil Mechanics Laboratory	0
CIV 441	Civil Engineering Materials II	4
CIV 441L	Civil Engineering Materials II Laboratory	0
COM219	Speech - OR-	
EGR 120	Graphical Communications	3
HU/SS	Lower-Level Elective	3
Total Credit		<u>33</u>

FOURTH YEAR

Course	Title	Credits
CIV	Geotechnical Elective	3
CIV	Civil Engineering Electives	6
CIV 460	Senior Design Project	3
CIV 490	The Civil Engineering Profession	1
HU/SS	Upper-Level Elective	3
EE 335	Electrical Engineering I	2
MA 412	Probability and Statistics	3
	Technical Electives	9
Total Credits		<u>30</u>
TOTAL DEGREE CREDITS		<u>128</u>

Civil Transportation Electives

CIV 447, 457, 499

Civil Structures Electives

CIV 431, 432, 499

Civil Geotechnical Electives

CIV 421, 422, 424, 499

Technical Electives

All CIV courses are acceptable. Other courses are to be selected from an approved list of courses maintained by the Civil Engineering program coordinator.

Up to 3 credits of Co-operative education may be used as Technical elective credits with department or Co-op advisor approval.

Computer Engineering

Bachelor of Science

The Bachelor of Science in Computer Engineering degree gives the student the opportunity to acquire a broad background in computer design, including embedded control systems, real-time systems, telecommunication systems, and software engineering. The curriculum includes courses in general education, computer science, software engineering, and electrical engineering, and features a capstone senior design. The program's emphasis on real-time embedded control systems and hardware/software interfaces provides program graduates employment opportunities beyond graduates of traditional computer engineering programs, including positions in the aerospace and defense industries.

The goal of the Computer Engineering program is to produce graduates who are successful practitioners of computer engineering. The detailed objectives of the program are that our graduates:

- Effectively analyze, design, and implement computer systems, including embedded, real-time, and safety-critical computer systems.
- Demonstrate professionalism in their work and grow professionally through continued learning and involvement in professional activities.
- Contribute to society by behaving ethically and responsibly.
- Communicate effectively in oral, written, and newly developing modes and media.
- Assume a variety of roles in teams of diverse membership.

The program curriculum is designed to facilitate accomplishment of these objectives by program graduates. The program includes significant project work designed to prepare students to work as part of a team on the development of complex systems involving both software and hardware. It allows the student opportunities to develop capabilities in teamwork, designing to requirements, and quality assurance techniques. The Computer Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (111 Market Place, Suite 1050, Baltimore, MD 21202-4012; Telephone: (410) 347-7700, <http://www.abet.org>).

Degree Requirements

The Bachelor of Science in Computer Engineering can be earned in eight semesters assuming appropriate background and full-time enrollment. Successful completion of a minimum of 127 credit hours is required. To enter this program, students should have demonstrated competence in mathematics, physics, and computer programming in high school, and they should be prepared to enter Calculus and Analytical Geometry I and Computer Science I. If necessary, students can prepare for the program by taking College Algebra (MA 140) and/or Trigonometry (MA 142) before taking Calculus and Analytic Geometry (MA 241). Students should check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

Academic Programs at the Daytona Beach Campus

FIRST YEAR

See Common Freshman Year outline on page 158.

Total Credits 32

SECOND YEAR

Course	Title	Credits
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Design Laboratory	1
CEC 320	Microprocessor Systems	3
CEC 322	Microprocessor Systems Laboratory	1
COM221	Technical Report Writing	3
CS 222	Introduction to Discrete Structures	3
EE 223	Linear Circuit Analysis I	3
EE 224	Electrical Engineering Laboratory I	1
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
CS 225	Computer Science II* (3 credits lecture, 1 credit lab) -OR-	4
COM 219	Speech*	3
Total Credits		34/33

* Students in the Computer Engineering program are encouraged to take CS 225 during the first year, postponing COM 219 until the second year.

THIRD YEAR

Course	Title	Credits
CEC 300	Computing in Aerospace and Aviation	3
CEC 330	Digital System Design with Aerospace Applications	4
CEC 315	Signals and Systems	3
CS 420	Operating Systems	3
EC 225	Engineering Economics	3
EE 302	Electronic Devices and Circuits	3
EE 304	Electronic Circuits Laboratory	1
HU/SS	Humanities/Social Sciences Elective	3
MA 412	Probability and Statistics	3
SE 300	Software Engineering Practices (3 credits lecture, 1 credit lab)	4
CEC 450	Real Time Systems	3
Total Credits		33

FOURTH YEAR

Course	Title	Credits
CEC 420	Computer Systems Design I (2 credits lecture, 1 credit lab)	3
CEC 421	Computer Systems Design II (1 credit lecture, 2 credit lab)	3
CEC 460	Telecommunication Systems	3
CEC 470	Computer Architecture	3
CEC/EE	3/4 Elective* (3 credit lecture, 1 credit lab)	4
	HU/SS 3/4XX Humanities or Social Sciences Elective (upper division)	3
	Specified Electives**	9
Total Credits		28
TOTAL DEGREE CREDITS		127

*EE 401/402, CEC 410/411, EE 410/412, other CEC/EE (300/400) with the approval of the program coordinator.

**Specified electives are courses to be selected, with the approval of the program coordinator, to support acquiring a minor, an identified concentration of domain knowledge (for example, aerospace, aviation, business, communications, human factors, mathematics, etc.) or further depth in computer engineering or related disciplines.

Academic Programs at the Daytona Beach Campus

Computer Engineering/Master of Software Engineering

Bachelor of Science / Master of Software Engineering

This is a five-year program that allows exceptional students to complete both a B.S. in Computer Engineering and a Master of Software Engineering degree. The objective of this five-year program, in addition to the objective for the Computer Engineering program, is to produce professional software engineers with advanced knowledge and skill in:

- Fundamentals of computing (discrete mathematics, programming languages, operating systems, computer architecture, and so on)
- Software systems development for real-time embedded applications
- Use of personal and team software processes
- Understanding the breadth of software engineering's terminology, tools, and techniques
- Use of requirements engineering and software architecture and design
- Use of modern software development methodologies (for example, object-oriented analysis and design)
- Software development in "real" work environments

Degree Requirements

Students interested in pursuing this program must meet the following requirements:

- Maintain at least a 3.2 cumulative GPA throughout the academic program.

- Maintain at least a 3.0 cumulative GPA for the graduate credits.
- Complete a total of 151 credit hours (listed in a subsequent section). There will be 124 credit hours of undergraduate requirements (equivalent to the B.S. in Computer Engineering) and 27 credit hours of graduate requirements (equivalent to a Master of Software Engineering degree).
- The program includes a requirement for two summer internships in the industry. Credit at the undergraduate and graduate level will be awarded for approved and successful work.

YEAR 1

See common Freshman Year outline on page 158.

Total Credits

32/33

YEAR 2

Course	Title	Credits
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Design Laboratory	1
CEC 320	Microprocessor Systems	3
CEC 322	Microprocessor Systems Laboratory	1
COM221	Technical Report Writing	3
CS 222	Introduction to Discrete Structures	3
EE 223	Linear Circuit Analysis I	3
EE 224	Electrical Engineering Laboratory I	1
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
CS 225	Computer Science II* (3 credits lecture, 1 credit lab) -OR-	4
COM 219	Speech*	3
Total Credits		34/33

* Students in the Computer Engineering program are encouraged to take CS 225 during the first year, postponing COM 219 until the second year.

Academic Programs at the Daytona Beach Campus

YEAR 3

Course	Title	Credits
CEC 300	Computing in Aerospace and Aviation	3
CEC 315	Signals and Systems	3
CEC 330	Digital System Design with Aerospace Applications	4
CEC 450	Real Time Systems	3
CS 420	Operating Systems	3
EC 225	Engineering Economics	3
EE 302	Electronic Devices and Circuits	3
EE 304	Electronics Circuits Laboratory	1
HU/SS	Humanities/Social Sciences Elective	3
MA 412	Probability and Statistics	3
SE 300	Software Engineering Practices (3 credits lecture, 1 credit lab)	4

Total Credits 32

SUMMER TERM (BETWEEN YEAR 3 AND YEAR 4)

Course	Title	Credits
CESE 4XX	Cooperative Education	3

Total Credits 3

The student must spend the term performing a co-op in a software industry and be engaged in a software engineering activity (such as analysis, design, code, or test).

YEAR 4

Course	Title	Credits
CEC 420	Computer Systems Design I (2 credit lecture, 1 credit lab)	3
CEC 421	Computer Systems Design II (1 credit lecture, 2 credits lab)	3
CEC 460	Telecommunication Systems	3
CEC 470	Computer Architecture	3
CEC/EE 3/4	Elective* (3 credit lecture, 1 credit lab)	4
HU/SS 3/4XX	Humanities or Social Sciences Elective (upper division)	3
SE 500	Software Engineering Concepts	3
SE 510	Software Project Management	3
SE 530	Software Requirements Engineering	3

Total Credits 28

FIVE-YEAR CE/MSE CURRICULUM

Summer Term (between YEAR 4 and YEAR 5)

Course	Title	Credits
CESE 5XX	Cooperative Education	3

Total Credits 3

The student must spend the term performing a co-op in a software industry and be engaged in a software engineering activity (for example, analysis, design, code, or test).

YEAR 5

SE 555	Object-Oriented Software Construction	3
SE 610	Software Architecture and Design	3
SE	Elective**	12

Total Credits 18

5 YEAR TOTAL 151

*CEC/EE 300/400 Level Elective

* EE 401/402, CEC 410/411, EE 410/412, other CEC/EE (300/400) with the approval of the program coordinator.

** Software Engineering 500/600 Level Elective

Course	Title	Credits
SE 520	Formal Methods for Software Engineering	3
SE 535	GUI Design and Evaluation	3
SE 545	Specification and Design of Real-Time Systems	3
SE 625	Quality Engineering and Assurance	3
SE 565	Concurrent and Distributed Systems	3
SE 575	Software Safety	3
SE 655	Performance Analysis of Real-Time Systems	3
SE 585	Metrics and Statistical Methods of Software Engineering	3
SE 660	Formal Methods for Concurrent and Real-Time Systems	3

While other elective courses may be selected, the student's advisor and the program coordinator must approve the selection.

Computer Science

Bachelor of Science

The curriculum for the Bachelor of Science degree in Computer Science includes courses in software development, computer organization, database systems, and software engineering. The program provides a blend of theory and applications that prepare students for a variety of computer science and software engineering positions in scientific and business fields, and lays the foundation for graduate studies in computer science and software engineering. The Computer Science program allows students interested in the area of computing to complement their computing knowledge with one other application area chosen from the different areas of concentration. There are three Areas of Concentration (AOC) to choose from: Applied Mathematics, Business Administration, and Human Factors. The courses in the Area of Concentration allow students to broaden their general education or pursue specific interests. Upper-level courses involve students in team projects that emphasize industrial processes and practices.

Applied Mathematics Area of Concentration

A Computer Science degree with an area of concentration in Applied Mathematics is designed to produce graduates who can operate at the intersection of applied mathematics, computer science, and a science application area. This degree program integrates computing, mathematical modeling,

and visualization to solve complex problems that arise in the physical, natural, and behavioral sciences as well as engineering. Students will have a very strong core of computing, as well as an in-depth exposure to numerical methods, modeling, and visualization. This background is synthesized and applied to computational models that arise in such areas as atmospheric physics, structural dynamics, or computational fluid dynamics in the capstone course.

Because of the strong emphasis on applied mathematics, computing tools, and science applications, this program provides an excellent background for graduates to work in a variety of aviation/aerospace or homeland security industries.

Business Administration Area of Concentration

A Computer Science degree with an Area of Concentration in Business Administration is designed to produce graduates who can operate at the intersection of Business Administration, Management, Computer Science, and Software Engineering. This program provides students with an in-depth knowledge associated with computing and management fundamentals. Graduates of this program have an opportunity to pursue graduate studies in computing or management, or careers in the computing industry, management, or entrepreneurship.

Academic Programs at the Daytona Beach Campus

Human Factors Area of Concentration

Human Factors is an interdisciplinary field that incorporates aspects of psychology, systems engineering, and computer science toward the improvement of the interface between operator and equipment. The intention is to improve designs to make them safer, more reliable, and easier to use for the system operator by understanding the capabilities and limitations of the operator.

A Computer Science degree with an Area of Concentration in Human Factors is designed to produce graduates who can operate at the intersection of human factors, computer science, and the quality assurance area. This degree program integrates computing, human factors, and software engineering. Students will have a very strong core of computing, as well as an exposure to in-depth human factors and quality assurance.

Degree Requirements

The Bachelor of Science degree can be earned in eight semesters assuming appropriate background and full-time enrollment. Successful completion of a minimum of 121 credit hours is required.

Students entering this program should have demonstrated a competence in mathematics and science (preferably physics). They should be prepared to enter Calculus I, having demonstrated proficiency in algebra and trigonometry. Students can prepare for this program by taking MA 140, College Algebra, and MA 142, Trigonometry, prior to taking MA 241.

The Computer Science program is

designed to prepare students to work as part of a team on the development of software systems. Software engineering concepts are integrated through the curriculum. The curriculum includes courses in general education, math science, and computing. The latter is divided into computing fundamentals, advanced concepts, applied computing, and software engineering. In addition, a student is required to select an area of concentration in a domain area of interest.

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

COMPUTER SCIENCE CORE

Course	Title	Credits
CEC 220	Digital Circuit Design	3
COM122	English Composition & Literature	3
COM219	Speech	3
COM221	Technical Report Writing	3
CS 222	Introduction to Discrete Structures	3
CS 225	Computer Science II	4
CS 315	Data Structures and Analysis of Algorithms.	3
CS 332	Organization of Programming Languages	3
CS 420	Operating Systems	3
EGR 101	Introduction to Engineering	2
EGR 115	Introduction to Computing for Engineers	3
HU 14X	Humanities	3
HU/SS	Upper-Level Electives	6
MA 241	Calculus I	4
MA 242	Calculus II	4
SE 300	Software Engineering	4
UNIV 101	College Success	1
Total Credits		55

Academic Programs at the Daytona Beach Campus

APPLIED MATHEMATICS

AREA OF CONCENTRATION

Course	Title	Credits
CEC 300	Computing in Aerospace and Aviation...	3
CS 344	C Programming and UNIX.....	3
CS 317	Files and Database Systems	3
CS 375	Algorithms.....	3
ES 312	Energy Transfer Fundamentals.....	3
HU/SS	Upper-Level Humanities.....	6
MA 243	Calculus III.....	4
MA 345	Differential Equations and Matrix Methods.....	4
MA 412	Probability and Statistics.....	3
MA 432	Linear Algebra.....	3
MA 350	Partial Differential Equations	3
MA 444	Scientific Visualization.....	3
MA 453	High Performance Scientific Computing ..	3
MA 488	Introduction to Numerical Fluids	3
MA 490	Capstone Project.....	3
PS 150	Physics for Engineers I.....	3
PS 160	Physics for Engineers II.....	3
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
WX 201	Survey of Meteorology.....	3
	Open Elective	3
Total Credits		66

BUSINESS ADMINISTRATION

AREA OF CONCENTRATION

Course	Title	Credits
BA 201	Principles of Management.....	3
BA 210	Financial Accounting	3
BA 220	Marketing.....	3
BA 225	Business Law.....	3
BA 317	Organizational Behavior	3
BA 325	Social Responsibility and Ethics in Management	3
BA 406	Strategic Management of Technical Operations	3
BA 422	Life Cycle Analysis for Systems and Programs in Aviation/Aerospace.....	3
BA 436	Strategic Management	3
CEC 300	Computing in Aerospace and Aviation...	3
CS 317	Files and Database Systems	3
CS 455	Artificial Intelligence	3
CS 490	Computer Science Capstone Design	3
EC 225	Engineering Economics	3
MA 222	Business Statistics	3
MA 245	Applied Differential Equations.....	3
MA 320	Decision Mathematics	3

PS	Science I*	3
PS	Science II*.....	3
PS	Science III* with Laboratory	4
SE 310	Analysis and Design of Software Systems.....	3
	Open Elective	3
Total Credits		67

HUMAN FACTORS AREA OF CONCENTRATION

Course	Title	Credits
CEC 300	Computing in Aerospace and Aviation...	3
CS 490	Computer Science Capstone Design	3
HF 210	Human Factors I: Principles and Fundamentals	3
HF 302	Human Factors II: Analytic Methods and Techniques	4
HF 305	Human Factors III: Test and Evaluation ..	4
HF 310	Human-Computer Interaction	3
HF 400	Human Factors IV: System Design	4
HF/PSY	Human Factors or Psychology Elective ..	3
MA 222	Business Statistics	3
MA 245	Applied Differential Equations.....	3
MA 320	Decision Mathematics	3
PS	Science I*	3
PS	Science II*	3
PS	Science III* with Laboratory	4
PSY 101	Introduction to Psychology	3
PSY 312	Research Analysis in Psychology	4
PSY 322	Research Design	4
SE 310	Analysis and Design of Software Systems.....	3
SE 320	Software Construction	3
SE 420	Software Quality Assurance	3
Total Credits		66

TOTAL DEGREE CREDITS

121/122

*Students may satisfy the science requirements by choosing one of the course sequences identified below.

- PS 150, PS 160, PS 250/253 -OR- PS 140/141

- PS 103/103L, PS 104/104L, PS 107/107L

- PS 107/107L, PS 111, PS 112

- Other combination of science topics may be approved by the program coordinator

Electrical Engineering

Bachelor of Science

The Bachelor of Science degree in Electrical Engineering provides the student with the opportunity to acquire a broad background in circuit theory, communication systems, computers, control systems, electromagnetic fields, energy sources and systems, and electronic devices. Emphasis on design places the Embry-Riddle Electrical Engineering student in a unique position to increase employment opportunities after graduation.

Three tracks are available in the Electrical Engineering program: Avionics, Systems, and Non-Track. The first year and a half are common, with a one course difference so students do not need to make a track decision until the beginning of their third year. The objectives of the Electrical Engineering degree are to produce graduates who:

- Are prepared to be immediately productive as well-rounded electrical engineers.
- Understand the importance of life-long learning and pursue professional development including advanced degrees and professional registration.
- Are able to systematically apply the fundamental principles of science and mathematics to solve engineering problems.
- Understand engineering design processes that will meet system and component requirements as well as comply with health and environmental regulations.
- Are effective at both oral and written communications.

- Work effectively within a team, in both supporting and leadership roles.
- Are able to apply their knowledge to real-world multidisciplinary challenges facing society.
- Are able to apply the latest tools and technology to engineering problems.
- Understand the impact of engineering solutions in a global, economic, environmental, political, social, and ethical context.

Degree Requirements

The Bachelor of Science in Electrical Engineering requires the successful completion of a minimum of 129 credit hours.

Aerospace Systems Track

The modern aircraft is an assembly of a wide spectrum of components, all operating together in a large and complex system. The aircraft then operates in the National Airspace System where it must operate in harmony with other aircraft, air traffic management, navigation, and safety systems, all at a reasonable cost. This example shows the importance of systems engineering and the broad range of subjects covered.

FRESHMAN YEAR

See the common Freshman Year outline on page [158](#)

Total Credits

32

Academic Programs at the Daytona Beach Campus

SOPHOMORE YEAR

Course	Title	Credits
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Design Laboratory	1
	- OR -	
COM219	Speech	3
CEC 320	Microprocessor	3
CEC 322	Microprocessor Laboratory	1
COM221	Technical Report Writing	3
CS 225	Computer Science II	4
EE 223	Linear Circuit Analysis	3
EE 224	Electrical Engineering Laboratory	1
MA 243	Calculus and Analytic Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
SYS 301	Introduction to Systems Engineering	3
Total Credits		33/34

JUNIOR YEAR

Course	Title	Credits
CEC 315	Signals and Systems	3
EC 225	Engineering Economics	3
EE 300	Linear Circuits II	3
EE 301	Linear Circuits Laboratory	1
EE 302	Electronic Devices	3
EE 304	Electronic Devices Laboratory	1
SYS 302	System Engineering Design Considerations	3
SYS 303	Optimization in Systems Engineering	3
SYS 304	Systems Engineering in Management, Risk, and Decision Making	3
HU/SS	Lower-Level Humanities	3
MA 412	Probability and Statistics	3
MA 441	Advanced Engineering Mathematics	3
Total Credits		32

SENIOR YEAR

Course	Title	Credits
EE 308	Introduction to Electrical Communications	3
EE 401	Control Systems Analysis & Design	3
EE 402	Control Systems Laboratory	1
EE XXX	Upper-Level Technical Elective	6
HU/SS	Upper-Level Elective	3
EE	Open Technical Elective	3
SYS 403	Systems Engineering Life Cycle Costing	3
SYS 405	Aerospace Systems, Guidance and Control	3
SYS 410	Space Systems and Mission Analysis	3
SYS 417	Senior Systems Engineering Project	3
Total Credits		31
TOTAL DEGREE CREDITS		128/129

Avionics Track

The Avionics track of the Electrical Engineering program provides preparation for students interested in the field of avionics. Fields of study include wired and wireless systems, digital communications, electromagnetics, high-frequency RF systems, and aeronautical navigation and communications systems. Students choosing the Non-Track option may replace EE 307 and EE 310 (Avionics I and II) with approved CEC/EE/MA/PS/SE 3/4 upper-level electives, and EE420/421 (Avionics Senior Design) with an approved senior design sequence.

FRESHMAN YEAR

See common Freshman Year outline on page 158

Total Credits **32**

SOPHOMORE YEAR

Course	Title	Credits
CEC 315	Signals and Systems	3
CEC 320	Microprocessor Systems	3
CEC 322	Microprocessor Systems Laboratory	1
COM221	Technical Report Writing	3
CS 225	Computer Science II	4
EE 223	Linear Circuits Analysis	3
EE 224	Electrical Engineering Laboratory I	1
MA 243	Calculus III	4
MA 345	Differential Equations and Matrix Methods	4
PS 250	Physics III	3
PS 253	Physics Laboratory for Engineers	1
SYS 301	Introduction to Systems Engineering	3
Total Credits		33

JUNIOR YEAR

Course	Title	Credits
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Design Laboratory	1
COM219	Speech	3
EC 225	Engineering Economics	3
EE 300	Linear Circuit Analysis II	3
EE 302	Electronic Devices and Circuits	3
EE 304	Electronic Circuits Laboratory	1
EE 307	Avionics I	3
EE 308	Introduction to Electrical Communications	3
EE 340	Electric and Magnetic Fields	3
MA 412	Probability and Statistics	3
MA 441	Advanced Engineering Mathematics	3
Total Credits		32

Academic Programs at the Daytona Beach Campus

SENIOR YEAR

Course Title	Credits
CEC 410 Digital Signal Processing	3
CEC 411 Digital Signal Processing Laboratory	1
CEC 460 Telecommunication Systems	3
EE 310 Avionics II	3
EE 401 Control Systems Analysis and Design	3
EE 417 Digital Communications	3
EE 420 Avionics Preliminary Design	3
EE 421 Avionics Detail Design	3
EE 430 Introduction to Radio Frequency Circuits	3
EE 430L Radio Frequency Circuits Laboratory	1
HU/SS Lower-Level	3
HU/SS Upper-Level	3
Total Credits	32
TOTAL DEGREE CREDITS	129

Non-Track Option

The non-track option of the Electrical Engineering program provides students the opportunity to pursue topics in their own areas of interest. Many fields of study are common with the Avionics track, including wired and wireless systems, digital communications, electromagnetics, and high-frequency RF systems.

FRESHMAN YEAR

See the common Freshman Year outline on page 158

Total Credits 32

SOPHOMORE YEAR

Course Title	Credits
CEC 315 Signals and Systems	3
CEC 320 Microprocessor Systems	3
CEC 322 Microprocessor Systems Laboratory	1
COM221 Technical Report Writing	3
CS 225 Computer Science II	4
EE 223 Linear Circuits Analysis	3
EE 224 Electrical Engineering Laboratory I	1
MA 243 Calculus III	4
MA 345 Differential Equations and Matrix Methods	4
PS 250 Physics III	3
PS 253 Physics Laboratory for Engineers	1
SYS 301 Introduction to Systems Engineering	3
Total Credits	33

JUNIOR YEAR

Course Title	Credits
CEC 220 Digital Circuit Design	3
CEC 222 Digital Circuit Design Laboratory	1
EC 225 Engineering Economics	3
EE 300 Linear Circuit Analysis II	3
EE 302 Electronic Devices and Circuits	3
EE 304 Electronic Circuits Laboratory	1
EE 308 Introduction to Electrical Communications	3
EE 340 Electric and Magnetic Fields	3
EE 417 Digital Communications	3
EE/CEC Upper-Level Elective	3
MA 412 Probability and Statistics	3
MA 441 Advanced Engineering Mathematics	3
Total Credits	32

SENIOR YEAR

Course Title	Credits
CEC 410 Digital Signal Processing	3
CEC 411 Digital Signal Processing Laboratory	1
EE/CEC/MA/PS Upper-Level Technical Elective	3
EE 401 Control Systems Analysis and Design	3
EE 420 EE Preliminary Design	3
EE 421 EE Detail Design	3
EE 430 Introduction to Radio Frequency Circuits	3
EE 430L Radio Frequency Circuits Laboratory	1
CEC 460 Telecommunication Systems	3
HU/SS Lower-Level	3
HU/SS Upper-Level	6
Total Credits	32
TOTAL DEGREE CREDITS	129

Mechanical Engineering

Bachelor of Science

Mechanical Engineering is a well-established engineering discipline that involves the state-of-the-art of engineering analysis, design, and research. Mechanical engineers have been in demand for literally hundreds of years and remain one of the more sought-after degree holders.

The common freshman year is the first year of the Mechanical Engineering program. The second year is the same as Aerospace Engineering, which gives the student great flexibility when deciding his or her major field of study.

The Mechanical Engineering program offers two areas of emphasis, or tracks, in High Performance Vehicle and Robotic Systems, which add to the breadth of topics in Mechanical Engineering such as machine design, heat transfer, and vibrations. The Robotic Systems track prepares students for the rapidly expanding robotics field, including applications to the aerospace industry. Attention is paid to the systems nature of robotics to include the integration of mechanics and electronics. The High Performance Vehicle track prepares students for employment in vehicle design and manufacturing, from competition vehicles to fuel-efficient and environmentally friendly vehicles. Subjects include aerodynamics, structures, and safety.

The objectives of the Mechanical Engineering degree are to produce graduates who:

- Are prepared to be immediately productive as well-rounded mechanical engineers in aerospace, aviation, and related fields.
- Are able to systematically apply the

fundamental principles of science and mathematics to solve engineering problems.

- Are effective at both oral and written communications.
- Work effectively within a team, in both supporting and leadership roles.
- Have exceptional backgrounds in engineering design that meet system, component, or process requirements and comply with health and environmental requirements.
- Are able to apply their knowledge to real-world multidisciplinary challenges facing society.
- Are able to apply the latest tools and technology to engineering problems.
- Understand the impact of engineering solutions in a global, economic, environmental, political, social, and ethical context.
- Understand the importance of life-long learning and pursue professional development, including advanced degrees and professional registration.

The curriculum is designed to accomplish the objectives with a base of engineering, math, and sciences that includes probability and statistics or numerical methods; engineering economics; advanced mathematics; electrical engineering; and engineering design. The culmination of the program is a two-semester design project that prepares the students for working in a team environment on projects involving mechanical engineering.

Academic Programs at the Daytona Beach Campus

FRESHMAN YEAR

See the common Freshman Year outline on page 121.

Total Credits 32

SOPHOMORE YEAR

Course Title	Credits
COM221 Technical Report Writing	3
COM219 Speech -OR-	
EGR 120 Engineering Graphics	3
ES 201 Statics	3
ES 202 Solid Mechanics	3
ES 204 Dynamics	3
ES 206 Fluid Mechanics	3
MA 243 Calculus III	4
MA 345 Differential Equations & Matrix Methods	4
PS 105 General Chemistry	4
PS 250 Physics III for Engineers	3
PS 253 Physics Laboratory for Engineers	1

Total Credits 34

JUNIOR YEAR

Course Title	Credits
EE 335 Electrical Engineering	2
EE 336 Electrical Engineering Laboratory	1
ES 305 Thermodynamics	3
ES 320 Engineering Materials	2
ES 321 Engineering Materials Laboratory	1
MA 412 Probability and Statistics	
-OR-	
MA 438 Numerical Analysis I	3
ME 304 Introduction to Machine Design	3
ME 305 Machine Design Laboratory	1
ME 303 Vehicle Dynamics (HPV)	
-OR-	
ME 306 Robotic Mechanisms (RS)	3
ME 401 Advanced Fluid Dynamics	3
ME 3/4XX Mechanical Engineering Elective	3
ME 400 Vibrations and Acoustics	3
ME 410 Advanced Machine Design	2

Total Credits 30

SENIOR YEAR (HIGH PERFORMANCE VEHICLES)

Course Title	Credits
EC 225 Engineering Economics	3
EE 401 Control Systems	3
ES 403 Heat Transfer	3
HU Upper-Level Humanities	3
ME 405 Vehicle Power Systems	3
ME 409 Vehicle Aerodynamics	3
ME 413 Preliminary Design of High Performance Vehicles w/Laboratory	4
ME 423 Senior Design of High Performance Vehicles	3
ME/EE/AE Technical Elective	3
ME/EE/AE Technical Elective	3

Total Credits 31

SENIOR YEAR (ROBOTICS SYSTEMS)

Course Title	Credits
EC 225 Engineering Economics	3
EE 401 Control Systems	3
ES 403 Heat Transfer	3
HU Upper-Level Humanities	3
ME 402 Robot Arms	3
ME 404 Mechatronics	3
ME 407 Preliminary Robotic Systems Design with Laboratory	4
ME 427 Senior Robotic Systems Design	3
ME/EE/AE Technical Elective	3
ME/EE/AE Technical Elective	3

Total Credits 31

TOTAL DEGREE CREDITS 127

Academic Programs at the Daytona Beach Campus

Master of Science in Mechanical Engineering

Master of Science

The Master of Science in Mechanical Engineering (MSME) program provides students advanced study in engineering with a specialization in Electro-Mechanical Systems. Students are prepared to design and implement electro-mechanical systems to fulfill the needs of a wide range of industries, including aerospace, aviation, automotive, and energy systems. Both thesis and non-thesis options are available, and each requires completion of 30 credits hours. In either option, the concentration area in Electro-Mechanical Systems requires students to complete 15 credit hours from a list of core courses. These core courses address both the theory and practical implementation of the electro-mechanical systems. Students are permitted to choose general electives offered within the College of Engineering and the College of Arts and Sciences that support the educational and/or research goals of the student, pending approval from the ME graduate program coordinator.

Degree Requirements

The Master of Science degree in Mechanical Engineering (MSME) provides student with advanced study in the concentration of Electro-Mechanical Systems. Students may choose to participate in a thesis or non-thesis program, each requiring 30 total credit hours. Students are required to submit a plan of study during their first semester in the graduate program, and course selections and changes must be approved by the graduate program coordinator.

Thesis Option:

Course	Title	Credits
	Electro-Mechanical Systems Electives . . .	15
	General Electives.	3
	Mathematics Elective	3
ME 700	Graduate Thesis	9
Total Credits		30

Non-Thesis Option:

Course	Title	Credits
	Electro-Mechanical Systems Electives . . .	15
	General Electives.	12
	Mathematics Elective	3
Total Credits		30

ELECTRO-MECHANICAL SYSTEMS ELECTIVES

Course	Title	Credits
EE 500	Digital Control Systems	3
EE 505	Advanced Mechatronics	3
CEC 510	Digital Signal Processing	3
ME 500	Clean Energy Systems	3
ME 503	Unmanned and Autonomous Vehicle Systems.	3
ME 506	Design for Manufacturing and Assembly	3
ME 508	Hydrogen and Hybrid Vehicle Systems . .	3
ME 510	Micro-Electrical Mechanical Systems . . .	3
SYS 500	Systems Engineering	3
Total Credits		15

GENERAL ELECTIVES

General Electives can be courses chosen from the Electro-Mechanical Systems electives above, and from appropriate graduate courses offered by the College of Engineering and the College of Arts and Sciences with program coordinator approval. Students may also obtain general elective credit for completing the graduate internship, ME 696 (3 credits).

MATHEMATICS ELECTIVE

Course	Title	Credits
MA 500	Level or higher.	3
Total Credits		3

Software Engineering

Bachelor of Science

The Bachelor of Science degree in Software Engineering is designed to prepare students for an entry-level software engineering position in industry that supports the design and implementation of software systems with the focus on real-time, embedded, and safety-critical applications. Such systems are critical in aviation, space, medicine, and other disciplines that rely on high-quality, dependable software. The objectives of the Software Engineering program are that our graduates:

- Effectively analyze, design, and implement software systems, including embedded, real-time, and safety-critical systems.
- Demonstrate professionalism in their work and grow professionally through continued learning and involvement in professional activities.
- Contribute to society by behaving ethically and responsibly.
- Communicate effectively in oral, written, and newly developing modes and media.
- Successfully assume a variety of roles in teams of diverse membership.

The curriculum is designed to facilitate accomplishment of these objectives by program graduates. It provides a broad education, including fundamental knowledge about computer software and hardware. It also allows graduates to work in a team environment and to recognize the value of collaborative effort. The program lays a foundation for lifelong learning, professional growth, and ethical and responsible behavior in society.

Degree Requirements

The Bachelor of Science degree can be earned in eight semesters assuming appropriate background and full-time enrollment. Successful completion of a minimum of 127 credit hours is required.

Students entering this program should have demonstrated a competence in mathematics and science (preferably physics). They should be prepared to enter Calculus I, having demonstrated proficiency in algebra and trigonometry. Students can prepare for this program by taking MA 140, College Algebra, and MA 142, Trigonometry, prior to taking MA 241. For those students who have not taken physics in high school, it is recommended that PS 103, Technical Physics I, be taken prior to PS 150.

The Software Engineering program is designed to prepare students to work as part of a team on the development of software systems. Software engineering concepts, methods, and techniques are integrated through the curriculum. The curriculum includes courses in general education, math and science, and computing. The latter is divided into computing fundamentals, advanced concepts, applied computing, and software engineering. In addition, a student can acquire a minor or a concentration in a domain area of interest. Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course descriptions at the back of this catalog before registering for classes to ensure requisite sequencing.

Academic Programs at the Daytona Beach Campus

The Software Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering Technology (111 Market Place, Suite 1050, Baltimore, MD 21202-4012, Telephone: (410) 347-7700, <http://www.abet.org>).

FIRST YEAR

See common Freshman Year outline on page 121.

Total Credits 32/33

SECOND YEAR

Course	Title	Credits
AS	120 Principles of Aeronautical Science	3
CEC	220 Digital Circuit Design	3
CEC	222 Digital Circuit Design Laboratory	1
CEC	320 Microprocessor Systems	3
CEC	322 Microprocessor Systems Laboratory	1
COM	221 Technical Report Writing	3
CS	222 Introduction to Discrete Structures	3
CS	315 Data Structures and Algorithms	3
PS	250 Physics III for Engineers	3
PS	253 Physics Laboratory for Engineers	1
SE	300 Software Engineering Practices (3 credits lecture, 1 credit lab)	4
CS	225 Computer Science II* (3 credits lecture, 1 credit lab) -OR-	4
COM	219 Speech*	3
Total Credits		<u>32/31</u>

* Students in the Software Engineering program are encouraged to take CS 225 during the first year, postponing COM 219 until the second year.

THIRD YEAR

Course	Title	Credits
CEC	470 Computer Architecture	3
CS	317 Files and Database Systems	3
CS	332 Organization of Programming Languages	3
CS	420 Operating Systems	3
EC	225 Engineering Economics	3
HU/SS	XXX Humanities/Social Sciences Elective	3
MA	3/4XX Math Elective**	3
MA	412 Probability and Statistics	3
SE	310 Analysis & Design of Software Systems	3
SE	320 Software Construction	3
CEC	450 Real Time Systems	3
Total Credits		<u>33</u>

FOURTH YEAR

Course	Title	Credits
CEC/CS/SE	3/4XX Elective	3
HU/SS	3/4XX Humanities/Social Sciences Elective (upper division)	3
	Open Elective	3
SE	410 Formal Software Modeling	3
SE	420 Software Quality Assurance & Testing	3
SE	450 Software Team Project I (2 credits lecture, 1 credit lab)	3
SE	451 Software Team Project II (1 credit lecture, 2 credits lab)	3
	Specified Electives***	9
Total Credits		<u>30</u>
TOTAL DEGREE CREDITS		<u>127</u>

** Math elective to be selected from an approved list of courses maintained by the program coordinator.

*** Courses to be selected, with the approval of the program coordinator, to support acquiring a minor, an identified concentration of domain knowledge (aerospace, aviation, business, communications, human factors, mathematics, etc.), or further depth in software engineering or related disciplines.

Software Engineering/Master of Software Engineering

Bachelor of Science

Master of Software Engineering

This is a five-year program that allows exceptional students to complete both the Bachelor of Science in Software Engineering (BSSE) and Master of Software Engineering (MSE) degrees.

The objective of this five-year program is to produce professional software engineers with advanced knowledge and skill in:

- Fundamentals of computing (discrete mathematics, programming languages, operating systems, computer architecture, and so on)
- Software systems development for real-time embedded applications
- Use of personal and team software processes
- Understanding the breadth of software engineering terminology, tools, and techniques
- Use of requirements engineering and software architecture and design
- Use of modern software development methodologies (such as object-oriented analysis and design)
- Software development in “real” work environments.

Students interested in pursuing this program must meet the following requirements:

- Maintain at least a 3.2 cumulative GPA throughout the academic program.
- Maintain at least a 3.0 cumulative GPA for the graduate credits.

- Complete a total of 151 credit hours (listed in a subsequent section). There will be 124 credit hours of undergraduate requirements (equivalent to the B.S. in Software Engineering) and 27 credit hours of graduate requirements (equivalent to a Master of Software Engineering degree).
- The program includes a requirement for two summer internships in the industry. Credit at the undergraduate and graduate level will be awarded for approved and successful work.

YEAR 1

See common Freshman Year outline on page 158

Total Credits 32/33

YEAR 2

Course	Title	Credits
AS 120	Principles of Aeronautical Science.....	3
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Design Laboratory	1
CEC 320	Microprocessor Systems	3
CEC 322	Microprocessor Systems Laboratory	1
COM221	Technical Report Writing.....	3
CS 222	Introduction to Discrete Structures	3
CS 315	Data Structures and Algorithms.....	3
PS 250	Physics III for Engineers	3
PS 253	Physics Laboratory for Engineers	1
SE 300	Software Engineering Practices (3 credits lecture, 1 credit lab).....	4
CS 225	Computer Science II* (3 credits lecture, 1 credit lab) -OR-.....	4
COM219	Speech.....	3
Total Credits		32/31

* Students in the Software Engineering program are encouraged to take CS 225 during the first year, postponing COM 219 until the second year.

Academic Programs at the Daytona Beach Campus

YEAR 3

Course Title	Credits
CEC 450 Real Time Systems	3
CEC 470 Computer Architecture	3
CS 317 Files and Database Systems	3
CS 332 Organization of Programming Languages	3
CS 420 Operating Systems	3
EC 225 Engineering Economics	3
HU/SS XXX Humanities/Social Sciences Elective . . .	3
MA 3/4XX Math Elective*	3
MA 412 Probability and Statistics	3
SE 310 Analysis and Design of Software Systems	3
SE 320 Software Construction	3
Total Credits	33

* Math elective to be selected from an approved list of courses maintained by the program coordinator.

SUMMER TERM (BETWEEN YEAR 3 AND YEAR 4)

Course Title	Credits
CESE 4XX Cooperative Education	3
Total Credits	3

The student must spend the term performing a co-op in a software industry and be engaged in a software engineering activity such as analysis, design, code, or test.

YEAR 4

Course Title	Credits
CEC/CS/SE 3/4XX Elective	6
HU/SS 3/4XX Humanities/Social Sciences Elective (Upper-Level)	3
SE 500 Software Engineering Concepts	3
SE 530 Software Requirements Engineering	3
SE 625 Quality Engineering and Assurance	3
SE 410 Formal Software Modeling	3
SE 450 Software Team Project I (2 credits lecture, 1 credit lab)	3
SE 451 Software Team Project II (1 credit lecture, 2 credits lab)	3
Total Credits	30

SUMMER TERM (BETWEEN YEAR 4 AND YEAR 5)

Course Title	Credits
CESE5XX Cooperative Education	3
Total Credits	3

The student must spend the term performing a co-op in a software industry and be engaged in a software engineering activity such as analysis, design, code, or test.

YEAR 5

Software Engineering 500-600 Level Elective**

Course Title	Credits
SE 510 Software Project Management	3
SE 610 Software Architecture and Design	3
SE Elective**	12
Total Credits	18

5 YEAR TOTAL

151

**Electives

Course Title	Credits
SE 520 Formal Methods for Software Engineering	3
SE 535 GUI Design and Evaluation	3
SE 545 Specification and Design of Real-Time Systems	3
SE 565 Concurrent and Distributed Systems	3
SE 575 Software Safety	3
SE 655 Performance Analysis of Real-Time Systems	3
SE 585 Metrics and Statistical Methods of Software Engineering	3
SE 660 Formal Methods for Concurrent and Real-Time Systems	3

While other elective courses may be selected, the student's advisor and the program coordinator must approve the selection.

*Master of Software Engineering (MSE)**

Master of Software Engineering

Introduction

The Master of Software Engineering (MSE) degree program is designed to give recent college graduates, or college graduates who have had several years of professional life, an opportunity to enhance their careers and work on the cutting-edge of modern software development. Software engineers who complete the program can rapidly assume positions of substantial responsibility in a software development organization.

The MSE degree program achieves its purpose by providing students not only with the technical tools and techniques of the field but also with skills in communication, group interaction, management, and planning. The program emphasizes a process-centered quantitative approach to the engineering of software systems. The goal of the program is to give graduates an in-depth understanding of the tools, techniques, and appropriate processes for the management of software development, elicitation and analysis of requirements, architecture and design, implementation, and verification and validation of software systems. In addition, the program pays special attention to the issues related to communication and teamwork.

A special emphasis is on real-time embedded software systems encountered in such applications as the FAA air traffic control computer system, aircraft avionics, NASA's

space station, and others. In addition, the MSE curriculum takes full notice of the Software Engineering Institute's (SEI) capability maturity model (CMM) by incorporating the key practices throughout the coursework.

The curriculum is structured into two groups of courses: core (18 credits) and specified electives (12 credits). As part of the core, each MSE student must complete a "capstone experience," which entails a major project that involves applications of the theory, practices, and technology studied in the other core courses. Typically students will take SE 69X to satisfy the capstone experience. In special cases, the capstone experience can be satisfied by completing a Graduate Research Project (SE 690). In such cases and prior to registering for SE 690, a faculty member must agree to be a GRP advisor and the student must obtain approval of a GRP research area.

Courses available as specified electives include metrics and statistical methods for software engineering, performance analysis of software systems, concurrent and distributed systems, software safety, and formal methods for software engineering.

* A five-year Computer Engineering/Master of Software Engineering program and a five-year Software Engineering/Master of Software Engineering program are available. See the undergraduate catalog for details.

Academic Programs at the Daytona Beach Campus

Degree Requirements

Students must complete 18 credit hours of core courses.

Course	Title	Credits
SE 500	Software Engineering Discipline	3
SE 510	Software Project Management	3
SE 530	Software Requirements Engineering	3
SE 555	Object-Oriented Software Construction	3
SE 610	Software Systems Architecture and Design	3
SE 697	Software Engineering Practicum	
	-OR-	
SE 690	Graduate Research Project	3
	Specified Electives	12
Total		30

Students must complete 12 credit hours from the following list of courses:

Course	Title	Credits
SE 505	Model-Based Verification of Software	3
SE 520	Formal Methods for Software Engineering	3
SE 535	Graphical User Interface Design and Evaluation	3
SE 565	Concurrent and Distributed Systems	3
SE 675	Software Safety	3
SE 545	Specification and Design of Real-Time Systems	3
SE 550	Current Trends in Software Engineering	3
SE 580	Software Process Definition and Modeling	3
SE 585	Metrics and Statistical Methods for Software Engineering	3
SE 590	Graduate Seminar	3
SE 625	Software Quality Engineering and Assurance	3
SE 655	Performance Analysis of Real-Time Systems	3
SE 660	Formal Methods for Concurrent and Real-Time Systems	3
SE 699	Special Topics in Software Engineering	3

Note: Other electives may be authorized based on the student's background, program of study, performance during the MSE, and approval of the MSE program coordinator.

MINOR COURSES OF STUDY

Minor courses of study are academic programs designed to satisfy students' personal interests and to meet their professional needs. Students explore, in some depth, the offerings in a field of study. A minor course of study provides the student with significant experience in a discipline organized around skills, methodology, and subject matter.

A minor program does not provide the depth of knowledge and experience as a major. All minors consist of 15-24 hours of coherent academic coursework. At least six hours must be fulfilled at the upper level. In addition, at least six hours of coursework applied to a minor must be completed at Embry-Riddle and at least three of those hours completed in residence must be at the upper-level. Students must earn a 2.00 GPA or higher in the minor to complete that program of study successfully. Some minor courses of study are not open to

students pursuing particular degree programs or areas of concentration. A minor must be in a discipline outside of the student's major field of study.

To gain the greatest value from their academic experiences, students are encouraged to select minors that complement their degree program and/or other minors they are pursuing. Students are encouraged to declare a minor by the beginning of their senior year. Designed to include a minimum number of required courses, minors provide students, whenever possible, with flexibility in fulfilling program requirements. No more than two substitutions (six hours) are permitted in any one minor or in any combination of multiple minors. A student who seeks three minors could have two substitutions in one minor, or one substitution in two of the three minors.

The following minors are offered at the Daytona Beach Campus.

- Aeronautical Studies
- Aerospace Electronics
- Aerospace Life Sciences
- Air Traffic Control
- Applied Meteorology
- Asian Studies
- Astronomy
- Aviation Law
- Aviation Maintenance Science
- Aviation Safety
- Avionics Line Maintenance
- Business Administration
- Communication
- Computer Aided Design/
Computer Aided
Manufacturing
- Computer Science
- Environmental Studies
- Flight
- Flight Test and Simulation
- High Performance Vehicle
- Homeland Security
- Human Factors
- Humanities
- Industrial Safety
- Information Technology
- International Relations
- Mathematics
- Physics
- Psychology
- Secondary Education
- Space Studies

Minor Courses of Study

Minor in Aeronautical Studies

This minor will allow students in non-Aeronautical Science degree programs an increased exposure to advanced aviation knowledge by taking a sequence of 18 hours of mostly upper-level Aeronautical Science courses and acquire credit for a minor. No more than nine of the 18 hours required for this minor can come from courses required for the student's degree. A minor in Aeronautical Studies can be earned by successfully completing six of the following:

Course	Title	Credits
AS 254	Aviation Legislation	3
AS 309	Aerodynamics	3
AS 310	Aircraft Performance	3
AS 311	Aircraft Engines - Turbine	3
AS 356	Aircraft Systems and Components	3
AS 357	Flight Physiology	3
AS 350	Domestic and International Navigation	3
AS 402	Airline Operations	3
AS 405	Aviation Law	3
AS 408	Flight Safety	3
AS 410	Airline Dispatch Operations	3
AS 411	Jet Transport Systems	3
AS 420	Flight Technique Analysis	3
Total Credits Required		18

Minor in Aerospace Electronics

The minor in Aerospace Electronics provides a knowledge of digital electronics and its application to aviation and space electronics systems. The minor is not open to students enrolled in the Bachelor of Science degree in Aerospace Electronics or the Aerospace Electronics Area of Concentration in the Bachelor of Science degree in Aviation Maintenance Science. A minor in Aerospace Electronics can be earned by successfully completing the following:

Course	Title	Credits
AS 358	Advanced Avionics	3
EL 107	Direct and Alternating Current Fundamentals and Circuit Analysis	4
EL 108	Direct and Alternating Current Laboratory	1

EL 212	Digital Circuit and Systems Analysis	4
EL 213	Digital Circuit Laboratory	1
EL 307	Microprocessor Systems	3
EL 308	Microprocessor Systems Laboratory	1
Total Credits Required		17

Minor in Aerospace Life Sciences

An interdisciplinary program of study that provides fundamental knowledge of general biology, and a more advanced knowledge of life sciences in aviation and aerospace applications. Of the 16 credit hours required for this minor, four must be earned with Elements of Biological Science (PS 107, 3 credits) and Biological Science Laboratory (PS 107L, 1 credit). The remaining 12 credits can be earned with any combination of other courses from the listing below:

Course	Title	Credits
AS 357	Flight Physiology	3
HF 321	Drugs in Society and Aerospace	3
HF 326	Human Performance in Extreme Environments	3
PS 107	Elements of Biological Science	3
PS 107L	Biological Science Laboratory	1
PS 142	Environmental Sciences	3
PS 309	Principles of Ecology	3
PSY 310	Sensation and Perception	3
PSY 335	Physiological Psychology	3
SF 315	Environmental Compliance	3
SF 355	Industrial Hygiene and Toxicology	3
Total Credits Required		16

Minor in Air Traffic Control*

The Air Traffic Control (ATC) minor provides the fundamental traffic controller knowledge and technical competency through a mix of classroom instruction, computer-based instruction, and realistic ATC laboratory simulations. Embry-Riddle has a formal partnership agreement with the FAA that designates the University as an FAA-approved air traffic control training school. This partnership ensures that the learning objectives and the standards of student achievement are rel-

Minor Courses of Study

evant to the needs of the FAA. To qualify for the ATC minor, students must successfully complete the required prerequisites, listed below, and the four ATC courses.

Course	Title	Credits
AT 200	Air Traffic Management I	3
AT 305	Air Traffic Management III	3
AT 315	VFR Tower	3
AT 401	Air Traffic Management IV	3
AT 405	Air Traffic Management V	3
WX 201	Survey of Meteorology	3
Total Credits Required		18

* Although AT 302 is not required for the ATC minor, those students who would like to be recommended for employment as an FAA Air Traffic Controller must also take AT 302.

Minor in Applied Meteorology

The minor in Applied Meteorology introduces the student with an interest in weather to the intriguing world of meteorology. The minor requires nine hours of WX courses beyond the two required courses, WX 201 and WX 301 (WX 352 in older catalogs), a total of 15 hours of WX courses. Six hours of these classes must be higher numbered classes than WX 301. Always check the catalog course descriptions for prerequisites.

Course	Title	Credits
WX 201	Survey of Meteorology	3
WX 301	Aviation Weather	3

Recommended Electives for flight students:

WX 261	Applied Climatology	3
WX 363	Thunderstorms	3
WX 364	Weather for Aircrews	3
WX 365	Satellite and Radar Weather Interpretation	3
	Or any combination of WX courses	9

Total Credits Required **15**

Minor in Asian Studies

The Asian Studies minor introduces students to the cultures, histories, and languages of Asian countries, and to cross-cultural comparisons between the United States and Asia.

Students can earn the minor by successfully completing at least 18 related credit hours. At least nine of those 18 credit hours must be earned in residence at Embry-Riddle. These 18 credits can be earned from the following options:

Option 1: Complete all 18 credits hours from the list of Asian Studies courses below.

Option 2: Transfer up to nine credits in an Asian language or from Asian Studies courses, and earn nine Asian Studies credits from Embry-Riddle.

Course	Title	Credits
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One of the following is required:

SS 110	World History	3
HU 145	Themes in Humanities	3

All of the following are required:

LCH 101	Mandarin Chinese	3
LCH 102	Mandarin Chinese II	3
LCH 201	Mandarin Chinese III	3
-OR-		
HU 199	Special Topics in Humanities	3

Choose two of the following:

HU 300	World Literature	3
SS 333	U.S. - Asian Relations	3
SS 325	International Studies	3
HU 399	Special Topics in Humanities	3

Total Credits Required **18**

Minor in Astronomy

Students may earn a minor in Astronomy by successfully completing one of the following two options:

Option 1:

Course	Title	Credits
PS 215	Physics I	3
PS 216	Physics I Laboratory	1
PS 208	Physics II	3
PS 219	Physics III	3
PS 220	Physics III Laboratory	1
PS 301	Astronomy	3
PS 303	Modern Physics	3
PS 305	Modern Physics Laboratory	1
EP 425	Observational Astronomy	3

Minor Courses of Study

PS 401 Astrophysics	3
-OR-	
EP 420 Planetary Science	3
Total Credits Required	24

Option 2:

Course Title	Credits
PS 150 Physics I for Engineers	3
PS 160 Physics II for Engineers	3
PS 250 Physics III for Engineers	3
PS 253 Physics Laboratory for Engineers	1
PS 301 Astronomy	3
PS 303 Modern Physics	3
PS 305 Modern Physics Laboratory	1
EP 425 Observational Astronomy	3
PS 401 Astrophysics	3
-OR-	
EP 420 Planetary Science	3
Total Credits Required	23

Minor in Aviation Law

The minor in Aviation Law introduces those students with an interest in aviation law to explore various aviation-related legal disciplines. The minor requires the student to take AS 405 and AS 414 and then an additional nine hours for a total of 15 credit hours. The remaining nine hours can be earned with any combination of other courses as listed below.

Required Courses:

Course Title	Credits
AS 405 Aviation Law	3
AS 414 Aviation and the Administrative Law Process	3

AND any three of the following:

AS 254 Aviation Legislation	3
AS 312 Ethics in the Aviation Environment	3
BA 225 Business Law	3
BA 322 Aviation Insurance	3
SF 462 Health, Safety, and Aviation Law	3
Total Credits Required	15

Minor in Aviation Maintenance Science

The minor in Aviation Maintenance Science leads to the student becoming a Federal Aviation Administration certified Airframe and Powerplant technician. The A&P certification is required to successfully complete this minor. This technical certification is a valuable addition to many of the other degrees offered on the Daytona Beach Campus. Twenty-four credit hours of coursework from the Aviation Maintenance Science Department count toward the minor, but up to an additional 24 credit hours of AMS courses will be needed for A&P certification. A minimum of six credit hours, up to a maximum of 12 credit hours, will be upper-division (300-level) credit. Check the catalog information on the bachelor degree in Aviation Maintenance Science for the full listing of courses.

Credits awarded for the AMS minor: 24

Minor in Aviation Safety

This minor has a strong aviation focus. Through relevant course selection, students may either concentrate on aircraft accident investigation or aviation safety management.

Course Title	Credits
SF 210* Introduction to Aerospace Safety -OR-	
SF 201* Introduction to Health, Occupational, and Transportation Safety	3
SF 320 Human Factors in Aviation Safety	3

AND any three of the following:

Course Title	Credits
SF 330 Aircraft Accident Investigation	3
SF 335 Mechanical and Structural Factors in Aviation Safety	3
SF 341 Safety and Security of Airport Ground Operations	3
SF 345 Safety Program Management	3
SF 350 Aircraft Crash and Emergency Management	3

Minor Courses of Study

SF	375	Propulsion Plant Investigation	3
SF	435	Aircraft Crash Survival Analysis and Design	3
SF	445	System Safety in Aviation	3
SF	399/499	Special Topics in Aviation Safety	3
Total Credits Required			15

*AS 408 may be substituted for SF 210/SF 201 in this minor.

NOTE: SF 345, SF 330, and SF 341 can be used for either the Aviation Safety minor OR Industrial Safety minor, but NOT both.

Minor in Avionics Line Maintenance

For the student interested in working in an aircraft line maintenance environment, the Aviation Maintenance Science Department offers this minor in order to prepare the student for working with today's complex electronic aircraft. The student will gain a working knowledge of the intricacies of avionics line maintenance from general aviation to air transport through classroom theory and lab projects. Avionics line maintenance is becoming a heavily demanded skill that aircraft technicians today must be capable of accomplishing. To bring about the high quality of maintenance required by the industry, avionics line technicians have to be knowledgeable in terrestrial and satellite navigation systems, airborne and onboard communication systems, surveillance systems, auto flight systems, glass flight deck installations, and the integration of all of these systems.

The Avionics Line Maintenance Minor is offered through the Aviation Maintenance Science Department. The courses that make up the minor are as follows:

Course Title	Credits
AMS 112 Fundamentals of Electricity	3
AMS 121 Electrical Power Systems I	2
AMS 243 Electrical Power Systems II	3
AMS 380 Radio Communication Theory and Application	2

AMS	384	General Aviation Avionics Systems Integration	4
AMS	388	Air Transport Avionics Systems	6
Total Credits Required			20

Minor in Business Administration

Students may earn a minor in Business Administration by successfully completing the following. This minor is not open to students pursuing degrees offered by the College of Business.

Course Title	Credits
BA 201 Principles of Management	3
EC 200 An Economic Survey -OR-	
EC 210 Microeconomics	3
BA 210 Financial Accounting	3
BA 220 Marketing	3
BA 332 Corporate Finance I	3
Specified Elective*	3
Total Credits Required	18

*Any Upper-Level BA/EC not required.

Minor in Communication

The minor in Communication encourages an appreciation of communication as the basis of shared meaning, provides interpersonal competencies that benefit students in any workplace, and offers advanced coursework in Communication required in high-skill, high-wage jobs. Students may earn a minor in Communication by successfully completing 15 credit hours, comprising six credits of required coursework and nine credits chosen from specified electives, as seen below.

Course Title	Credits
COM225 Science and Technology Communication	3
COM265 Introduction to News Writing	3
Specified Electives*	9
Total Credits Required	15

*Specified Electives

Minor Courses of Study

Course	Title	Credits
COM230	Digital Photography	3
COM260	Introduction to Media	3
COM268	Introduction to Sports Writing	3
COM320	Mass Communication Law and Ethics	3
COM322	Aviation and Aerospace Communication.	3
COM350	Environmental Communication.	3
COM360	Media Relations I	3
COM364	Visual Design.	3
COM410	Advanced Professional Writing	3
COM411	Web Design Workshop.	3
COM412	Advanced Technical Writing.	3
COM415	Nonverbal Communication.	3
COM460	Media Relations II.	3
HU 319	Advanced Speech	3
HU 361	Interpersonal Communication	3
HU 362	Communication and Organizational Culture	3
HU 363	Communication and Society.	3
HU 375	Nature of Language	3
HU 420	Applied Cross-Cultural Communication.	3

Minor in Computer Aided Design/ Computer Aided Manufacturing

Students may earn a minor in Computer Aided Design/Computer Aided Manufacturing by successfully completing the following:

Course	Title	Credits
EGR 120	Graphical Communications	3
EGR 305	Advanced CATIA.	3
	-OR-	
CS 335	Introduction to Computer Graphics	3
ME 304	Introduction to Machine Design.	3
ME 424	Automation and Rapid Prototyping	3
ME 428	Design for Manufacturing and Assembly	3
Total Credits Required		15

Minor in Computer Science

Students may earn a minor in Computer Science by successfully completing the following:

Course	Title	Credits
EGR 115	Introduction to Computing for Engineers	3
CS 225	Computer Science II	4
SE 300*	Software Engineering Practices	4/3
XX 300-400**	CS/SE/CEC Electives.	6
Total Credits Required		17

* SE 300 is a variable credit course. Students receive 4 credits (3 credit lecture, 1 credit laboratory).

** XX 300-400. In addition to any 300-400 level CS/SE/CEC electives, students may take ES 405 or any computer-related course approved by the Computer and Software Engineering Department.

Minor in Environmental Studies

This course sequence is an interdisciplinary program designed to provide a fundamental knowledge of the natural environment and the dimensions of human impacts. It provides in-depth analysis of the relationship between the environment, culture, and law. Furthermore, it supplies knowledge about major environmental issues surrounding technology and technical careers. Not open to AES-Environment students.

Course	Title	Credits
COM350	Environmental Communication -OR-	
SS 360	Environmental Law	3
PS 107	Elements of Biological Science	3
PS 101	Basic Chemistry -OR-	
PS 105	General Chemistry I -OR-	
PS 108	Contemporary Chemistry -OR-	
PS 140	Chemistry for Engineers	3/4
PS 142	Introduction to Environmental Science.	3
PS 304	Environmental Science -OR-	
PS 309	Principles of Ecology	3
Total Credits Required		15-16

Minor in Flight

The Flight minor incorporates the courses required to obtain the FAA commercial pilot certificate with instrument and multi-engine ratings. In addition to the required flight courses, rigorous academic classes are included to provide professional pilot education in excess of the minimum FAA requirements for the associated FAA certificates. Included is instruction in CRM, team building, resource management, communication skills, and other topics associated with piloting multi-engine aircraft at the commercial level.

Course	Title	Credits
AS 121	Private Pilot Operations	5
AS 221	Instrument Pilot Operations	3
AS 321	Commercial Pilot Operations	3
	Upper-Level AS Course	3

-AND-

SINGLE-ENGINE FLIGHT TRACK*

FA 121	Private Single Flight	1
FA 221	Instrument Single Flight	1
FA 321	Commercial Single Flight	1
FA 323	Commercial Multi Add On	1

-OR-

MULTI-ENGINE FLIGHT TRACK*

FA 121	Private Single Flight	1
FA 122	Private Multi Flight with Laboratory	1
FA 222	Instrument Multi Flight	1
FA 322	Commercial Multi Flight	1

Total Credits Required 18

*See the Advanced Standing section in the University Academic Regulations and Procedures and the Aeronautical Science Notes under the Aeronautical Science degree sections of this catalog for information pertaining to these courses and the awarding of credit for previously earned FAA certificates, and an explanation of the single-engine and multi-engine flight tracks.

Minor in Flight Test and Simulation

The minor in Flight Test and Simulation is an interdisciplinary minor that draws on many different majors fields of study with the commonality of aviation as a focal point.

This minor has been designed to be available to almost all University majors by the selection of the proper coursework. Typical major fields of study include but are not limited to Aerospace Engineering, Aeronautical Science, Human Factors, and Engineering Physics. Students may earn a minor in Flight Test and Simulation by completing 15 credits.

All of the following are required:

Course	Title	Credits
SIM 200	Aviation Simulation Systems	3
AE 413	Airplane Stability and Control	
	-OR-	
HF 310	Human Computer Interaction	
	-OR-	
AS 340	Instructional Design in Aviation	3
SIM 410	Flight Test and Simulation	3
Total Credits		<u>9</u>

Choose two courses (6 credits) from the following technical electives:

SIM 400	Instrumentation for Flight Test	3
SIM 402	Introduction to Flight Testing	3
SIM 404	Fly-By-Wire Aircraft Simulation and Design	3
	-OR-	
AE 432	Flight Dynamics and Control	3
SIM 405	Simulation Visual Systems	3
SIM 406	Aviation Simulation Systems Integration	3
HF 415	Human Factors and Simulation Systems	3
Total Credits Required		<u>15</u>

Minor in High Performance Vehicles

This minor introduces students to High Performance Vehicles. The following topics are covered: suspension design, aerodynamics of race cars, advanced drive systems (such as hybrid electric drives, fuel cells, and high-power engines), and vehicle dynamics and safety systems. Special topics courses on research and student projects related to the minor may be available. This minor is not available to students in the High Performance Vehicle Track of Mechanical Engineering.

Minor Courses of Study

Course	Title	Credits
ME 303	Vehicle Dynamics	3
ME 304	Introduction to Machine Design.	3
	-OR-	
AE 316	Aerospace Engineering Materials	3
ME 400	Vibrations and Acoustics.	3
	-OR-	
ME 405	Vehicle Power Systems.	3
ME 409	Vehicle Aerodynamics	3
AE 430	Control Systems Analysis and Design.	3
Total Credits Required		15

Minor in Homeland Security

This minor has a strong focus on protecting the nation's transportation infrastructure and planning for, responding to, and emergency management of events dealing with acts of terrorism and natural and man-made disasters. This minor complements degrees in safety, aeronautical science, airport management, communication, human factors, aeronautics, business, or aerospace studies. This minor requires 15 credit hours of the following courses:

Course	Title	Credits
HS 201	Introduction to Homeland Security.	3
HS 301	Fundamentals of Transportation Security 3	
HS 302	Fundamentals of Occupational Security	
	-OR-	
SF 311	Industrial Security	3
HS 306	Legal and Investigative Issues of Security	
	-OR-	
HS 307	Law Enforcement of Security	3
HS 401	Fundamentals of Emergency Management	3
Total Credits		15

Minor in Human Factors

Students may earn a minor in Human Factors by successfully completing the two specified courses and an additional three courses from the following list, totaling 15 credit hours.

Specified Courses:

Course	Title	Credits
PSY 101	Introduction to Psychology.	3
	- AND -	
HF 201	Introduction to Human Factors	3
	-OR-	
HF 210	Human Factors I: Principles and Fundamentals	3

Three of the following courses are also required:

Course	Title	Credits
HF 310	Human Computer Interaction	3
HF 312	Ergonomics and Bioengineering	3
HF 315	Automation and Systems Issues in Aviation	3
HF 325	Human Factors and System Safety	3
HF 330	Human Factors in Space	3
HF 335	Human Factors in Air Traffic Control	3
HF 340	Human Factors and Product Liability.	3
HF 410	Human Factors in Crew Station Design	3
HF 412	Simulating Humans in Complex Systems	3
HF 415	Human Factors in Simulation Systems.	3
HF 422	Applied Ergonomic Design, Analysis, and Evaluation	3
SF 320	Human Factors in Aviation Safety.	3

Total Credits Required

15

Minor in Humanities

Students may earn a minor in Humanities by successfully completing 18 hours. Within those 18 hours, students must select two courses from the HU 140-146 series for a subtotal of 6 credits.

Additionally, students must complete four courses selected from the list below for a subtotal of 12 credits. Note that at least one course from the following must be completed: HU 300, HU 305, and/or HU 310.

Course	Title	Credits
HU 300	World Literature	3
HU 302	Contemporary Issues in Science.	3
HU 305	Modern Literature	3
HU 310	American Literature	3
HU 316	Studies in Music	3
HU 321	Mythology	3
HU 325	Exploring Film.	3
HU 330	Values and Ethics	3
HU 335	Technology and Modern Civilization	3
HU 338	Traversing the Borders: Interdisciplinary Explorations	3

Minor Courses of Study

HU 341 World Philosophy	3
HU 345 Comparative Religions.	3
HU 355 Creative Writing	3
Total Credits Required	18

HU 395/495, experimental courses in the humanities, and 399/499, Special Topics in Humanities, may be included in the minor with advance permission of the department chair.

Minor in Industrial Safety

This minor exposes students to the broader field of safety. While focusing on managing safety under OSHA and EPA regulations which all business (aviation and non-aviation) in the United States must adhere to, this minor also covers safety programs required by the FAA. Students receive an OSHA 30-hour safety certificate after completing the requirements for this minor.

Required Courses

Course	Title	Credits
SF 201	Introduction to Health, Occupational, and Transportation Safety	3
SF 355	Industrial Hygiene and Toxicology	3
SF 410	Design of Engineering Hazard Controls	3

AND any two of the following:

SF 315	Environmental Compliance and Safety.	3
SF 320	Human Factors in Aviation Safety	3
SF 330	Aircraft Accident Investigation	3
SF 341	Safety and Security of Airport Ground Operations	3
SF 345	Safety Program Management	3
SF 365	Fire Protection	3
SF 399/499	Special Topics in Safety	3

Total Credits Required	15
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NOTE: SF 345, SF 341, and SF 330 can be used for either the Aviation Safety minor OR Industrial Safety minor, but NOT both.

Minor in Information Technology

NOTE: New students are not being accepted into this minor.

The Information Technology minor includes a core that provides basic knowledge and understanding of computer programming, the World Wide Web, and computer

networks. The core provides the foundation for a student to pursue one of two tracks: the Webmaster track or the Network Administration track. The Webmaster track prepares a student to work in the development and administration of an Internet Web site. The Network Administration track prepares a student to work as a system administrator of a computer network.

Core

Course	Title	Credits
CS 118	Fundamentals of Computer Programming (or other programming courses such as EGR 115 or CS 125).	3
IT 210	Web Page Authoring and Design.	3
IT 220	Introduction to Networking	3

Elective (one course from the following):

BA 320	Business Information Systems -OR-	
COM411	Publishing on the Internet -OR-	
CS/CEC	Approved CS/CEC elective -OR-	
HF 310	Human-Computer Interaction	3

Total Credits	12
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Track 1: Information Technology - Webmaster

IT 310	Web Site Management	3
IT 330	Programming for the Web	3

Total Credits	6
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Track 2: Information Technology - Network Administration

IT 320	Network Configurations	3
IT 340	WAN Theory and Design	3

Total Credits	6
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TOTAL CREDITS REQUIRED	18
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Minor in International Relations

The minor in International Relations provides students with both exposure to foreign cultures and an understanding of the complex interactions between the United States and the world. The minor benefits students by preparing them to pursue either careers in the global workplace or government, or to pursue graduate work in a variety of fields including history and business.

Minor Courses of Study

Students may earn a minor in International Relations by successfully completing 15 credit hours: composed of one lower-level Social Science option, the required keystone course, and 9 credits chosen from specified electives, as seen below.

One of the following is required:

Course	Title	Credits
EC 200	An Economic Survey	3
EC 211	Macroeconomics	3
SS 110	World History	3
SS 120	American History	3
SS 130	History of Aviation in America	3

Required Keystone Course:

Course	Title	Credits
SS 337	Globalization and World Politics	3

Specified Electives (choose three):

Course	Title	Credits
BA 335	International Business	3
SS 311	U.S. Military History 1775-1900	3
SS 321	U.S. Military History 1900-Present	3
SS 325	International Studies	3
SS 326	Russian-American Relations	3
SS 331	Current Issues in America	3
SS 333	US-Asian Relations	3
SS 334	Contemporary Africa and the World	3
SS 336	The Modern Middle East in World Affairs	3
SS 340	American Foreign Policy	3
SS 363	Inter-American Relations	3
Total Credits Required		15

Minor in Mathematics

Students may earn a minor in Mathematics by completing the following:

Course	Title	Credits
MA 241	Calculus and Analytic Geometry I	4
MA 242	Calculus and Analytic Geometry II	4
MA 243	Calculus and Analytic Geometry III	4
MA 245	Applied Differential Equations -OR-	3
MA 345	Differential Equations and Matrix Methods	4
MA	Electives (approved by department chair)	5-6
Total Credits Required		21

Minor in Physics

Students may earn a minor in Physics by completing the list below. Engineering Physics or Space Physics students are not eligible.

Course	Title	Credits
PS 150	Physics for Engineers I	3
	-OR-	
PS 215	Physics I	3
PS 160	Physics for Engineers II	3
	-OR-	
PS 208	Physics II	3
PS 250	Physics III for Engineers	3
	-OR-	
PS 219	Physics III	3
PS 253	Physics Laboratory for Engineers	1
	-OR-	
PS 220	Physics III Laboratory	1
PS 303	Modern Physics	3
PS 305	Modern Physics Laboratory	1
	Upper-Level Elective*	3
Total Credits Required		17

* Choose one elective from EP 320, EP 400, EP 440, PS 320, PS 400

Minor in Psychology

Students may earn a minor in Psychology by successfully completing the three specified courses and an additional two courses from the following list, totaling 15 credit hours.

Specified Courses

Course	Title	Credits
PSY 101	Introduction to Psychology	3
PSY 350	Social Psychology	3
	-AND-	
HF 201	Introduction to Human Factors	3
	-OR-	
HF 210	Human Factors I: Principles and Fundamentals	3

Two of the following courses are also required:

BA 317	Organizational Behavior	3
HU 361	Interpersonal Communication	3
HU 363	Communication and Society	3
PSY 310	Sensation and Perception	3
PSY 315	Cognitive Psychology	3
PSY 320	Aviation Psychology	3
PSY 335	Physiological Psychology	3

PSY 340 Industrial-Organizational Psychology	3
PSY 345 Training and Development	3
PSY 400 Introduction to Cognitive Science	3
SS 310 Personality Development	3
SS 350 Psychology of Relationships	3
Total Credits Required	15

Three credits of HF 299, 399, or 499 or PSY 299, 399, or 499 (Special Topics in Psychology) may be substituted with advance permission of the department chair.

Minor in Secondary Education

Students may earn a minor in Secondary Education through a collaborative agreement between Embry-Riddle and the University of Central Florida (UCF) by completing the following courses at UCF:

UCF Courses	Credits
<i>General Methods (Two courses)</i>	
EDF 2005 Introduction to Education	6
EDF 4603 Analysis of Critical Issues in Education	
<i>Sociological Foundations (Two courses)</i>	
EDG 2701 Teaching Diverse Populations	6
EDG 4323 Professional Teaching Practices	
<i>Psychological Foundations</i>	
EDF 4214 Classroom Learning Principles	3
-OR-	
EDF 4467 Learning Theory and Assessment	
<i>Special Methods (Select one)</i>	
EME 2040 Technology for Educators	3-4
MAE 4360 Mathematics Instructional Analysis	
PET 4710 Teaching Physical Education K-12	
SCE 4360 Science Instructional Analysis	
Total Credits Required	18-19

In conjunction with the minor in Secondary Education, students seeking to acquire teacher certification at the secondary level have the opportunity to satisfy both education and internship requirements (18 additional credit hours) through collaborative agreements with UCF.

Minor in Space Studies

Students may earn a minor in Space Studies by completing 15 credits from the following list.

Twelve credits selected from:

Course	Title	Credits
SP 110	Introduction to Space Flight	3
SP 200	Planetary and Space Exploration	3
SP 210	Space Transportation System	3
SP 215	Space Station Systems and Operations	3
SP 220	Life Support Systems	3
SP 300	Satellite and Spacecraft Systems	3
SP 340	Russian Space Operations and Technology	3
SP 400	Introduction to Space Navigation	3
SP 299/399/499	Spec. Topics in Space Studies	3

In addition, all students must complete:

SP 425	Selected Topics in Space and Aerospace	3
Total Credits Required		15

SPECIAL OPPORTUNITIES

Embry-Riddle Language Institute (ERLI)

The Embry-Riddle Language Institute (ERLI) was established to help non-English speaking prospective students and aviation professionals become more proficient in listening, speaking, reading, and writing skills. In addition, English for aviation and TOEFL preparation courses are offered every semester.

This program is offered to those who have a TOEFL level of less than 550 or other demonstrated English-language deficiencies. The purpose of the program is to prepare students for whom English is not the first language to move into Embry-Riddle degree programs or other academic institutions. Specific aviation courses have been developed for aircraft maintenance, avionics, aviation management, air traffic control, and flight. More information is available by contacting the ERLI Office at (386) 226-6192.

Embry-Riddle Honors Program

The Honors Program at Embry-Riddle is highly selective, offering students an enriched educational experience while also giving them opportunities to enhance campus and community life for others. Honors Program students enroll in several general education seminars focused on relevant, stimulating, interdisciplinary topics that encourage critical and creative thinking. Honors classes are small, the faculty are carefully selected, and the courses are student-centered and discussion-oriented. The Honors experience in the major emphasizes close involvement with selected faculty, research opportunities, and individually tailored projects. The program also adds to

campus life through its guest speaker series and through activities sponsored by its student organization. Graduates of the Honors Program are models of academic excellence and student leadership.

Some features of the Honors Program:

- Nine credit hours of Honors in general education; at least nine credit hours of Honors in the major. The Honors Program does not add credit hours to any major.
- Honors seminars no larger than 20 students.
- Honors faculty.
- Guest speakers who spend time with students in Honors seminars.
- Honors housing for freshman students.
- Priority registration for classes.
- Research opportunities.
- Co-op and internship opportunities
- Summer study-abroad opportunities.

International Programs

Recognizing the unquestionable benefits of international exposure in today's increasing globalization, Embry-Riddle offers its students a wealth of opportunities to study abroad in more than 50 destinations spanning five continents worldwide. Whether it's as short as a one-month summer venture or a two-year dual degree program, we feel these programs provide students with the experience that will greatly enhance not only their academic and professional lives, but their personal lives.

Motivated students in good academic standing (participation requires a mini-

minimum GPA of 2.5 for summer programs and 3.0 for exchange programs except under special circumstances) from the residential and Worldwide campuses have the unique opportunity to take courses through our partner schools that will be directly applicable to their degree programs at Embry-Riddle while traveling and participating in numerous cultural activities abroad. Foreign language classes are an essential part of every program, and students at all levels of language experience – from absolute beginners to native speakers – are encouraged to take part. In fact, all of our summer programs are designed to accommodate students who have had no prior foreign language experience. We offer many opportunities to take classes taught in English abroad, including specialized semester-long programs. For the more avid travelers, we offer dual degree opportunities, where students may obtain both an Embry-Riddle undergraduate degree as well as a master-level degree from a foreign institution, simultaneously. Qualified exchange program partici-

pants could also have the opportunity to be placed in paid internships with companies or research labs abroad.

Summer Study Abroad

Embry-Riddle offers four to six week summer programs at half-price tuition, providing an additional incentive for students to explore other continents and advance their education. Living expenses in many of our destinations can be substantially lower than in the United States, allowing students to save even more. Students who qualify for financial aid will receive an equivalent amount when enrolled in one of our international programs; there may also be additional scholarship and grant opportunities available to students who choose to study abroad.

Cooperative Education

Cooperative Education/Internship offers qualified students an opportunity to gain valuable experience, explore career options,



Special Opportunities

develop contacts in the industry, and earn college credit. Requirements and benefits vary by degree program and by employer. Students should discuss their co-op/internship plans with their academic advisor, Career Services program manager, and, when applicable, with the co-op/internship faculty advisor in their degree program. One upper-level open elective credit hour is awarded for every 100 clock hours of work completed, up to a maximum of six credit hours in one semester. Additional information, including current openings and requirements, is available from Career Services and on the Career Services Web site. A co-op/internship fee based on the cost of one credit hour in a student's degree program is charged each semester.

Reserve Officer Training Corps

Reserve Officer Training programs are subject to the control of the service branch that sponsors them and are operated according to the rules and regulations established by the service branch. These may be changed from time to time without notice or obligation.

Not all Reserve Officer Training programs are available at all University campuses or locations. Students should contact the Admissions Office to determine program availability.

Air Force Reserve Officer Training Corps

The Air Force Reserve Officer Training Corps (Air Force ROTC) is an educational program designed to give men and women the opportunity to become Air Force officers while completing their college degrees. The Air Force ROTC program is focused on pre-

paring cadets to become leaders in today's high-tech Air Force.

Air Force ROTC enrollment is not restricted to individuals who wish to become commissioned officers in the USAF. Students may elect to take Air Force ROTC courses for academic credit only, earning elective credits for all University degrees.

Any qualified student may enroll in Air Force ROTC; check with your local Air Force ROTC detachment for more information.

Four-Year Program

The first half of the four-year program is called the General Military Course, which is offered during a student's freshman and sophomore years. This program allows students to try out Air Force ROTC for up to two years without incurring any obligation (unless they are on an Air Force ROTC scholarship). As students attend class, they learn more about the Air Force and the historical development of airpower. The last two years are called the Professional Officer Course. These junior and senior level classes cover leadership skills, national security affairs, and preparation for active duty.

Two-Year Program

This program, also called the Professional Officer Course, or POC, is available to any student or veteran who has approximately two years of college work remaining (undergraduate, graduate, or a combination of the two). It's especially suited for those who major in selected scientific and technical areas such as mathematics, physics, engineering, and computer science. The POC program is highly competitive, so it's important to apply early in your sophomore

year. Check with your local Air Force ROTC detachment for more information and the availability of this program.

Finances

Textbooks for all Air Force ROTC courses are free. Students who have contracted with Air Force ROTC receive a tax-free subsistence allowance during the academic year of \$300-\$500 per month, depending on their academic year.

Air Force ROTC Scholarships

Air Force ROTC offers scholarships covering a student's college education for two, three, or four years. Each scholarship pays up to full tuition, laboratory fees, incidental fees, an annual book allowance of \$900, and a tax-free subsistence allowance of \$300-\$500 per month (see Finances). In addition to the Air Force's scholarship aid, Embry-Riddle also offers financial incentives to new high school AFROTC scholarship winners. All high school three-year AFROTC scholarship recipients will receive a minimum University assurance of \$15,000 during the first year of attendance, and \$5,000 in each subsequent year. All high school four-year AFROTC scholarship recipients will receive a minimum University assurance of \$7,500 for each year of attendance. University funding includes any University scholarships, need-based grants, and awards. University funding, in combination with funding from AFROTC, cannot exceed the cost of education. This University assurance is offered at the discretion of the University financial aid department, not AFROTC. High school students interested in a scholarship should apply as soon as possible in the six-month application period (June 1 to December 1 of

their senior year). Application forms for the scholarship are available online at <http://www.afrotc.com>.

In-college scholarship opportunities are also available for students already enrolled in the Air Force ROTC program. Freshmen can earn three-year scholarships, while sophomores can earn two-year scholarships. College transferees may also apply for these scholarships.

All scholarship applicants must meet the following minimum requirements:

- Be a U.S. citizen
- Be less than 31 years old as of December 31 of the year you will commission
- Meet military and physical standards
- Pass the Air Force Officer Qualifying Test
- Have a minimum cumulative GPA of 2.50

For more information, contact:

AFROTC Detachment 157
Embry-Riddle Aeronautical University
600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114-3900
(386) 226-6880
<http://det157.com>

Army Reserve Officer Training Corps

Army Reserve Officer Training Corps (ROTC) is open to both men and women, freshmen through seniors, and may lead to a commission as an officer in the U.S. Army. Army ROTC enhances a student's education by providing unique leadership and management training, along with practical experiences. The curriculum is designed to be challenging, educational, and flexible enough to allow students to meet scholastic and personal goals. Classes and training

Special Opportunities

include leadership development, leadership problem-solving, tactics, physical training, map reading, land navigation, rappelling, rifle marksmanship, patrolling, drill and ceremony, military history, ethics, and military law. Students may earn 18 hours of academic credit for completing four years of Army ROTC. The ROTC courses may also be applied toward open elective requirements in degree programs. All uniforms, military textbooks, and equipment are issued to Basic Military Science freshman/sophomore cadets at no charge.

Army Reserve Officer Training

The Army Reserve Officer Training Corps program gives students an opportunity to acquire the skills and knowledge necessary for commissioning as a second lieutenant in the U.S. Army. The program offers a two, three, and four-year option. The two-year option allows students with at least two academic years remaining in college to meet all requirements for commissioning by attending basic camp or using past military experience for credit.

Basic Military Science

The Basic Military Science courses are offered during the freshman and sophomore years. These courses cover military organization, equipment, weapons, map reading, land navigation, use of compass, rank structure, threat, communications, leadership, and physical training. Each course consists of classroom instruction and a mandatory lab. Students are required to have a doctor's statement allowing participation in college-level physical education classes. Freshman and sophomore students may enroll in Basic Military Science classes with no obligation to

the Army.

Advanced Military Science

The Advanced Military Science courses are normally taken during the junior and senior years. These courses specialize in small unit tactics, preparation and conduct of military training, military justice system, staff procedures, decision making and leadership, managerial concepts, problem analysis, military writing, the ethics of the professional soldier, and physical training. The courses consist of classroom instruction and a mandatory lab. This phase requires attendance at a five-week National Leadership Development Assessment Course (LDAC) held at Ft. Lewis, Wash., during the summer after the junior year.

Leaders Training Course

A summer training program is offered for students without previous ROTC or military training who will be academic juniors. A five-week course at Fort Knox, Ky., during the summer after the sophomore year qualifies a student for entry into the Advanced Course, thus allowing completion of all requirements for commissioning in two years. Students attending the summer camp at Fort Knox receive approximately \$800. Students receive six hours of credit for the basic military science course upon completion of the Leadership Training Course.

Benefits

All contracted military science students receive a monthly stipend of \$300-\$500 per month.

Four-year, three-year, and two-year scholarships are available to those who qual-

ify. The higher the student's GPA and SAT/ACT scores, the better their chance of being selected as a scholarship recipient.

In addition, entering freshmen who receive three-year advance designee and four-year Army ROTC scholarships are eligible to receive additional financial incentives from Embry-Riddle. Army Green to Gold Scholarship winners may be eligible for these incentives as well.

All applicants must meet the following requirements:

- Be a U.S. citizen
- Be under 31 years of age prior to commissioning
- Meet required medical and physical standards
- Have a minimum cumulative academic GPA of 2.50
- Have a minimum SAT score of 920 or an ACT composite score of 19

Scholarship Benefits Include

- Full tuition per year
- A subsistence allowance of \$300-\$500 per month
- A \$450 book allowance per semester
- Embry-Riddle ROTC Scholarship Assurance - \$7,000 per year minimum for certain Army ROTC scholarship winners

Admission to the Basic Course

Admission requirements are:

- Enrollment in a baccalaureate or master degree program
- Must be at least 17 years of age at time of entry

- U.S. citizen
- Must maintain full-time student status each term

Admission to the Advanced Course

Admission requirements are:

- Successful completion of the Basic Course Leader's Training Camp or its equivalent
- Successful completion of the Army physical examination
- Selection by the professor of Military Science
- Agreement to complete the Advanced Course requirements and serve on active duty, reserve, or National Guard duty as a commissioned officer
- Maintain a 2.00 overall academic GPA and a 3.00 ROTC GPA
- Must maintain full-time student status each term

Army Green to Gold

If you are currently on active duty and will have two years of active duty before school starts and are accepted by Embry-Riddle as either a freshman, sophomore, or junior, you can compete for an Active Duty Green to Gold four, three, or two-year scholarship.

You must have a GT score of 110 or higher and a cumulative grade point average of 2.50 on a 4.00 grading system to be eligible for the three or two-year scholarship. A GT score is not required for individuals applying for a four-year scholarship. Four-year applicants must have a cumulative grade point average of 2.00 on a 4.00 grading scale. All applicants must meet other eligibil-

Special Opportunities

ity requirements. An SAT score totaling 920 or an ACT composite score of 19 is required for three and four-year Green to Gold scholarships.

For further information contact:

Embry-Riddle ARMY ROTC
600 S. Clyde Morris Blvd.
ROTC Building, Second Floor
Daytona Beach, FL 32114-3900
(386) 226-6470/6437
fax: (386) 226-7615
email: armyrotc@erau.edu

Physical Training

All non-scholarship cadets are required to attend physical training one day per week as part of the course grade. All scholarship and Advanced Course cadets are required to attend physical training three days per week as part of the course grade. Physical training is normally conducted on Monday, Wednesday, and Friday from 6-7 a.m.

Marine Corps Platoon Leaders Course Program

For freshmen, sophomores, and juniors, the Marine Corps offers the Platoon Leaders Course (PLC) program. Freshmen and sophomores attend two six-week training sessions and juniors attend one 10-week session at Quantico, Va. During the training sessions candidates can earn from \$2,100 to \$3,200, depending on which training session is attended. In addition, eligible candidates may apply for two financial assistance programs, the Financial Assistance Program (FAP) and the College Tuition Assistance Program (CTAP). Call or visit the Web site to receive more information.

To be eligible for the program, the student must be a U.S. citizen (either native-born

or naturalized), with full-time enrollment in a minimum of 12 academic credits per semester, and must be working toward an accredited/recognized baccalaureate degree.

The PLC Program offers two entry-level paths that lead to commissioning as a second lieutenant in the U.S. Marine Corps. The first is the Guaranteed Aviation Program. Applicants must have a qualifying ACT, SAT, or ASVAB score and must take the Aviation Selection Test Battery (ASTB). Those who have at least the minimum score of 4/6 on the ASTB; pass a Class 1 aviation medical examination performed at a Navy medical facility; pass a Marine Corps Physical Fitness Test (PFT); and are accepted into the program by Headquarters Marine Corps, will be eligible to receive a contract guarantee. The second program is the Ground Officer Program. This program encompasses all military occupational specialties not directly related to piloting aircraft, or guaranteed law.

To be eligible for the U.S. Marine Corps Platoon Leaders Class Program, a student must be enrolled full-time. Openings are available for men and women with any major who are under the age of 28.

Contact the Officer Selection Office at (866) 290-2680 (toll free) or (407) 249-5873.

Naval Aviation Club

A dynamic Naval Aviation Club informs and assists students who are eager to learn about naval aviation careers. Membership dues are nominal and no academic credit is conferred. The club features guest speakers and aircraft from fleet squadrons, in addition to field trips to naval air stations, aircraft carriers, and the cradle of naval aviation at Pensacola. Current Navy policy information is made available through close liaison with

Navy Recruit Command representatives.

For more information, contact the president of the Embry-Riddle Naval Aviation Club.

Naval Reserve Officers Training Corps

The Naval Reserve Officers Training Corps (NROTC) unit administers the Naval Science Program at Embry-Riddle. All students enrolled in the University who are physically and mentally qualified are eligible to apply for the entry to the NROTC Program. This program affords men and women the opportunity to receive instruction in Navy specified courses which, in conjunction with the baccalaureate degree, and U.S. citizenship, will qualify them for a commission in the U.S. Navy or Marine Corps. Students are selected on their own merit to become officers in the U.S. Navy and Marine Corps. As naval officers, Embry-Riddle NROTC graduates become eligible for varied careers, serving in aviation squadrons, on surface ships, on submarines, and in special operations, or in numerous sub-specialties as an officer of the Marine Corps.

Students interested in the Embry-Riddle NROTC Program may compete for four-year NROTC national scholarships prior to matriculation. Students who join the unit through the NROTC College Program are eligible to compete for other types of scholarships throughout their college career. With the consent of the Professor of Naval Science, any student, although not enrolled in the NROTC Program, is eligible for enrollment in naval science courses.

Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu for more information.

Naval ROTC Four and Two-Year National Scholarship Programs

Scholarship students are appointed midshipmen, U.S. Navy Reserve. The Navy pays for tuition, fees, uniforms, a stipend for textbooks each semester, and a monthly subsistence allowance starting at \$250 per month for first-year candidates and up to \$400 for senior students during the academic year for four-year scholarship winners. Four-Year Scholarship students are normally selected through national competition during their senior year in high school. However, students who are already enrolled in college but not in the NROTC Program may compete nationally for both four and two-year scholarships. If selected for the two-year scholarship, the student will attend the Naval Science Institute in Newport, R.I., for an intensive six-week training course of naval science and military training.

Although it is not a requirement, students in the NROTC Scholarship Program are encouraged to pursue a major in engineering, mathematics, chemistry, or physics to meet the technological requirements of the Navy. Other fields of study for a major leading to a baccalaureate degree are permitted, with the approval of the Professor of Naval Science. Regardless of the major, every Navy scholarship student must complete one year of calculus and calculus-based physics.

Students must include certain Navy specified courses in their program and complete a program of courses as prescribed by the Professor of Naval Science. Upon graduation and successful completion of the naval science curriculum, the midshipman will receive a commission as an ensign in the U.S. Navy or second lieutenant in the U.S.

Special Opportunities

Marine Corps and will serve on active duty for a minimum of four years, with a total service obligation of eight years.

Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu.

Naval ROTC Tweedale Scholarship Program

The Professor of Naval Science awards two Tweedale scholarships per year to outstanding Embry-Riddle students in a technical major. The scholarship's focus is to give students an opportunity to earn a commission in the U.S. Navy and serve as a nuclear propulsion officer. The scholarship pays for all tuition, books, and fees. In addition it provides a monthly allowance of \$350.

Eligibility requirements include: Must be technically oriented with documented strong performance in math and science and earned no less than a "B" in calculus if completed. Must have achieved a grade of "C" or better in all courses attempted. Must be in an engineering or computer science major. Must have completed at least one, but not more than four, terms toward your bachelor degree. Must maintain a GPA of 3.0 or higher. Must be able to obtain an endorsement from your department chair. Must not have previously been non-selected for or disenrolled from an officer accession program.

Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu.

Naval ROTC College Program

Students enrolled in the NROTC College Program compete for full scholarships ranging from three and a half years to two years. Once selected for a scholarship, students fall under the Scholarship Program described

above.

Students who are not selected for a scholarship may be eligible for selection to Advanced Standing status. Students selected for Advanced Standing are appointed as midshipmen in the Naval Reserve prior to commencement of the Advanced Course in their junior year. The Navy pays for uniforms and naval science textbooks during the four-year period and, during the junior and senior years, pays the midshipman a monthly subsistence allowance. Each student is selected for enrollment in the program through application to the Naval Education and Training Command on the basis of past academic performance, potential, personal interviews, and a physical examination. A college program midshipman only acquires a military service obligation after entering the Advanced Course at the beginning of the junior year.

Although there are no restrictions on the major college program students may pursue, it is highly recommended that they pursue a course of study similar to that of scholarship students. Students must also include in their program certain Navy specified courses and a program of courses in naval science. Students, upon graduation and successful completion of the naval science curriculum, receive a commission as an ensign in the U.S. Navy or as a second lieutenant in the U.S. Marine Corps and incur a total service obligation of eight years, with at least three of those years served in active-duty status.

Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu.

Naval ROTC Two-Year College Program (Non-Scholarship)

NROTC offers a two-year non-scholarship program that is designed specifically for students commencing their third year of college who were not enrolled in the NROTC program during their freshman and sophomore years. Applications must be submitted during the sophomore year by March 1 to permit processing, personal interviews, and a physical examination. Qualifications for acceptance to this program include demonstrated ability to complete college-level science and math courses. Upon acceptance into this program, the student attends a six-week intensive course at the Naval Science Institute in Newport, R.I., in the summer prior to beginning the junior year of study. Students in a five-year engineering curriculum may attend the institution between their third and fourth years. The six-week summer course qualifies the student for enrollment in the NROTC Program at the junior level. During the student's attendance at the Naval Science Institute, the Navy provides room and board, books, uniforms, transportation from home and return, and also pays the student approximately \$365 per month. Upon successful completion of the course, the Navy pays for uniforms and naval science textbooks provided, and a \$350 subsistence allowance. Students, upon graduation and successful completion of the naval science curriculum, receive a commission as an ensign in the U.S. Navy or as a second lieutenant in the U.S. Marine Corps and incur a total service obligation of eight years, with at least three of those years served in active-duty status.

Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu for more information.

Naval ROTC Summer Training

The NROTC Scholarship Program student is required to complete training of approximately four weeks during each of the three summer recesses. During the first summer period, each scholarship student receives instruction in aviation training, marine combat training, surface warfare indoctrination, and submarine indoctrination either in Norfolk, Va., or San Diego, Calif. The second summer training is performed aboard operational ships of the U.S. fleet from an enlisted servicemember perspective. During the third summer, candidates for U.S. Navy commissions will perform training aboard operational ships as junior officers. The student who qualifies for nuclear propulsion training may elect to cruise on nuclear-powered ships or submarines. Some midshipmen cruise with allied navies through the Midshipman Foreign Exchange Program. Transportation costs to and from the training sites, subsistence, quarters, and pay of approximately \$365 per month will be paid to every participating student.

The candidates for U.S. Marine Corps commissions will perform training at the U.S. Marine Corps Base, Quantico, Va. The Marine Option NROTC Summer Training Program is designed to prepare midshipmen for appointment to commissioned grade by providing basic military instruction and physical training. An evaluation of midshipmen is made to ensure that they possess the leadership, academic, and physical qualifications required for appointment to commissioned grade in the Marine Corps.

Special Opportunities

Contact the professor of Naval Science at (386) 323-8990 or conrotc@erau.edu.

U.S. Navy Bachelor Degree Completion Program

The U.S. Navy offers a Bachelor Degree Completion Program with a guaranteed career specialty contract. This program is open to all Embry-Riddle students who are: U. S. citizens, will be at least 18 but not more than 29 at graduation, meet Navy physical standards, have a 2.7 GPA (GPA waivers are possible) and have completed at least 30 semester hours. If selected you will enlist in the Navy and receive active-duty pay, allowances, and benefits. This remuneration will be paid to you for the last three years of school, if you are working toward a technical degree, or for the last two years of school for a nontechnical degree. This program can provide you over \$68,000.

This is not ROTC. There are no drills, and uniforms are not required. All majors are eligible. After graduation, you will proceed to Naval Station Newport, R.I., for Officer Candidate School. After 14 weeks, you will be commissioned an ensign in the U.S. Navy and begin a career in Naval Aviation, flight training. Contact the Professor of Naval Science at (386) 323-8990 or conrotc@erau.edu for more information.

Aviation Maintenance Science

Airframe and Powerplant Technician Certification Program

The Airframe and Powerplant Technician Certification program provides the student with the training required to qualify for the Federal Aviation Administration

(FAA) Airframe and Powerplant Technician Certification. The 16-month program, offered only at the Daytona Beach Campus, presents a carefully selected blend of theory and practical applications that qualifies the student to take the FAA certification examinations.

Students perform repairs and overhaul engines and accessories, including those used in the Embry-Riddle pilot-training fleet. The curriculum, facilities, equipment, and instructional staff are fully approved under the Code of Federal Regulations (CFR) Title 14 Part 147. Embry-Riddle holds Air Agency Certificate No. NX4T404M and FAA Repair Station Certificate No. NX42404M.

Avionics Line Maintenance Specialization Program

The Avionics Line Maintenance program provides the student with the training needed to successfully obtain the FCC General Radiotelephone Operators License (GROL) as well as receive advanced avionics training using current industry standards and procedures. Students will cover basic wiring and electronics concepts, system installations, and advanced avionics line maintenance troubleshooting.

Sources of Information

For general academic and admissions information regarding the Aviation Maintenance Science programs:

Aviation Maintenance Science Dept.
600 S. Clyde Morris Blvd.
Daytona Beach, FL 32114
(386) 323-5086 - or - (877) 904-3746
fax: (386) 226-6778
<http://www.embryriddle.edu/amt>

UNDERGRADUATE COURSE DESCRIPTIONS

Embry-Riddle Aeronautical University course offerings are listed in alphabetical order, according to the course designations below.

AAS	Applied Aviation Science	CS	Computer Science	MSL	Military Science and Leadership
AE	Aerospace Engineering	EC	Economics	NSC	Naval Science
AEL	Aerospace Electronics	EE	Electrical Engineering	PS	Physical Science
AES	Aviation Environmental Science	EGR	Engineering	PSY	Psychology
AF	Air Force Aerospace Studies	EL	Electronics	RS	Regional Studies
AMS	Aviation Maintenance Science	EP	Engineering Physics	SE	Software Engineering
AS/ASC	Aeronautical Science	ES	Engineering Science	SF	Safety Science
AT	Air Traffic Control	FA	Flight-Academic	SIM	Simulation
AVT	Avionics Technology	HON	Honors	SIS	Global Security and Intelligence Studies
BA	Business Administration	HF	Human Factors	SP	Space Studies
CE	Cooperative Education	HS	Homeland Security	SS	Social Sciences
CEC	Computer Engineering	HU	Humanities	SYS	Systems Engineering
CIV	Civil Engineering	IT	Information Technology	UNIV	College Success
COM	Communication	L	Languages	WX	Applied Meteorology
		MA	Mathematics		
		ME	Mechanical Engineering		

Courses numbered 001–099 are basic skills courses and do not apply toward degree requirements. Courses numbered 100–299 are lower-division courses and are generally taken in the freshman and sophomore years. Many lower-division courses serve as prerequisites for other coursework, so students are urged to plan ahead to meet necessary prerequisites. Courses numbered 300–499 are upper-division courses, reflecting advanced levels of technical skills and disciplinary knowledge. Upper-division work is generally taken in the junior and senior years. Only the dean of a college, or an appointed designee, may waive corequisite and prerequisite requirements. The University reserves the right to administratively drop a student from a course in which prerequisite requirements have not been met.

Course numbers ending in 95 designate time-limited offerings, such as those taught by a visiting lecturer. Course numbers ending in 96 or 97 identify special sequential courses. Those ending in 98 provide students with a unique, collective program of learning activities supervised by a professor. Courses ending in 99 denote individual study between professor and student.

Numbers in parentheses, immediately following course titles and numbers, indicate lecture and laboratory hours that a class meets each week. For example, (3,3) signifies that the course consists of three lecture hours and three laboratory hours weekly.

The following courses are not necessarily offered every term, nor are they offered at all campus locations.

Course Descriptions

Applied Aviation Science

AAS 101

Applied Aviation Science College Success Seminar (1,0)

1 Credit

A course for incoming freshmen majoring or planning to major in Safety Science, Air Traffic Management, Homeland Security, or Applied Meteorology in which students assess and develop the personal, interpersonal, intellectual, and social skills necessary to succeed in college. This course is for freshmen only and is Pass/Fail.

AAS 199-499

Special Topics in Applied Aviation Science (1,0)

1-6 Credits

Individual independent or directed studies of selected topics in Applied Aviation Science.

Prerequisite: consent of instructor and the department chair. May be repeated with a change of content.

Aerospace Engineering

A grade of C or better is required in MA 241, MA 242, PS 150, PS 160, and PS 250 for entry into all AE courses. A passing grade in all prerequisite courses or department consent is required for entry into all AE courses.

AE 301

Aerodynamics I (3,0)

3 Credits

The atmosphere. Incompressible and compressible one-dimensional flow. Airspeed measurement. Two-dimensional potential flow. Circulation theory of lift. Thin airfoil theory. Viscous flow. Boundary layers. Finite wing theory. Drag in incompressible flow. Wing-body interactions.

Prerequisites: ES 204, ES 206, MA 243.

Corequisite: ES 305.

AE 302

Aerodynamics II (3,0)

3 Credits

Laminar and turbulent flows, transition point, determination of skin friction drag on an airfoil. Obtaining equations for streamline, for particle path, and for streakline in a flow field. Compressible flow, shock waves, thermodynamics of gas flow. Reversible and irreversible processes. Changes in pressure, density, and temperature across shock waves. Isentropic duct

flow and flow through a nozzle. Static performance and maneuvers in flight. Propeller theory.

Prerequisite: AE 301.

AE 304

Aerospace Structures I (3,0)

3 Credits

Methods of stress analysis of statically-determinate lightweight structural systems. Applications include space structures and semimonocoque structures. Inertia force and load factor computation. Topics in applied elasticity. Three dimensional beam bending. Shear flow. Materials considerations. Finite element modeling and computer-aided analysis.

Prerequisite: ES 202.

AE 313

Space Mechanics (3,0)

3 Credits

This course presents the vector-based solution of the two-body problem and the solution for the position and time problem (Kepler's equations). These are used to analyze orbits, satellite launch, ground tracks, orbit transfer, interplanetary trajectories, and interception and rendezvous. Using three-dimensional vector dynamics, the motion and stability of rigid and semi-rigid spacecraft are studied as are the means for controlling spacecraft orientation.

Prerequisites: ES 204, MA 345.

AE 314

Experimental Aerodynamics (1, 0)

1 Credit

This course supports the Experimental Aerodynamics lab by providing lectures based in practice and theory. Topics include wind tunnel design, instrumentation, scaling effects, tunnel wall corrections, and data acquisition, and data reduction as well as good experimental practices. The Experimental Aerodynamics Lab AE 315 must be taken during the same semester as AE 314.

Prerequisite: COM 221.

Corequisite: AE 301.

AE 315

Experimental Aerodynamics Laboratory (0,3)

1 Credit

This laboratory consists of a sequence of experiments that demonstrate basic aerodynamic theory while developing skills in the use of classic and modern experimental apparatus, the practice of good experimental technique, and the writing of experimental reports. Specific experiments depend on

apparatus availability and instructor preference. The Experimental Aerodynamics Lab, AE 315, must be taken during the same semester as AE 314.

Prerequisite: COM 221.

Corequisite: AE 301.

AE 316

Aerospace Engineering Materials (3,0)

3 Credits

Structure, properties, and processing of engineering materials. Crystal structure, defects, imperfections, and strengthening mechanisms. Mechanical properties, fracture mechanics, fatigue and creep, material failures. Phase diagrams and transformations. Degradation of materials. Characteristics of ferrous and nonferrous metals and alloys, ceramics, polymers, and composite materials. Emphasis on materials and processes used in the aerospace industry.

Prerequisites: COM 221, ES 202, PS 105, or PS 140.

AE 325

Experimental Space Systems Engineering (1,0)

1 Credit

Lecture-based course to support the Space Systems Engineering Laboratory. Course covers subsystems of spacecraft, experimental methods, data acquisition, and data reduction. The Experimental Space Systems Engineering Lab, AE 326, must be taken during the same semester as AE 325.

Prerequisite: PS 250.

Corequisite: EP 394.

AE 326

Experimental Space Systems Engineering Laboratory (0,3)

1 Credit

Laboratory for the fundamentals of spacecraft systems. A lab covering each of the major subsystems of spacecraft, which may include propulsion, attitude control, power, telemetry and command, communications, structures and vibrations, materials and mechanisms, thermal control, and mass properties. The Experimental Space Systems Engineering Lab, AE 326, must be taken during the same semester as AE 325.

Prerequisite: PS 220.

Corequisite: EP 394.

AE 350

Project Engineering (3,0)

3 Credits

Role of the engineer in project management with emphasis on systematic evaluation of the benefits and costs of projects involving engineering design and analysis. Proposal preparation and presentation, engineering contracts, negotiation techniques. Value engineering.

Prerequisite: Junior class standing or consent of instructor.

AE 401

Advanced Aerodynamics I (3,0)

3 Credits

An advanced-level presentation of the theory and applications of incompressible aerodynamics. Kinematics and dynamics of fluid flow. Flow about a body. Shock tube flow. Thin airfoil and finite wing theory. Approximation techniques; numerical methods. Introduction to compressible flow.

Prerequisites: AE 302, MA 441.

AE 404

Aerospace Structures II (3,0)

3 Credits

Continuation of AE 304. Methods of computer-aided deflection and stress analysis of redundant lightweight structural systems by means of virtual work principles and their energy counterparts. Introduction to finite element theory. Buckling considerations. Applications include space structures and semimonocoque structures.

Prerequisite: AE 304.

AE 408

Turbine and Rocket Engines (3,0)

3 Credits

A study of gas turbine and rocket engines. Topics include control volumes, conservation equations, combustion processes, efficiencies, fuel consumption, nozzle flow, diffusers, ideal and real ramjets, gas turbine engines, performance of rocket vehicles, and solid and liquid propellant rocket motors.

Prerequisite: AE 302.

AE 409

Aircraft Composite Structures (3,1.5)

3 Credits

Introduction to reinforced plastic composite structural materials and their use in modern aircraft. Discussion of basic material properties, testing proce-

Course Descriptions

dures, design and analysis using classical lamination theory, and fabrication techniques, including some hands-on demonstrations.

Prerequisites: ES 202, AE 316.

AE 411

Advanced Experimental Aerodynamics (2,3)

3 Credits

This course consists of a series of advanced experiments using a wind tunnel. Topics include model design and construction, testing procedures, control surface testing, propeller testing, the use of wind tunnel data, scale effects, complete model testing, and an introduction to supersonic testing.

Prerequisite: AE 314.

AE 413

Airplane Stability and Control (3,0)

3 Credits

Development of longitudinal, lateral, and directional stability and control equations. Control surface design. Control effectiveness and size requirements. Dynamic control theory. Handling characteristics and maneuvering stability of aircraft.

Prerequisite: MA 345.

Corequisite: AE 302.

AE 414

Space Propulsion (3,0)

3 Credits

The course provides the student with an introduction to the basic principles of liquid and solid propulsion systems. Flight performance parameters are presented for single and multistage vehicles. The thermo-chemistry of the combustion process will also be discussed. Performance enhancements of nuclear rockets and electric propulsion will be covered.

Prerequisites: AE 301 and ES 305.

AE 415

In-Flight Laboratory (3,1.5)

3 Credits

Development of longitudinal and lateral-directional, static and dynamic stability and excess power, rate of climb, turn rate, and load factor performance theory, with laboratory concept validations.

Prerequisite: AE 413.

AE 416

Aerospace Structures and Instrumentation (1,0)

1 Credit

Lecture-based course to support the Structures and Instrumentation Laboratory. Course emphasizes aerospace vehicle testing through instrumentation, data acquisition, and data reduction. Test plans and design are utilized. The Structures and Instrumentation Laboratory, AE 417, must be taken during the same semester as AE 416.

Prerequisites: COM 221, ES 202, EE 335.

AE 417

Aerospace Structures and Instrumentation Laboratory (0,3)

1 Credit

Principles of modern aerospace vehicle testing and instrumentation. Basic electrical measurements and devices such as strain gages, piezoelectric sensors, and thermocouples. Topics could include measurement of fluid pressure and flow; temperature; thermal and transport properties; strain; motion; vibration; force and torque. Experimental static and dynamic analysis of structures. Processing and analyzing experimental data; report writing and data presentation. The Structures and Instrumentation Laboratory, AE 417, must be taken during the same semester as AE 416.

Prerequisites: COM 221, ES 202, EE 335.

AE 420

Aircraft Preliminary Design (3,3)

4 Credits

Airplane conceptual design principles are developed to meet modern aerodynamic, propulsion, structural, and performance specifications. A complete airplane is designed, resulting in a design package consisting of specifications, aerodynamic calculations, inboard profile drawing, weight and balance, general arrangement drawing, aerodynamic drag analysis, and complete performance report.

Prerequisites: AE 314, AE 413.

AE 421

Aircraft Detail Design (3,3)

4 Credits

Principles of aircraft detail and component part design, manufacture, and production are covered along with projects to give actual experience in the design of aircraft components. Carries the design of an airplane from the general layout to the design of its detail parts and the design of necessary tools.

Prerequisites: AE 404, AE 420.

AE 425

Aircraft Acoustics and Noise Control (3,0)

3 Credits

Sound wave characteristics, levels, and directivity. Hearing and psychological effects of noise. Noise control criteria and regulations. Instrumentation. Noise sources. Acoustics of walls, barriers, and enclosures. Acoustical materials and structures. Noise characteristics of jet and propeller aircraft, including helicopters.

Prerequisite: AE 301.

AE 426

Spacecraft Attitude Dynamics (3,0)

3 Credits

Fundamentals of spacecraft attitude dynamics. Three-dimensional rigid-body kinematics. Stability and dynamics of symmetric and tri-inertial bodies. Attitude, nutation, and spin-control maneuvers for spin-stabilized spacecraft. Effects of energy dissipation. Momentum-biased spacecraft dynamics. Stability, modeling, and simulation of spin-stabilized and momentum-biased spacecraft. Elements of three-axis stabilized spacecraft. Effects of gravity gradient, solar radiation pressure, atmospheric drag, and magnetic torque on spacecraft attitude.

Prerequisites: AE 313, MA 345.

AE 427

Spacecraft Preliminary Design (3,3)

4 Credits

Spacecraft preliminary design principles are developed to meet mission objectives. A complete spacecraft is designed, resulting in a design package consisting of specifications; calculations; CAD drawings; weight and various subsystem budgets; and a series of trade studies, reviews, and design reports.

Prerequisites: AE 313, EP 394, or instructor consent.

Corequisite: AE 426 or instructor consent.

AE 430

Control Systems Analysis and Design (3,0)

3 Credits

Modeling, analysis, and control of dynamical systems with aerospace applications. Transfer functions, block diagram algebra. Routh Hurwitz stability criteria. Introduction to system design using root locus, Bode and Nyquist diagrams.

Prerequisites: EE 335, MA 345.

AE 432

Flight Dynamics and Control (3,0)

3 Credits

Aircraft equations of motion. State variable representation of the equations of motion. Longitudinal motion (stick fixed) and lateral motion (stick fixed). Aircraft response to atmospheric inputs. Automatic control theory. Application of classical and modern control theory to aircraft autopilot design.

Prerequisites: MA 345, AE 413.

AE 433

Aerodynamics of the Helicopter (3,0)

3 Credits

The development of rotating-wing aircraft and the helicopter. Hovering theory and vertical flight performance analysis. Auto-rotation, physical concepts of blade motion and control, aerodynamics and performance of forward flight. Blade stall, stability, and vibration problems. Design problems.

Prerequisites: AE 302, MA 441.

AE 434

Spacecraft Control (3,0)

3 Credits

A review of spacecraft equations of motion and state variable representation of the equations of motion. Automatic control theory, the classical approach as well as the modern control approach. Attitude control with thrusters, attitude control with reaction wheels, and attitude stabilization with spin. Attitude control during throughst maneuvers. Control of translational motion.

Prerequisite: MA 345.

Corequisite: AE 426.

AE 435

Air-Breathing Propulsion Preliminary Design (3,3)

4 Credits

This course is concerned with the preliminary design, subject to specifications, of an air-breathing engine for aircraft propulsion. A complete engine is designed and presented with proposed engine layout, cycle calculations, installed performance, and engine sizing information. Calculations demonstrating that the proposed engine satisfies requirements are also presented.

Corequisite: AE 408 or permission of the instructor.

Course Descriptions

AE 440

Air-Breathing Propulsion Detail Design (3,3)
4 Credits

This course is concerned with the design of the various components of an air-breathing engine, starting with the general layout. The students are grouped into teams and each team is charged with the design of a major component (inlet, fan, compressor, combustor, turbine, nozzle, support systems). The components are then integrated to verify that they function together.

Prerequisite: AE 435 or permission of the instructor.

AE 445

Spacecraft Detail Design (3,3)
4 Credits

Principles of spacecraft detail and subsystem design, analysis, modeling, manufacture, and test are covered and incorporated into projects to give actual experience in the detail design and integration of spacecraft subsystems and systems. Integration of multiple subsystems into a single functional model is a key component of the course.

Prerequisites: AE 304, AE 426, AE 427, AE 430, or consent of instructor.

AE 299, 399, 499

Special Topics in Aerospace Engineering
1-6 Credits

Individual independent or directed studies of selected topics in aerospace engineering.

Prerequisite: Consent of instructor and the department chair. May be repeated with a change of content.

Aerospace Electronics

AEL 311

Airborne Pulse Systems (3,0)
3 Credits

A technical study of airborne pulse systems to include distance-measuring equipment and secondary radar to include their operation and support.

Prerequisites: EL 301, EL 303, and EL 307.

Corequisite: AEL 313.

AEL 312

Airborne Communications and Navigation Systems (3,0)
3 Credits

A technical study of communications and navigation systems to include their operation and support.

Prerequisites: EL 301, EL 303, and EL 307.

Corequisite: AEL 313.

AEL 313

Airborne Electronics Maintenance
Operations (0,6)

2 Credits

A practical application of theory to the test, evaluation, and support of airborne electronics systems.

Prerequisites: EL 301, EL 303, and EL 307.

Corequisites: AEL 311 and AEL 312.

AEL 315

Linear Systems and Signals Analysis (3,0)

3 Credits

An intensive study of linear electronic circuits and signals using practical, theoretical, and mathematical approaches. Topics include time and frequency domain analysis of discrete and continuous time systems, and the use of the Fourier, Laplace, and Z-transforms to analyze and design these systems for communications and aerospace electronics applications.

Prerequisites: EL 307, MA 245, and PS 250.

AEL 316

Elements of Engineering Design and Laboratory
Procedures (2,3)

3 Credits

This course is intended to familiarize the student with various theoretical and empirical design procedures including CAD/CAE to translate these designs into laboratory breadboard hardware and to observe and practice acceptable laboratory investigative procedures. The student will be required to provide and use an engineering laboratory notebook throughout this course. Project documentation will include a final, scholarly, written engineering report.

Prerequisite: EL 307.

Corequisite: AEL 315.

AEL 321

Advanced Communications Systems
Analysis (4,0)

4 Credits

An advanced course in communications techniques. Topics include modulation, filtering, distortion, spectral density and correlation, digital coding, random processes, noise, and optimization with aerospace applications.

Prerequisites: AEL 315 and AEL 316.

Corequisites: AEL 322, AEL 323, and AEL 324.

Course Descriptions

AEL 322

Advanced Communications, Microwave, and Control Systems Analysis Laboratory (0,3)

1 Credit

The practical application of communications, microwave, and control system theory using applicable hardware and software.

Corequisites: AEL 321, AEL 323, and AEL 324.

AEL 323

Applied Control System Analysis (2,0)

2 Credits

An intensive study of linear feedback control systems using established analytical approaches. Topics include system designation, response, stability, and compensation techniques with electronic and aircraft applications.

Prerequisite: AEL 315.

Corequisites: AEL 321, AEL 322, and AEL 324.

AEL 324

Microwave and Radar System Analysis (2,0)

2 Credits

An advanced course in microwave theory and radar with application to airborne systems.

Prerequisite: AEL 315.

Corequisites: AEL 321, AEL 322, and AEL 323.

AEL 401

Airborne Surveillance Systems (3,0)

3 Credits

A technical study of airborne surveillance systems to include their operation and support.

Prerequisites: AEL 311 and AEL 312.

AEL 402

Airborne Electronics System Integration (3,0)

3 Credits

A technical study of airborne system integration to include system operation and support.

Prerequisites: AEL 311 and AEL 312.

Corequisite: AEL 401.

AEL 403

Advanced Space and Airborne Electronics Systems (3,0)

3 Credits

A technical study of space and airborne electronic systems to include their operation and support.

Prerequisites: AEL 311, AEL 312.

AEL 404

Airborne Electronics Maintenance Operations II (0,6)

2 Credits

An advanced study of support operations for airborne electronics systems to include practice, installation, regulation, and maintenance techniques.

Prerequisite: AEL 313.

Corequisites: AEL 401, AEL 402, and AEL 403.

AEL 411

Communication and Navigation Systems (3,0)

3 Credits

A comprehensive study of airborne electronics communications and navigation systems to include their design and operation.

Prerequisites: AEL 321, AEL 323, and AEL 324.

AEL 412

Surveillance and Control Systems (3,0)

3 Credits

A comprehensive study of airborne surveillance and control systems to include their design and operation.

Prerequisites: AEL 321, AEL 323, and AEL 324.

AEL 413

Satellite Communications and Navigation Systems (4,0)

4 Credits

A comprehensive study of satellite navigation and communication systems to include their design, operation, and application.

Prerequisite: AEL 321.

AEL 414

System Test and Evaluation Laboratory (0,3)

1 Credit

A familiarization with state-of-the-art test systems used in the evaluation of airborne electronic components and systems.

Corequisites: AEL 411 and AEL 412.

AEL 421

Aerospace Electronic System Integration and Design (3,0)

3 Credits

Design applications in aerospace electronic system integration in current airborne vehicles. Subjects include package design, vehicle mainframe effects on design, FAA regulations and certification, agencies

Course Descriptions

involved in the design, licensing, and standardization of aerospace systems, and manufacturer specifications.

Prerequisites: AEL 411, AEL 412, and AEL 413.

AEL 422

Integrated Logistics Support (3,0)

3 Credits

An intensive study of logistics engineering in aerospace. Study to include reliability, maintainability, and product support engineering.

Prerequisite: MA 412.

AEL 423

Test System Development Laboratory (0,3)

1 Credit

A familiarization with test and evaluation system development for airborne systems using industry-applicable generic test hardware and software.

Prerequisites: AEL 411, AEL 412, and AEL 414.

Corequisites: AEL 421.

AEL 424

Senior Project (2,2)

3 Credits

Capstone project that includes the use of theory and practice learned to design and implement a space or airborne electronic system.

Prerequisite or corequisite: AEL 421.

Aviation Environmental Science

AES 330

Environmental Consulting (3,0)

3 Credits

Today's industries, including the aviation industry, are under the umbrella of federal and state regulations dealing with a variety of environmental issues. One aspect of these regulations is an EA (Environmental Assessment), which is part of the NEPA (National Environmental Protection Act) regulations. This process will be examined and used to analyze local and regional projects.

AES 406

Environmental Management (3,0)

3 Credits

This course focuses on the development of an environmental management plan. Today much of the

environmental work in corporations, including the aviation industry, is carried out in projects. The management of these projects starts with the development of proposals, funding sources, tasks, and timeline. Employees at a variety of levels are required to help manage projects, so terms and organizational contents will be covered.

Air Force Aerospace Studies

AF 101

The Foundation of the U.S. Air Force (General Military Course) (1,0)

1 Credit

A survey course designed to introduce students to the U.S. Air Force and Air Force Reserve Officer Training Corps. Featured topics include mission and organization of the Air Force, officership and professionalism, military customs and courtesies, Air Force officer career opportunities. Leadership Laboratory is mandatory for Air Force ROTC cadets and complements this course by providing cadets with follower-ship experiences.

Corequisite: AF 101L.

AF 102

The Foundation of the U.S. Air Force (1,0)

1 Credit

Continuation of AF 101. Topics include Air Force core values, leadership principles, group leadership dynamics, and an introduction to communication skills. A weekly Leadership Laboratory is mandatory.

Corequisite: AF 102L.

AF 101L/AF 102L

Leadership Laboratory (0,2)

0 Credit

Consists of Air Force customs, courtesies, leadership, teamwork, field training orientation, drill, and ceremonies. Includes a mandatory physical fitness program. These courses are graded Pass/Fail.

AF 201

The Evolution of USAF Air and Space Power (General Military Course) (1,0)

1 Credit

The AF 201 course is designed to examine the aspects of air and space power through a historical perspective. Using this perspective, the course covers a time period from the first balloons and dirigibles to the Air and Space applications employed at the beginning of the Cold War. Historical examples are studied

to extrapolate the fundamentals of air power, including the tenets of air and space power, principles of war, and Air Force competencies, functions, and doctrine. In addition, the students will continue to discuss the importance of the Air Force core values, through the use of operational examples and historical Air Force leaders, and will continue to develop their communication skills. Leadership Laboratory is mandatory for AFROTC cadets and complements this course by providing cadets with followership experiences.

AF 202

The Evolution of USAF Air and Space Power (General Military Course) (1,0)

1 Credit

Continuation of AF 201. This course continues to explore Air Force history, beginning with the Vietnam era and culminating with the modern air and space applications employed during Operations Iraqi and Enduring Freedom. A weekly Leadership Laboratory is mandatory.

Corequisite: AF 202L.

AF 201L / AF 202L

Leadership Laboratory (0,2)

0 Credit

Consists of Air Force customs, courtesies, leadership, teamwork, drill, ceremonies, and field training orientation. Includes a mandatory physical fitness program. These courses are graded Pass/Fail.

AF 301

Air Force Leadership Studies (Professional Officer Course) (3,0)

3 Credits

A study of leadership, management fundamentals, professional knowledge, Air Force personnel evaluation systems, leadership ethics, and the communication skills required of an Air Force junior officer. Case studies are used to examine Air Force leadership and management situations as a means of demonstrating and exercising practical applications of the concepts being studied. A mandatory Leadership Laboratory complements this course by providing advanced leadership experience in officer-type activities, giving students the opportunity to apply the leadership and management principles of this course.

AF 302

Air Force Leadership Studies (Professional Officer Course) (3,0)

3 Credits

Continuation of AF 301. A weekly Leadership Laboratory is mandatory.

Corequisite: AF 302L.

AF 301L / AF 302L

Leadership Laboratory (0,2)

0 Credit

Provides advanced leadership experience in officer-type activities, giving students the opportunity to apply leadership and management principles. Includes a mandatory physical fitness program. These courses are graded Pass/Fail.

Prerequisites: Completion of the General Military Course or Two-Year Program selection and/or approval of the professor of Aerospace Studies.

AF 401

Preparation for Active Duty (Professional Officer Course) (3,0)

3 Credits

Examines the national security process, regional studies, advanced leadership ethics, and Air Force doctrine. Special topics of interest focus on the military as a profession, officership, military justice, civilian control of the military, preparation for active duty, and current issues affecting military professionalism. Continued emphasis is given to the refinement of communication skills. An additional Leadership Laboratory complements this course by providing advanced leadership management principles.

Corequisite: AF 401L.

AF 402

Preparation for Active Duty (Professional Officer Course) (3,0)

3 Credits

Continuation of AF 401. A weekly Leadership Laboratory is mandatory.

Corequisite: AF 402L.

AF 401L / AF 402L

Leadership Laboratory (0,2)

0 Credit

Provides advanced leadership experiences in officer-type activities, giving students the opportunity to apply leadership and management principles.

Course Descriptions

Includes a mandatory physical fitness program. These courses are graded Pass/Fail.

Prerequisites: Completion of the General Military Course or Two-Year Program selection and/or approval of the professor of Aerospace Studies.

AF 403L / AF 404L

Leadership Laboratory (0,2)

0 Credit

Mandatory. Provides advanced leadership experiences in officer-type activities. Includes a mandatory physical fitness program.

Prerequisites: completion of the POC. These courses are graded Pass/Fail.

Aviation Maintenance Science

The Aviation Maintenance Science courses are taught on an "A" and "B" term basis every semester of the year. For this reason, the hours shown for weekly class and lab time will be noticeably higher than for other courses in this catalog.

AMS 101

Maintenance Mathematics and Physics (10,0)

2 Credits

The fundamentals of mathematics and physics as applied to an aviation format that includes technical math (fractions, decimals, ratio, geometry, formulae, and proportions) and basic concepts of aviation applied physics (atmospheric properties, thermodynamics, fluid power, heat, power, work, machines, and sound).

AMS 102

Aircraft Familiarization (10,0)

2 Credits

Theory of aerodynamics and corrosion control involving the physical properties necessary as well as the types of structures and airplanes they are found in is discussed along with the associated safety procedures and aircraft ground operations found in today's aviation profession.

AMS 103

Tools, Materials, and Processes (8,7)

2 Credits

The development of skills in the use of basic mechanic's hand tools, hardware, safety methods, and the fabrication and installation of fluid lines and fittings

through the introduction of tools, hardware, and materials used in aircraft maintenance and repair. Also, various methods of nondestructive testing are studied and applied to various practical situations.

AMS 111

Regulations, Documentation, and Drawing (15,0)

3 Credits

A presentation of the privileges and limitations of the FAA's Federal Aviation Regulations (FAR) Parts 43, 65, and 91 pertinent to aircraft maintenance and the associated documents, publications, and records applicable to the maintenance technician. Also included is weight and balance for aircraft. Also introduced is basic mechanical drawing and blueprint reading for the technician.

AMS 112

Fundamentals of Electricity (8,7)

3 Credits

An introduction to direct and alternating current electricity, electrical circuit design and measuring devices, transformers, and electronic devices and applications. Emphasis will be on voltage, current, resistance, and impedance relationships. Lectures are reinforced with laboratory projects.

AMS 121

Electrical Power Systems I (5,5)

2 Credits

The theory behind aircraft wiring, basic electrical lighting in airframe systems, and DC electrical power systems, generators, and batteries is developed in depth through the use of laboratory projects and classroom material.

Prerequisite: AMS 112.

AMS 122

Metallic Structures (10,10)

2 Credits

A study of aircraft metallic structures with emphasis on aluminum sheet metal applications and their manufacture, repair, and inspection. Through an intensive lab project and in-depth theory discussions, the student will come to understand metal-working processes and skills necessary for airworthy manufacture and repair. Also included are aircraft painting and finishing materials.

Prerequisites: AMS 101, AMS 102, AMS 103, AMS 111.

AMS 123

Instruments and Avionics (8,2)

2 Credits

An overview of current aviation electronic systems (avionics), electromechanical instrumentation, and antenna installation practices. Additional theory of today's electronic instruments and flight management systems, including autopilot, will also be discussed.

Prerequisites: AMS 102, AMS 112.

AMS 131

Composite Materials and Processes (6,5,6)

2 Credits

The fabrication, repair, finishing, and safety practices relating to plastic, composite, wood, and fabric materials found in current structural applications on aircraft. Labs involve the student with component manufacturing, repair, and inspection through the application of plastic resins and adhesives to common composite materials, vacuum bagging, and light nondestructive inspection of composite parts.

Prerequisites: AMS 102, AMS 103, AMS 111.

AMS 132

Aircraft Systems I (6,5,6)

2 Credits

Classroom theory and practical application will involve the operating, service, and line maintenance of heating, cooling, pressurization, oxygen, fire warning, and various fuel systems found in current regional jets.

Prerequisites: AMS 101, AMS 102, AMS 103, AMS 111, AMS 112.

AMS 133

Aircraft Systems II (8,7)

2 Credits

Operating principles and basic troubleshooting techniques for hydraulic and pneumatic components and systems will be discussed in the class, with practical lab situations for reinforcement. Component maintenance, repair, and overhaul will be emphasized for landing gear, anti-skid, and braking systems found in today's turbine-powered aircraft.

Prerequisites: AMS 102, AMS 103, AMS 112.

AMS 242

Airframe Maintenance Practices (9,8,5)

3 Credits

The application of FAA type certificate data sheets, aircraft records, maintenance publications, and Federal Regulations pertinent to airframe inspections that are required by both general and commercial aviation aircraft are covered in theory and applied on Embry-Riddle flight line aircraft. This includes rigging and assembly techniques that are found in current general aviation and jet-type aircraft. Also included are basic welding techniques and welding repairs, gas and electric.

Prerequisites: AMS 103, AMS 111, AMS 112.

AMS 243

Electrical Power Systems II (9,8,5)

3 Credits

The maintenance, repair, and overhaul of electrical power system components and advanced aircraft electrical systems are addressed in the classroom and the laboratory. Jet-type aircraft systems found in current production aircraft are covered through classroom and computer-based instruction.

Prerequisites: AMS 103, AMS 111, AMS 121.

AMS 251

Introduction to Powerplants (8,7)

2 Credits

Reciprocating engine disassembly, inspection, and reassembly procedures are practiced in the lab. In the classroom the study of the theory of these procedures and techniques for reciprocating aircraft engine components and their operation are discussed with emphasis on the design, FAA regulations, and mechanic limitations found in the aviation industry.

Prerequisites: AMS 101, AMS 102, AMS 103, AMS 111.

AMS 252

Fuel, Air, and Exhaust Systems (5,5)

2 Credits

Provides an in-depth study of reciprocating engine fuel metering and distribution, superchargers, heat exchangers, and exhaust manifolds, which are applied to the maintenance, repair, and overhaul of operating reciprocating engine components. Fuel control units and their system operation as it pertains to jet aircraft are also covered.

Prerequisites: AMS 102, AMS 103, AMS 111.

Course Descriptions

AMS 253

Powerplant Electrical Systems (6.5,6)

2 Credits

The operating principles of the powerplant ignition system and components found on reciprocating and turbine engine powered aircraft are covered. Included are various powerplant electrical systems: fire detection and extinguishing, DC twin generator systems, and AC generator systems. Auxiliary power units, their operation, and their components are discussed in depth, with the emphasis on systems theory technology. Lab work covers the maintenance, repair, and overhaul of a magneto.

Prerequisites: AMS 101, AMS 102, AMS 103, AMS 111, AMS 112, AMS 121.

AMS 361

Turbine Engines (10,12.5)

3 Credits

A study of the construction and design of modern gas turbine engines used in the current generation of airplanes and helicopters. Turbine engine systems will be studied, including lubrication, fuel scheduling, starting, and ignition. Heavy emphasis will be placed on maintenance, repair, inspection, and troubleshooting techniques.

Prerequisites: AMS 251, AMS 253.

AMS 362

Propeller Systems (7.5,7.5)

3 Credits

Maintenance, repair, and overhaul theory and practices on propellers and their system components is covered as it pertains to reciprocating and turboprop engines found in today's regional aircraft.

Prerequisites: AMS 101, AMS 102, AMS 103, AMS 111, AMS 121.

AMS 371

Powerplant Inspection and Line Maintenance (10,10)

3 Credits

Operational maintenance and troubleshooting procedures for reciprocating powerplants and powerplant systems are studied in a "real" environment using the 12 engine test stands found on the flight line. Students get hands-on turboprop engine time with the PT-6 and the Garrett 331 operational test stands also found on the flight line.

Prerequisites: AMS 121, AMS 251, AMS 252, AMS 253, AMS 362.

AMS 372

Engine Maintenance, Repair, and Overhaul (10,7.5)

3 Credits

Under the auspices of the FAA Repair Station organization, the student will find invaluable the real learning situation in this lab. The practical and theoretical side is supported through classroom interaction and includes the study of the procedures and acceptable techniques used in engine disassembly, inspection, repair, and reassembly. The use of advanced techniques of nondestructive testing and the recording and return-to-service procedures necessary are covered.

Prerequisites: AMS 251, AMS 253.

AMS 380

Radio Communication Theory and Application (2,0)

2 Credits

This course is designed to increase previously learned electronics theory obtained during the course of study toward the A&P certificate or formal basic electronic theory classes. Upon completion of this course the student will be able to pass the FCC General Radio Telephone Examination (Elements 1 & 3).

Prerequisites: AMS 112, AMS 121, AMS 243, or A&P Certificate.

AMS 384

General Aviation Avionics Systems Integration

4 Credits

This course is a study of aviation electronic equipment with hands-on wiring and system testing. Emphasis will be placed on avionics system installation and the block diagrams of individual appliances. Complete wiring of an Allied Signal Silver Crown avionics suite and a GPS unit is a requirement of the class. Upon completion of this course, the student will be able to understand the operation, testing, and troubleshooting of general aviation avionics systems and wiring concepts.

Prerequisites: AMS 112, AMS 121, AMS 243, or A&P Certificate.

AMS 388

Air Transport Avionics Systems Line Maintenance

6 Credits

This course is an advanced course in aircraft wiring and air transport avionics systems with hands-on wiring and testing. This is the capstone course of the AMS 380 to 388 series and will concentrate on cor-

porate and airline maintenance and troubleshooting. Included in this effort will be the use of advanced ramp test equipment and wiring concepts.

Prerequisites: AMS 112, AMS 121, AMS 243, or A&P Certificate.

Aeronautical Science

AS 120

Principles of Aeronautical Science (3,0)

3 Credits

An introductory course in Aeronautical Science designed to provide the student with a broad-based aviation orientation in flight-related areas appropriate to all non-Aeronautical Science degree programs. Subjects include historical developments in aviation and the airline industry, theory of flight, airport operations, aircraft systems and performance, elements of air navigation, basic meteorology theory, air traffic principles, flight physiology, and aviation regulations and safety. Not available to Aeronautical Science students or to students with FAA flight certificates.

AS 121

Private Pilot Operations (5,0)

5 Credits

This course develops aeronautical knowledge required for certification as a Private Pilot with an Airplane Single Engine Land rating. Topics include regulations, safety, pre-solo operations, cross-country planning, airspace, chart use, communications, weather, performance, weight and balance, aerodynamics, and decision-making.

Corequisite: ASC 101 (Air Science students).

AS 142

Private Helicopter Operations (3,0)

3 Credits

During this course the student obtains the foundation for all future helicopter aviation training. The student will be introduced to helicopter fundamentals of flight and will become familiar with basic flight maneuvers and operating procedures. Emphasis will be placed on developing a safe and competent pilot who is adequately prepared for solo, cross-country, and night operations. The student will receive training in safety awareness, crew resource management, and aeronautical decision-making. By the end of the course, the student will have met the aeronautical knowledge requirements to take the FAA Private Pilot, Rotorcraft-Helicopter, written knowledge test.

AS 220

Unmanned Aerial Vehicles and Systems (3,0)

3 Credits

This course is a survey of Unmanned Aerial Vehicles and systems, emphasizing the military and commercial history, growth and applications of UAVs. Course will include basic acquisition, use, and operation of UAVs with an emphasis on operations.

AS 221

Instrument Pilot Operations (3,0)

3 Credits

This course develops aeronautical knowledge required for addition of an Instrument Airplane rating to a Private Pilot certificate. Topics include instrument flying regulations, safety, operations, navigation systems, chart use, weather, flight planning, decision-making, and crew resource management.

Prerequisite: AS 121.

AS 252

Instrument Helicopter Operations (3,0)

3 Credits

This course will examine helicopter instrument flying in the National Airspace System below 18,000 feet. Topics to be covered include Federal Aviation Regulations, helicopter performance for instrument flight, instrument approach procedures, weather related to instrument flying, en route navigation, and the elements of resource management. By the end of the course, the student will have met the aeronautical knowledge requirements to take the FAA Instrument, Rotorcraft-Helicopter written knowledge test.

Prerequisite: AS 142 or FAA Private Pilot Certificate with Rotorcraft-Helicopter Rating.

AS 254

Aviation Legislation (3,0)

3 Credits

This course examines the evolution of federal civil aviation regulations in the United States. It provides an overview of the past and present problems prompting regulation of the industry, the resultant safety legislation, airport development funding legislation, and international aviation legislation.

AS 309

Aerodynamics (3,0)

3 Credits

Incompressible flow airfoil theory, wing theory. Calculation of stall speed, drag, and basic performance criteria. Configuration changes, high and

Course Descriptions

low speed conditions. Special flight conditions.
Introduction to compressible flow.

Corequisite: PS 104.

AS 310

Aircraft Performance (3,0)

3 Credits

Aerodynamic performance of aircraft powered by reciprocating, turboprop, or jet turbine engines. Stability and control, weight and balance and operating data.

Prerequisite: AS 309.

Corequisite: AS 311.

AS 311

Aircraft Engines-Turbine (3,0)

3 Credits

A comprehensive study of aircraft gas turbine engine fundamentals and theory at the technical level. Areas of study include background, types, variations, and applications; engine theory; construction and design; systems and accessories; representative engines.

Corequisite: PS 104.

AS 312

Ethics in the Aviation Environment (3,0)

3 Credits

This course will introduce the student to decision making and sound business practice based on legal, ethical, moral, and statutory fundamentals. Students will be introduced to legal restraints and model professional rules pertaining to confidentiality and conflict of interest, as well as ethical and cultural issues such as competence and truthfulness as related to legal and aviation related professions. Emphasis will be on restraints placed on the decision-making process required of aviation and business professionals.

Prerequisite: Junior standing.

AS 313

Resource Management-An Instrument Pilot Perspective (1,0)

1 Credit

A review of the fundamentals of resource management followed by application to the single-pilot IFR environment. Includes classroom exercises allowing student demonstration and practice of basic resource management theory. Includes preview/perspective of future resource management training.

Prerequisites: AS 213, FA 251.

Corequisite: FA 304.

AS 320

Commuter Aviation (3,0)

3 Credits

This course acquaints the student with the development, administrative policies, and operational factors peculiar to commuter aviation, especially since passage of the Airline Deregulation Act of 1978. The impact of mergers and acquisitions, profiles of passenger and cargo carrying commuters, and analysis of commuter successes and failures are discussed. Emphasis is placed on the establishment of a new commuter airline, which includes market and financial analysis, the company plan, aircraft selection and acquisition, route structure and timetable, marketing strategy, and pertinent regulatory requirements. The course culminates in a formal proposal soliciting for venture capital to start a commuter airline.

Prerequisite: BA 201.

AS 321

Commercial Pilot Operations (3,0)

3 Credits

This course develops aeronautical knowledge required for certification as a Commercial Pilot with Single and Multi-Engine Land ratings. Topics include multi-engine flying in VFR and IFR environments, including high altitude, night, winter, and mountain. Topics also include regulations, safety, weather, aerodynamics, weight and balance, performance, aircraft systems, navigation facilities, chart use, and decision-making.

Prerequisite: AS 221.

AS 340

Instructional Design in Aviation (3,0)

3 Credits

The application of the method of scientific inquiry to the process of instruction in aviation is presented. This means the systematic design of instruction, based on knowledge of the learning process, taking into account as many factors about the particular situation as possible. Special emphasis will be placed on examining instructional problems and needs in aviation, setting a procedure for solving them, and then evaluating the results.

Prerequisite: Commercial Pilot Certificate with Instrument Rating.

AS 346

Advanced Navigation (3,0)

3 Credits

This course continues the flight planning and navigation procedures started in AS 246. It brings the

student into long-range IFR operations. Planning, FAR Part 121 regulations, routes, oceanic procedures, instrument approach procedures, and emergency considerations are applied to U.S. and international operations. The student is introduced to ground-based radar surveillance and the Global Positioning System.

Prerequisites: AS 246, AS 310.

AS 350

Domestic and International Navigation (3,0)

3 Credits

This course will study FAR Part 121 domestic and flag regulations and evaluate their impact on long-range domestic and international flights. The student will be able to use ICAO, JAA, and FAA operational requirements and typical air carrier Ops SPECS to plan domestic and transoceanic flights. CBT simulation programs may be used as necessary to demonstrate actual flight scenarios. High-altitude airspace, navigation, and approach procedure chart interpretation will be examined in detail. Students will study and use the concepts of MNPS and RVSM airspace, dispatch procedures, ETOPS, ETP, driftdown, track messages, LRN accuracy checks, Oceanic Air Traffic Control clearances, international METARs and TAFs and emergencies and contingencies while on oceanic tracks. Communication systems requirements and methodology will be examined to include satellite, digital, and analog devices.

Prerequisites: AS 310 and AS 221 or Instrument Rating.

AS 356

Aircraft Systems and Components (3,0)

3 Credits

A comprehensive study of aircraft systems and components at the technical level. Areas of study include aircraft electrical, hydraulic, fuel, propeller, and auxiliary systems including theory of operation, calculations, and related Federal Aviation Regulations.

Prerequisite: PS 104.

AS 357

Flight Physiology (3,0)

3 Credits

Aeromedical information. Causes, symptoms, prevention, and treatment of flight environment disorders. Altitude effects, spatial disorientation, body heat imbalance, visual anomalies, and psychological factors are included as they relate to pilot performance and survival effectiveness.

Prerequisite: Sophomore standing.

AS 358

Advanced Avionics (3,0)

3 Credits

The student will be taught the electronic characteristics of communications, navigation, and surveillance equipment both on the ground and in the aircraft. This will include historical information leading to the current systems. Systems and concepts taught will include ADF, VOR, INS, IRS, GPS, ILS, VHF and UHF communications, SATCOM, ACARS, TCAS, EGPWS, transponders (Mode A, C, and S), ADS and ADS-B, TLS, free flight and weather radar. Since this area is very dynamic, new systems will be introduced as they are designed and perfected.

Prerequisite: AS 221 or Instrument Rating.

AS 372

Commercial Helicopter Operations (3,0)

3 Credits

The student will develop an in-depth knowledge of helicopter components, functions, systems, aerodynamics, and performance at the commercial pilot level. The student will also gain necessary knowledge on en route flight to include weather, navigation, and regulations. By the end of the course, the student will have met the aeronautical knowledge requirements to take the FAA Commercial Pilot, Rotorcraft-Helicopter written knowledge test.

Prerequisite: AS 142 or FAA Private Pilot Certificate with Rotorcraft-Helicopter Rating.

AS 378

Environmental Helicopter Operations (3,0)

3 Credits

During this course, the student obtains the foundation for helicopter operations in terrain flight and in varying environmental conditions. The student will be introduced to aspects particular to helicopter flight as it pertains to adverse weather, day and night environments specifically pertaining to take-off, cruise, and landing. Emphasis will be placed on understanding principles of flight close to the Earth and hazards both natural and man-made. Additional emphasis will be placed on helicopter flight in and around mountains. The student will be exposed to visual references and how to adjust perceptions to maintain safe, low-level flight in and around hazardous conditions present in commercial helicopter operations. By the end of the course, the student will have sufficient knowledge to understand the concepts necessary for employment in the commercial helicopter industry.

Prerequisite: AS 372 or approval of instructor.

Course Descriptions

AS 380

Pilot Career Planning and Interviewing Techniques (1,0)

1 Credit

A course in which students will discuss and develop short-term and long-term job and career goals, conduct career research using various University and industry resources, prepare a personal job search portfolio, prepare resumes and letters of application, and gain insights and proficiency in interviewing skills so they are better prepared to enter the job market upon graduation. Students will participate in simulated interview scenarios, will be expected to correspond with at least one company, and will be involved in the evaluation of letters, resumes, and interviews. This course will be graded Pass/Fail.

Prerequisite: Junior standing.

AS 387

Crew Resource Management (3,0)

3 Credits

A capstone course designed to develop a detailed understanding of the organizational behavior, interpersonal relationships skills, and other critical behavioral dynamics of professional flight crews. The course builds upon the knowledge of crew resource management (CRM) acquired during the student's private, instrument, and commercial pilot certification training. The history of CRM, CRM concepts of communication processes, problem solving, group dynamics, workload management, and situational awareness will be investigated. Aircraft incidents and accidents related to the evolution of CRM training programs and FAA regulations will be analyzed. Intrapersonal and psycho-motor skills will be addressed as they relate to safe, legal, and efficient flight operations.

Prerequisites: AS 350 and PSY 101.

AS 388

Helicopter Flight Planning (3,0)

3 Credits

During this course, the student obtains the foundation for the FARs as they relate to flight planning and navigation for various operations. The student will be able to use regulatory and operations requirements to plan flights. Remote location flight and terrain flight navigation procedures will be studied closely. Cargo planning for internal and/or external loads will also be considered. Communications procedures with internal and external operations nodes during near-ground operations will be discussed. By the end of the course, the student will have sufficient

knowledge to understand the concepts necessary for effective flight planning and operation in the commercial helicopter industry.

Prerequisite: AS 372 or approval of instructor.

AS 402

Airline Operations (3,0)

3 Credits

A study of the scope and function of a major air carrier's organizational structure and the specific relationships of the operations department with those of marketing, maintenance, and safety are discussed. A study of corporate issues including the industry in general, market structure, certification, FAR Part 121 regulations, economic issues, mergers, corporate culture, and international topics will be included. From an operational perspective, topics include flight operations employment policies, domiciles, operating specifications, types of services provided, training, passenger considerations, decision making, communications, and pertinent FARs.

AS 405

Aviation Law (3,0)

3 Credits

This course will introduce the advanced student to the U.S. Constitution as well as to federal, state, and local statutes. The student will become familiar with case law and common law and develop an understanding of the chronological development of these laws and their application to aviation. The student will be introduced to civil law, including tort, product liability, contract, sales, secured credit, property, environmental, and labor laws. Criminal statutory law and government, airman, and operator rights and liabilities will also be studied, as well as international laws and conferences.

Prerequisite: Junior standing.

AS 408

Flight Safety (3,0)

3 Credits

A capstone course designed to assist the student in developing an attitude and philosophy for accident prevention. The course includes ideal and practical, personal and organizational safety procedures and goals; safety philosophies; aircraft accident reports; human factors; principles of accident investigation, accident prevention programs, and accident statistics; current events; and NTSB special studies.

Prerequisite: Senior standing.

AS 410

Airline Dispatch Operations (3,0)

3 Credits

This capstone course includes a review of pertinent Federal Aviation Regulations, navigation systems and procedures, manual flight planning, emergency and abnormal procedures, the general operating manual, aircraft systems and performance development, human factors, and practical dispatching applications.

Prerequisite: AS 310.

Corequisites: AT 300, WX 301. (AT 300 and WX 301 are only applicable for those students in the Dispatcher Program.)

AS 411

Jet Transport Systems (3,0)

3 Credits

This course will provide the student with detailed knowledge of complete turbojet systems. The student will: (1) be exposed to complex air carrier aircraft systems; (2) conduct a detailed examination of the B-747-400. Air carrier procedures are examined from a crew members' operational perspective.

Prerequisite: AS 356 or permission of the instructor.

AS 412

Corporate and Business Aviation (3,0)

3 Credits

Operation of a corporate flight department. Value of management mobility. Aircraft and equipment evaluation, maintenance, flight operations, administration, fiscal considerations.

AS 413

Resource Management-The Crew Perspective (1,0)

1 Credit

A brief historical overview of crew resource management followed by a study of recent major and regional carrier accidents and direct application of crew resource management fundamentals that were used or not used. Classroom team exercises allow student demonstration and practice of basic resource management theory, specifically applied to the three-person crew of a Boeing 727. Additionally, students are challenged with crew resource management theory applications by the major carriers today and applications to each student's private life and career.

Prerequisites: AS 313, FA 418.

Corequisite: FA 420.

AS 414

Aviation and the Administrative Law Process (3,0)

3 Credits

This course will introduce the student to administrative law and the role of the Federal Aviation Administration in the rule-making process. Additionally, the student will learn and understand the adjudication and judicial review functions the court exercises over administrative agencies and the process by which they exercise such control.

Prerequisite: AS 254, or permission of the instructor.

AS 420

Flight Technique Analysis (3,0)

3 Credits

Application of aerodynamic principles to the development of optimal pilot techniques and procedures. Uniform procedures applicable to all airplanes and special procedures for large, high-performance, and transport aircraft are analyzed, including principles of flight deck resource management.

Prerequisites: AS 310, AS 435.

AS 428

FMS/Autopilots for Helicopters (3,0)

3 Credits

During this course, the student studies the principles, systems analysis, operations of flight directors with mechanical, glass cockpits, HUDs, autopilots, automatic flight control systems with auto throttle, altitude hold, heading hold, position hold, stability augmentation devices, and flight management systems.

Prerequisite: AS 372 or approval of instructor.

AS 435

Electronic Flight Management Systems (3,0)

3 Credits

This course teaches the theory and principles governing flight with autopilot and flight management systems. Students will apply theory and principles by demonstrating good decisions and thought processes in autopilot and FMS/PC simulators.

Prerequisites: AS 310, AS 350.

Corequisite: AS 358.

AS 438

Advanced Helicopter Operations (3,0)

3 Credits

During this course, the student obtains the foundation for advanced and specialized commercial heli-

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copter operations. The student will be introduced to advanced commercial operations and their requirements for the PIC/SIC. Emphasis will be placed on developing a safe and competent pilot who is adequately prepared for flight operations in these areas. This course also focuses on training management, safety management, personnel management, maintenance management, and record keeping. By the end of the course, the student will have sufficient knowledge to understand the concepts necessary for leadership in the commercial helicopter industry.

Prerequisite: AS 372 or approval of instructor.

AS 442

Flight Instructor Helicopter Operations (3,0)

3 Credits

The theory and proper techniques of instruction and helicopter private and commercial pilot knowledge will be presented. The student will develop, plan, and give practice instruction on topics for private and commercial helicopter pilots. By the end of the course, the student will have met the aeronautical knowledge requirements to take the Fundamentals of Instruction and CFI-Helicopter written knowledge tests.

Prerequisite: AS 252 or FAA Commercial Pilot Certificate and Rotorcraft-Helicopter Rating.

AS 471

All-Attitude Flight and Upset Recovery

1 Credit

Introduction to all-attitude flight and upset recovery using flight simulation software running on high-performance personal computers. Analysis of selected loss-of-control and controlled-collision-with-ground accidents. Simulated training in inverted flight, low-altitude steep bank and pitch maneuvers upright and inverted, and aerobatics in a high-performance jet airplane. Study of upset training techniques in a transport-type airplane as taught in several major airline/aircraft manufacturing companies. Simulated upset recovery training in a heavy jet transport aircraft from nose-high and nose-low attitudes at various bank angles.

Prerequisite: AS 309, Pilot Certificate with Instrument Rating.

AS 199, 299, 399, 499

Special Topics in Aeronautical Science

1-3 Credits

Individual independent or directed studies of selected topics in general aviation.

Prerequisites: Consent of instructor and approval of department and program chairs. May be repeated with a change of subject. Special topics courses involving flight training are offered in selected areas for the purpose of gaining proficiency in required pilot operations for various certificates and ratings.

ASC 101

Aeronautical Science Student Success

Seminar (1,0)

1 Credit

This course helps students assess and develop the personal, interpersonal, intellectual, and social skills necessary to succeed in a flight-related college degree program. Topics include time management, study skills, principles of learning, goal clarification, and college resources. Practical applications will emphasize strategies for coping with challenges unique to students in a flight-related degree program.

Corequisite: AS 121 or approval of instructor.

Air Traffic Control

AT 200

Air Traffic Management I (3,0)

3 Credits

AT 200 is the entry-level course in the Air Traffic Management (ATM) degree sequence. It is also the first of the courses required in the FAA's Collegiate Training Initiative (CTI) program the FAA is using to meet ATC staffing requirements. This course provides students with a fundamental knowledge of the U.S. air traffic control system and develops content knowledge in the following areas: the Federal Aviation Administration, its mission, organization, and operation; the air traffic control career; navigational aids, current and future; airspace; communications; federal aviation regulations; ATC procedures; control tower operations; nonradar operations; radar operations; pilots' environment; and future air traffic control systems. The course also provides essential information that is useful for pilots and other aviation professionals.

AT 302

Air Traffic Management II (3,0)

3 Credits

Air Traffic Management II gives the student an introduction to the manuals, procedures, maps, charts, and regulations used by pilots and air traffic controllers in the National Airspace System (NAS). Included is an examination of FAA Orders, the Aeronautical

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Information Manual (AIM), and Federal Air Regulations (FARs). Students will also acquire basic knowledge about SIDs, STARs, en route IFR charts, and instrument approaches. Search and rescue, special operations, NOTAMS, and teamwork in the ATC environment are also studied in this course.

Prerequisite: AT 200.

AT 305

Air Traffic Management III (3,0)

3 Credits

This course covers the basic air traffic control (ATC) procedures for instrument flight rules (IFR) in terminal ATC facilities in the National Airspace System (NAS). Knowledge and skill requirements for air traffic control specialists (ATCS) in the current ATC system are studied in the classroom and practiced in a realistic, performance-based laboratory environment. Duties and responsibilities of the Tracon air traffic controller are integrated into an understanding of how the total ATC system works. Classroom delivery is augmented by practical laboratory problems using an air traffic control simulation of terminal radar operations.

Prerequisites: AT 200, AT 302.

AT 315

Air Traffic Management-VFR Tower (2.5,1)

3 Credits

AT 315 is the air traffic control VFR Tower segment in the Air Traffic Management (ATM) degree sequence. This course provides students with a fundamental knowledge of VFR Tower terminal operations in the U.S. air traffic control system and develops content knowledge in the following areas: control tower equipment and operating positions; the airport traffic area; navigation aids; airspace; VFR traffic patterns; controller/pilot phraseology; aircraft taxi instructions; control of vehicle movement; interagency communications and intrafacility coordination; federal aviation regulations; notification and handling of emergency aircraft; flight progress strip marking; aircraft recognition and characteristics; limited weather observations; airport lighting systems; wake turbulence and its effects on arriving/departing aircraft; VFR and IFR ATC procedures; runway incursions; using ATIS; reporting RVR/RCR; determining prevailing visibility using visual reference; NOTAMS; and criteria for runway selection. The course also provides essential information that is useful for pilots and other aviation professionals.

Prerequisites: AT 200, AT 302, AT 305.

AT 401

Air Traffic Management IV (2,3)

3 Credits

This course integrates the knowledge of air traffic control gained in previous air traffic control courses with an opportunity to actually “work” air traffic control operating positions. Using a realistic air traffic control simulation, students issue instructions to aircraft, make hand-offs, coordinate with other controllers, solve aircraft confliction problems, and do other controller tasks. The ability to make “real-time” decisions, determine strategies for controlling aircraft, and work with a dynamic scenario are features unique to this learning experience. This course combines classroom discussion and group and team coordination with various forms of evaluation for course credit. Student competency in the performance phase of the course is determined by computer scoring.

Prerequisites: AT 200, AT 302, AT 305.

AT 405

Air Traffic Management V (2,3)

3 Credits

This course expands on the skills, knowledge, and abilities the student has acquired in previous ATC classes. AT 405 presents more demanding and complex traffic scenario requiring higher-level performance and decision-making skills and prepares the student for initial training in any ATC specialization. Students will also gain an appreciation for the challenges of implementing large-scale changes in the National Airspace System. Upon successful completion of this course, students will demonstrate the knowledge and technical aptitude required for entry-level qualification as an air traffic control specialist.

Prerequisites: AT 200, AT 302, AT 305, AT 401.

AT 406

Air Traffic Management VI

3 Credits

This course introduces students to the non-radar procedures and minima prescribed in FAAH 7110.65 and builds on knowledge gained in prerequisite courses. Training includes the vertical, lateral, and longitudinal separation of aircraft in the departure, en route, and arrival phases of flight. Phraseology, strip marking, instrument/visual approaches, and the coordination procedures necessary to operate in an en route non-radar environment will be covered. Students will work a number of air traffic control scenarios and demonstrate higher-level performance and decision-making skills required for entry-level qualification as an air traffic control specialist.

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Prerequisites: AT 200, AT 302, AT 305, AT 401, AT 405.

Avionics Technology

AVT 301

Introduction to Avionics (3,0)

3 Credits

A survey course designed to provide a basic knowledge of electronics with application to avionics for the non-avionics major.

AVT 330

Simulation Maintenance Technician (2,3)

3 Credits

This course is an introduction to simulator types, FAA regulations germane to simulators, and actual operation of different types of simulators. Types of display devices, computer languages, support systems, inspection techniques, and troubleshooting procedures will be offered in the classroom and laboratory environment.

Corequisite: AEL 311, AEL 312, or permission of the department chair.

Business Administration

BA 101

Introduction to Business Programs and Careers (3,0)

1 Credit

The student will assess and develop the personal and interpersonal dynamics and intellectual and social demands necessary to succeed in college. Time management, study skills, goal clarification, career concerns, and college resources are included in the course. Different aspects of careers in business will be discussed in depth. This course is available to freshmen only.

BA 105

American Business Enterprise (3,0)

3 Credits

The course examines the issues, foundations, and environment of the business enterprise system. Business financing, production, marketing, and employee relations are stressed. Not available to Business Administration students.

BA 120

Introduction to Computer-Based Systems (3,0)

3 Credits

An overview of computing in the business environment, and an introduction to the tools, techniques, and strategies of computer-based information system development. The emphasis is on developing computer literacy through the use of computers in the design and presentation of business communications such as plans, proposals, spreadsheets, graphs, and charts.

BA 201

Principles of Management (3,0)

3 Credits

Provides an overview of relevant management principles and practices as applied in contemporary formal and informal organizations. Focuses on management theories, philosophies, and functions.

BA 210

Financial Accounting (3,0)

3 Credits

An introduction to accounting information systems and financial reports, including accounting concepts and analysis and interpretation of financial reports with an emphasis on the operating activities of aviation-related businesses.

BA 212

Advanced Financial Accounting (3,0)

3 Credits

An in-depth study of accounting information systems and financial reports used in a management environment, analyzing and interpreting financial reports with an emphasis on the operating, investing, and financing activities of all types of organizations, including airline and aviation related companies.

Prerequisite: BA 210.

BA 215

Transportation Principles (3,0)

3 Credits

This course will introduce the basic principles of several modes of transportation, including air, sea, rail, automobile, transit, and pipeline. The operating characteristics of each mode is discussed, as are issues associated with inter-modal competition, compatibility, and inter-connectivity, the importance of each in the economy, environmental issues, and future developmental prospects.

Prerequisite: BA 201.

BA 220

Marketing (3,0)

3 Credits

Marketing theory; marketing management, sales management; market research. Public and customer relations, advertising, distribution.

Prerequisite: BA 201.

BA 221

Advanced Computer-Based Systems (3,0)

3 Credits

This course is a continuation of BA 120 or IT 109. It covers advanced concepts of spreadsheet use, database management systems, and Internet usage. Students perform macro and command language programming in applications packages. In addition, the course provides the basics of web-based design to support management activities.

Prerequisite: BA 120 or IT 109.

BA 225

Business Law (3,0)

3 Credits

This course is an overview of the law as it pertains to business relations and business transactions. Areas covered include: Procedure, Torts, Criminal Law and Procedure, Constitutional Law, Administrative Law, Contracts, Agency, Real Property, Personal Property, Wills, Trusts and Estates, Insurance Law, Employment Law, Commercial Transactions, Secured Transactions, Creditor/Debtor Law, and Negotiable Instruments. Areas of the law applicable to the aviation industry will also be covered.

Prerequisite: BA 201.

BA 308

Public Administration (3,0)

3 Credits

Characteristics of organization and management in government; impact of political processes and public pressures on administration action; role of regulatory agencies; governmental personnel and budgetary procedures; unique qualifications of the public administrator.

Prerequisite: BA 201.

BA 310

Airport Management (3,0)

3 Credits

Students will be introduced to the history of airports in the United States including major federal legislation affecting their development. Students will be

introduced to the rules and regulations governing airport operations, the air traffic control, airfield, terminal, and ground access facility infrastructure of airports, airport security policies, and the economic, political, and social role of civil use airports.

Prerequisites: BA 201, AS 120 or AS 121.

BA 312

Managerial Accounting (3,0)

3 Credits

Emphasizes management's use of cost information in internal decision-making. Decision-making processes include cost analysis, control, allocation, and planning. A variety of accounting techniques applicable to aviation/aerospace companies are presented.

Prerequisite: BA 210.

BA 314

Human Resource Management (3,0)

3 Credits

This course will examine the functions to be accomplished in effectively managing human resources. An in-depth study of the interrelationship of managers, organizational staff, and/or specialists will assist the student in understanding and applying management theories to real-world human resource planning. Areas of concentration include human resource planning; recruitment and selection; training and development; compensation and benefits; safety and health; and employee and labor relations.

Prerequisite: BA 201.

BA 315

Airline Management (3,0)

3 Credits

An introduction to the administrative aspects of airline operation and management. Topics include demand modeling and forecasting, analyzing market competition, schedule planning, fleet assignment, crew scheduling, maintenance routing, irregular operations management, revenue management, the theory of pricing, and marketing and sales initiatives.

Prerequisite: BA 201.

BA 317

Organizational Behavior (3,0)

3 Credits

This course introduces students to the fundamental concepts of organizational behavior with an emphasis on research, theory, and practice. The student is presented with (1) basic concepts shaping individual behavior such as values, personality, perception, learning, and motivation; (2) basic concepts shaping

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group/team behavior such as leadership, communication, power, politics, conflict and negotiation; (3) basic concepts shaping organizational structure such as work design, HR policies, culture as well as issues related to organizational change, stress, ethics, and diversity.

Prerequisite: BA 201.

BA 318

Entrepreneurial Small Business (3,0)

3 Credits

An analysis of the theoretical and practical knowledge necessary to be successful in conceiving, initiating, organizing, and operating a small business is the main focus. Special focus will be placed on developing a business plan, business in aviation, and entrepreneurship.

Prerequisite: BA 201 or permission of the instructor.

BA 320

Business Information Systems (3,0)

3 Credits

A management approach to understanding business information systems. The general characteristics, potential, and limitations of business systems are covered. The major emphasis is on understanding the inputs, processing, and outputs of a variety of business systems; the ways in which business systems are interrelated and the inherent management problems involved in the implementation and control of such systems.

Prerequisite: BA 221.

BA 321

Aviation/Aerospace Systems Analysis Methods (3,0)

3 Credits

Overview of the system development life cycle. Emphasis on current system documentation through the use of both classical and structured tools/techniques for describing process flows, data flows, data structures, file designs, input and output designs, and program specifications.

Prerequisite: BA 320.

BA 322

Aviation Insurance (3,0)

3 Credits

An introduction to the basic principles of insurance and risk with its special application to the aviation industry. An in-depth review of the aviation insurance industry in the U.S. including the market and types of aviation insurers.

Prerequisite: BA 201.

BA 324

Aviation Labor Relations (3,0)

3 Credits

An investigation of labor-management relations with specific reference to the aviation industry. Examined are the history of unionism, structure of unions, legal environment and the Railway Labor Act, collective bargaining, public sector relationships, grievance procedures, conflict resolution, and contemporary trends affecting union membership.

Prerequisite: BA 201.

BA 325

Social Responsibility and Ethics in Management (3,0)

3 Credits

A comprehensive inquiry into the major components of social responsibility including economic, legal, political, ethical, and societal issues involving the interaction of business, government, and society.

Prerequisite: BA 201.

BA 326

Marketing Management (3,0)

3 Credits

Marketing management in today's global marketplace must focus on developing strategic options and business plans by managers possessing an integrative functional perspective and understanding marketing's role in the firm. Emphasis will be given to corporate and marketing strategy formulation; market analysis and target market selection; strategic marketing programming; and control of the marketing tactics selected.

Prerequisite: BA 220.

BA 327

Airline-Airport Operations (3,0)

3 Credits

Airline-Airport Operations is a comprehensive overview of the symbiotic and dynamic relationship between airline and airport operations. This course focuses on the day-to-day issues that airline and airport management must address in order to effectively operate. The student will develop an understanding of current issues impacting the relationship between airlines and airports. A historical overview, current airport and airline operational characteristics, regulatory perspectives, current political and financial environment, air service development, and future issues are studied.

Prerequisite: BA 201.

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BA 332

Corporate Finance I (3,0)

3 Credits

The finance function as used by management, including financial analysis and control financial planning; and short, intermediate, and long-term financing, using the theory of cost of capital and leverage in planning financial strategies. Aviation-related businesses are emphasized.

Prerequisite: BA 210.

BA 333

Personal Financial Planning (3,0)

3 Credits

A study of the personal financial planning process. Includes taxes, investments, purchase of housing/auto, insurance needs and analysis, use of credit, and retirement and estate planning. Student will develop a personal financial plan and will invest in a \$500,000 portfolio of securities.

Prerequisite: BA 210.

BA 334

Investment Analysis (3,0)

3 Credits

This course is an introduction to the field of investments. The course is designed as a guide for people studying the capital markets for the first time. The course provides a survey of investments including security markets, investment vehicles, investment analysis, and portfolio management. Specific topics include the concept of risk and return, types of financial instruments, study of how they are bought and sold, an introduction to how they are valued in the marketplace, a survey of investment companies, asset allocation, concept of efficient markets, equity and bond portfolio management, portfolio performance evaluation, fiduciary responsibility and ethical conduct in the investment profession, and corporate governance. The course is taught from the viewpoint of an individual rather than an institutional investor. The course uses current economic and capital market information for a practical application of the course materials.

Prerequisite: BA 332 or EC 225 or permission of the instructor.

BA 335

International Business (3,0)

3 Credits

An analysis of economic development and international trade in modern times, with an examination of

current U.S. relations with other nations. Attention will be focused on the impact of foreign trade on the aviation industry and the industry's contribution to economic development.

Prerequisite: BA 201.

BA 340

International Accounting (3,0)

3 Credits

This course introduces the student to accounting in the global environment. The student will learn about accounting systems and reporting practices around the world. Efforts toward accounting harmonization and the impact of International Financial Reporting Standards will be discussed. Specific accounting topics, such as accounting for currency exchange rate changes, financial reporting and disclosure issues in a global context, and using financial statements across borders and in emerging capital markets will be covered. Managerial issues in an international context will also be discussed.

Prerequisite: BA 210.

BA 342

International Finance (3,0)

3 Credits

The purpose of this course is to provide the analytical framework required for understanding how changes in international financial conditions influence decisions faced by modern business leaders in a global setting. The focus will be on interactions between cross-border trade and capital flows, inflation, interest rates, exchange rates, monetary and fiscal policy, and economic growth. Exchange rate regimes, exchange rate risk and hedging, global capital budgeting, short-term and long-term financing of multinational enterprise, and managing multinational operations will also be explored. The course is tailored to students seeking careers in global banking and investment or with finance and strategy departments of aviation operating enterprises in global markets.

Prerequisite: BA 332.

BA 405

General Aviation Marketing (3,0)

3 Credits

Marketing and management concepts applicable to FBOs and other general aviation enterprises. Travel analysis is performed to determine the need for a business aircraft.

Prerequisite: BA 326.

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BA 410

Management of Air Cargo (3,0)

3 Credits

Intensive study of the practices and problems of management with respect to air cargo. Importance of air cargo service to the economy, rate and tariff problems, terminal facilities, competition, and future prospects.

Prerequisite: BA 215.

BA 411

Logistics Management for Aviation/Aerospace (3,0)

3 Credits

This course examines ways to optimize the physical flow of goods and materials in a firm from acquisition through production, and movement through channels of distribution. It focuses on applying logistics theory to aviation management problems in materials handling, managing inventory, planning capacities, and locating distribution centers. It includes case studies with aviation/aerospace applications using computer models.

Prerequisites: BA 201, MA 222.

BA 412

Airport Planning and Design (3,0)

3 Credits

The principles of airport master planning and system planning are studied. Fundamental principles of airport planning and design are covered, including activity forecasting, capacity and delay analysis, site selection, airfield and terminal design, environmental mitigation and abatement and financial planning.

Prerequisites: BA 318, MA 222.

BA 418

Airport Administration and Finance (3,0)

3 Credits

This course is an advanced study of the organizational, political, and financial administration of public and private civil use airports. Areas of emphasis include public relations management, safety and security issues, employee organizational structures, financial and accounting strategies, revenue and expense sources, economic impacts of airport operations, airport performance measurement standards, and current trends and issues of direct concern to airport administrators.

Prerequisites: BA 310, BA 332.

BA 419

Aviation Maintenance Management (3,0)

3 Credits

Comprehensive examination of organizational maintenance policies, programs, and procedures. Emphasis on maintenance planning; forecasting and cost control; reliability and safety; and flight schedule performance.

Prerequisites: BA 201, MA 222.

BA 420

Management of Production and Operations (3,0)

3 Credits

An intensive study of management in all organizations: service-oriented and product-oriented. Scheduling, inventory control procurement, quality control, and safety are investigated. Particular attention is given to applications of aviation-oriented activities.

Prerequisite: MA 320 or by permission of the instructor.

BA 422

Life Cycle Analysis for Systems and Programs in Aviation/Aerospace (3,0)

3 Credits

This course is a study of system theory and its relationship to aviation/aerospace systems management. It covers a brief history of system theory and system life cycle and presents the major activities in each phase of a system's life cycle. Also covered are specific topics related to system design and support, including reliability, maintainability, availability, testing, quality control, customer support, product improvement program analysis, and the role of data collection and analysis in the operational phase. Related topics covered are cost-effectiveness analysis and project management. The course examines applications and case studies specific to aviation/aerospace, including military applications and computer simulation models.

Prerequisites: BA 201, MA 222.

BA 424

Project Management in Aviation Operations (3,0)

3 Credits

This course introduces the student to the concept of project management in aviation operations. It addresses the three-dimensional goals of every project: the accomplishment of work in accordance with budget, schedule, and performance requirements. The procedures for planning, managing, and developing projects in an aeronautical environment

Course Descriptions

are covered as well as the aspects of controlling project configuration from inception to completion. Automated tools used to determine cost, schedule, staffing, and resource allocation are covered, as well as the process of determining the effectiveness and technical validity of aviation-related projects.

Prerequisite: MA 320.

BA 425

Trends and Current Problems in Air Transportation (3,0)

3 Credits

This course is to assist students in building skills that allow them to identify trends and current problems in air transportation. These trends are related to market growth, airline network structure, competition, schedule change, aircraft size change, pricing, delays and on-time performance, financial conditions, etc. Students will use available databases to extract data, perform descriptive and statistical analysis, and derive conclusions.

Prerequisite: BA 201.

BA 426

International Aviation Management (3,0)

3 Credits

An investigation of international aviation management and its three elements: the nature of international aviation business, working in a foreign environment, and managing in an international environment.

Prerequisite: BA 335.

BA 427

Management of the Multicultural Workforce (3,0)

3 Credits

An investigation into the management of the multicultural workforce. The elements of cultural anthropology and international business, communicating across cultures, contrasting cultural values, and managing and maintaining organizational culture are addressed in the context of international aviation management.

Prerequisites: BA 201, BA 314, BA 335.

BA 430

International Trade and Regulations (3,0)

3 Credits

Economic analysis of international trade, capital flows, and labor migration with particular emphasis on the laws governing these factors. Aviation applications include code-sharing and other international

airline agreements and the impact of trade subsidies and open skies treaties.

Prerequisites: EC 200 or EC 210 or EC 211, BA 225.

BA 434

Corporate Finance II (3,0)

3 Credits

The objective of this course is to study the major decision-making areas of managerial finance and some selected topics in financial theory. The course reviews the theory and empirical evidence related to the investment and financing policies of the firm and attempts to develop decision-making ability in these areas. This course serves as a complement and supplement to Corporate Finance I. Topics include leasing, dividend policy, mergers and acquisitions, corporate reorganizations, financial planning, working capital management, and international finance. Aviation and aerospace related businesses are emphasized.

Prerequisite: BA 332.

BA 436

Strategic Management (3,0)

3 Credits

This business capstone course examines strategic management principles involving strategy, formulation, implementation, evaluation, and organization analysis. Case analysis employing strategic management principles is used to examine and solve organization problems. Total quality management concepts are studied for improvement of organizational effectiveness.

Prerequisite: Graduating senior standing.

BA 450

Airline/Airport Marketing (3,0)

3 Credits

An investigation of the role of marketing in the aviation/airport industries. Topics to be covered include consumer segmentation, database management, integrated marketing communications, public relations, vendor relations, and retailing.

Prerequisite: BA 220.

BA 299, 399, 499

Special Topics in Management

1-4 Credits

Individual independent or directed studies of selected topics in management.

Prerequisites: Consent of the instructor and approval of the department chair. May be repeated with change of content.

Course Descriptions

Cooperative Education

CE 396, 397, 398

1-6 Credits

Aerospace Engineering (AE), Aerospace Studies (AR), Aeronautical Science (AS), Aircraft Engineering Technology (ET), Applied Aviation Sciences (AAS), Aviation Business Administration (ABA), Aviation Environmental Science (AES), Management of Technical Operations (MTO), Aviation Management (AM), Avionics (AV), Computer Engineering (CEC), Computer Science (CS), Electrical Engineering (EE), Flight (FL), Global Security and Intelligence Studies (GSIS), Maintenance Technology (MT), Space Studies (SP). Provides practical learning experience in full-time or part-time employment related to the student's degree program and career goals. Course title and level are based on the work assignment.

Prerequisite: Approval by the department chair and cooperative education administrator.

NOTE: Cooperative Education and internship experiences are designed as academically based experiential education. A student enrolled in a University-approved co-op/internship professional activity and registered for 6 credit hours will be considered full-time by all University departments other than Financial Aid. The Financial Aid Office will consider a 6-hour co-op/internship as half-time enrollment and will process financial aid accordingly. They will report enrollment to the outside agencies as half-time, thus keeping them out of repayment on their student loans.

CE 496, 497, 498

1-6 Credits

Continuation of CE 396, 397.

Computer Engineering

CEC 220

Digital Circuit Design (3,0)

3 Credits

Introduction to logic design and interfacing digital circuits. Boolean algebra, combinatorial logic circuits, digital multiplexers, circuit minimization techniques, flip-flop storage elements, shift registers, counting devices, and sequential logic circuits.

Corequisite: CEC 222.

CEC 222

Digital Circuit Laboratory (0,3)

1 Credit

Laboratory experiments in the measurement and verification of digital circuits. Discrete and integrated logic circuit design analysis and measurements.

Corequisite: CEC 220.

CEC 300

Computing in Aerospace and Aviation (3,0)

3 Credits

This course explores the computer engineering aspects of systems ranging from embedded sensor and actuator controllers to high-performance computing systems used in air traffic control and weather forecasting. The critical factors that impact the engineering decisions involved, including technological, economic, social, and professional issues, are discussed. Key engineering techniques and practices, including database, human-computer interaction, and networks of systems, are explored through case studies and representative examples from the aerospace and aviation domains.

Prerequisites: EGR 115 and junior standing.

CEC 315

Signals and Systems (3,0)

3 Credits

Introduction to signal processing systems for both digital and analog systems. Mathematics of signal representation and signal processing, including functional descriptions of signals and systems. Implications of linearity and time-invariance, and input-output behavior of linear, time-invariant systems. Causality and stability. Zero-input and zero-state responses. Z and Laplace Transforms. Fourier Series and Fourier Transforms for discrete and continuous systems. Extensive use of MATLAB and Simulink.

Prerequisite: EGR 115. *Corequisite:* MA 345.

CEC 320

Microprocessor Systems (3,0)

3 Credits

Study of digital computer organizations. Introduction to microcomputer systems using a current microprocessor. Assembly language programming techniques for microcomputers will be used to study digital computer operation. Input and output techniques, memory devices, RS 232, and other interfacing techniques will be studied. Hardware and software relationships will also be discussed.

Prerequisites: CEC 220 and experience in programming in a high-level language.

Corequisite: CEC 322.

CEC 322

Microprocessor Systems Laboratory (0,3)

1 Credit

Hands-on experience with a microprocessor is provided through weekly experiments involving hardware and software techniques.

Corequisite: CEC 320.

CEC 330

Digital Systems Design with Aerospace Applications (3,3)

4 Credits

This is the continuation of Introduction to Digital Circuit Design (CEC 220). Students in this class use tools such as FPGA (field programmable gate array) to design and implement digital circuit components and subsystems that are responsible for the control and operation of an aerospace system. In addition, students will be introduced to high-level design languages, such as VHDL (VHSIC hardware description language), RTL (register transfer language), and their application to the design and development of digital circuits.

Prerequisites: CEC 220 and CEC 222.

CEC 410

Digital Signal Processing (3,0)

3 Credits

Specification, design, and implementation of offline signal processing systems on general-purpose computers and real-time signal processing systems on special-purpose digital signal processing microprocessors (DSPs). Review of sampling theory and discrete-time filtering. Filter design tools. Digital-to-analog and analog-to-digital conversion hardware. DSP core architectures and hardware interrupts.

Aspects of system-on-a-chip DSPs for data transfer, cache management, external memory reference, and co-processor interface. Real-time operating systems for DSPs. Applications to modern communication and control systems.

Prerequisite: CEC 315.

Corequisite: CEC 411.

CEC 411

Digital Signal Processing Laboratory (0,3)

1 Credit

Laboratory companion course to CEC 410 featuring development of signal generation, processing, and analysis systems using digital signal processing microprocessors (DSPs). DSP software development and debugging environments. Chip- and board-support libraries. Use of algorithm libraries for rapid

system development. System development tools, including automatic code generation with Simulink. Culminates in development of stand-alone board-based DSP system.

Corequisite: CEC 410.

CEC 420

Computer Systems Design I (2,3)

3 Credits

This is the first course in the senior project sequence (CEC 420 and CEC 421). This course introduces students to discussing issues of management, planning, task assignment, resource allocation, requirement collection, and system specification and design. The team working in a distributed environment will develop a base for implementation of a computer-centered system with elements of both hardware and software. The artifacts developed during this course will be used as the foundation for further development during the second course (CEC 421) in the sequence.

Prerequisites: Computer Engineering major, senior status.

CEC 421

Computer Systems Design II (1,6)

3 Credits

This is the second course in the senior project sequence (CEC 420 and CEC 421). This is the continuation of CEC 420. This course continues with project development, focusing on issues of detailed design, modularization, component selection, coding, assembling, and testing. The team working in a distributed environment will implement and test a computer-centered system with elements of both hardware and software.

CEC 440

Autonomous Vehicle Design (3,0)

3 Credits

This course introduces students to the issues involved in the development of autonomous vehicles as applied in aerospace and aviation. This multidisciplinary course is designed to give students a variety of basic concepts and hands-on experience in robotics and automation. Topics include control, sensing, vision, intelligence, and mechanics. To gain hands-on experience, students will participate in a project in which they will design and build an autonomous vehicle that will participate in an international robotics competition.

Prerequisite: CEC 320.

Course Descriptions

CEC 450

Real-Time Systems (3,0)

3 Credits

The course introduces the concepts of real-time systems from the user and designer viewpoint. The requirements, design, implementation, and basic properties of real-time application software are described with an overview of system software. Related topics such as interrupts, concurrent task synchronization, sharing resources, and software reliability are discussed. A team project on a real-time prototype application may be incorporated in the course.

Prerequisites: CS 225, CEC 320.

Corequisite: CS 420.

CEC 460

Telecommunications Systems (3,0)

3 Credits

Techniques and applications in telecommunications. Types of data communication versus line discipline methodology. Hardware requirements and constraints. Speed versus quality. Security and encoding algorithms.

Prerequisite: CEC 320 or permission of instructor.

CEC 470

Computer Architecture (3,0)

3 Credits

This course describes in detail the Von Neuman computer architecture, which includes processors, memory, input/output, and transfer of information; examples of machine language, assembly language, microprogramming and operating system will be discussed. Additional topics in advanced computer architecture and computer systems will be covered.

Prerequisite: CEC 320.

CEC 299, 399, 499

Special Topics in Computer Engineering

1-6 Credits

Directed studies of selected topics in computer engineering.

Prerequisite: Consent of instructor and department chair.

Civil Engineering

CIV 140

Engineering Measurements (1,3)

2 Credits

Introduction to data collection and analysis.

Principles of surveying and mapping, with emphasis on modern methods. Laboratory methods.

Corequisite: CIV 140L.

CIV 140L

Engineering Measurements Laboratory (0,3)

0 Credits

Field practice in surveying and mapping. Use of modern measurement instrumentation. Development of team work and surveying project management skills.

CIV 304

Structural Analysis (3,0)

3 Credits

Analysis of statically determinate and indeterminate structures using statics, kinematics, virtual work, strain energy, force, and displacement methods.

Structural laboratory testing.

Prerequisite: ES 201.

CIV 307

Civil Engineering Materials I (3,3)

4 Credits

Properties of engineering materials: steel, concrete, soil, asphalt, polymers, composites. Relationship between structure and behavior. Standard methods of testing and inspecting. Laboratory methods.

Prerequisites: COM 221, ES 202.

Corequisite: CIV 307L.

CIV 307L

Civil Engineering Materials I Laboratory (0,3)

0 Credits

Use of modern testing methods for determining the engineering properties of steel, concrete, asphalt, polymers, and composites. Laboratory report development.

CIV 311

Introduction to Transportation Engineering (3,0)

3 Credits

Fundamentals of transportation engineering including planning, design, construction, maintenance, operation, economics, and the role of transportation

facilities in society. Concepts, underlying theory, and design issues are detailed.

Prerequisite: PS 150.

CIV 316

Hydraulics (3,0)

3 Credits

Open channel and pipe flows. Hydraulic structures. Groundwater hydrology and stormwater management.

Prerequisite: ES 204.

CIV 320

Soil Mechanics (3,3)

4 Credits

Study of the engineering behavior of soil: origin, classification, identification, and structure. Permeability, seepage, consolidation, settlement, slope stability, lateral pressures, bearing capacity. Soil sampling and testing. Laboratory methods.

Prerequisites: COM 221, ES 202.

Corequisite: CIV 320L.

CIV 320L

Soil Mechanics Laboratory (0,3)

0 Credits

Modern soil testing and analysis methods. Preparation of samples. Testing of soils for engineering behavioral properties including permeability, settlement, bearing capacity, and lateral pressures.

CIV 330

Computer Applications in Transportation (1,3)

2 Credits

Application of computer software for planning and design of transportation systems. Emphasis is placed on finding solutions to current problems associated with existing airport and intermodal transportation systems.

Prerequisite: CIV 311.

CIV 340

Construction Engineering (3,0)

3 Credits

Delivery of construction projects. Introduction to construction equipment, production rates, construction methods for concrete, asphalt, steel, wood, and masonry, planning and scheduling, safety, and construction economics.

CIV 362

Engineering and Construction Operations in Space (3,0)

3 Credits

U.S. space exploration policies in the 21st century. Construction in zero- or low-weight environments. Development of lunar and planetary resources. Controlled ecological life support systems. Lunar concrete.

CIV 370

Computational Methods in Civil Engineering (3,0)

3 Credits

Numerical techniques for solving civil engineering problems. Applications of statistical methods. Matrix operations. Spreadsheet development.

Prerequisite: EGR 115.

CIV 421

Geotechnical and Foundation Engineering (3,0)

3 Credits

Prediction of settlement, analysis of the stability of slopes, prediction of the bearing capacity of shallow and deep foundations, and determination of earth pressures acting on retaining structures.

Prerequisite: CIV 320.

CIV 422

Design of Pavement Structures (3,0)

3 Credits

Theory and practice in pavement design for highways and airfields, pavement performance, structural design of pavement layers, types of materials used in pavement layers, characterization of pavement layer materials, introduction to pavement management concepts.

Prerequisite: CIV 320.

CIV 424

Rehabilitation of Pavement Structures (3,0)

3 Credits

Pavement distresses and their causes. Pavement evaluation, roughness, friction, drainage survey and evaluation, structural evaluation, material characterization, traffic loading evaluation, design of pavement rehabilitation alternatives, economic analysis, and selection of preferred alternatives.

Prerequisite: CIV 320.

Course Descriptions

CIV 431

Reinforced Concrete Design (3,0)

3 Credits

Properties of concrete, its constituents, and reinforcement steels. Design of beams, columns, beam-columns, and slabs. Cracking and deterioration. Torsion and shear reinforcement. Anchorage and bond detailing. Application of the concrete design code.

Prerequisites: CIV 304, ES 202.

CIV 432

Structural Steel Design (3,0)

3 Credits

Steel and its properties. Design of tension members, column members, torsional members, plate girders. Welded and bolted connections. Steel design specifications and building codes. Current philosophies in steel design.

Prerequisites: CIV 304, ES 202.

CIV 441

Civil Engineering Materials II (3,3)

4 Credits

Physical and mechanical properties of construction materials, portland cement concrete, proportioning of concrete mixtures including admixtures. Fiber reinforced concrete design and evaluation. Origin, production, specifications, and tests of bituminous materials and paving mixtures used in construction and maintenance of roads and pavements, pavement surface properties, pavement distress, and correction alternatives.

Prerequisite: CIV 307.

Corequisite: CIV 441L.

CIV 441L

Civil Engineering Materials II Laboratory (0,3)

0 Credits

Advanced testing methodology for concrete, concrete mixtures, bituminous materials, and pavements.

CIV 447

Airport Design I (3,0)

3 Credits

Fundamental principles of airport layout and preliminary design. Airport site selection, runway length and orientation, air traffic control, capacity, and delay.

Prerequisite: CIV 311.

CIV 457

Airport Design II (3,0)

3 Credits

Airport terminal passenger and vehicle processing systems. Lighting and signing systems, pavement marking, baggage handling, communication systems, and security systems.

Prerequisite: CIV 447.

CIV 460

Senior Design Project (3,0)

3 Credits

Detailed and complete design of a civil engineering facility. Progress reports and presentation. Interdisciplinary group cooperation is emphasized.

Prerequisite: Senior standing.

CIV 490

The Civil Engineering Profession (1,0)

1 Credit

Current problems in engineering, professional duties and responsibilities, opportunities for professional development, ethics, and professionalism.

Prerequisite: Graduating senior status.

CIV 499

Directed Design Project (Variable)

1-3 Credits

Directed design project. Individual investigation of current design problem. Offered by special arrangement only.

Prerequisite: Permission of Civil Engineering program coordinator.

CIV 199, 299, 399

Special Topics in Civil Engineering (Variable)

1-3 Credits

Directed studies of special topics in Civil Engineering. Offered by arrangement only.

Prerequisite: Consent of instructor and Civil Engineering program coordinator.

Communication

COM 008

Academic English for Non-Native Speakers of English (4,0)

4 Credits

A developmental course designed to help intermediate-level non-native speakers of English develop their English language proficiency. The emphasis is on

writing and reading in academic settings. Students cannot withdraw from the course. The course must be passed with a grade of C or better. (Credit not applicable to any degree.)

COM 018

Advanced Academic English for Non-Native Speakers of English (4,0)

4 Credits

A developmental course designed to help advanced-level non-native speakers of English develop their English language proficiency. The emphasis is on writing and reading in an academic setting and on preparation for degree-credit bearing communication courses. (Credit not applicable to any degree.) Students cannot withdraw from the course. The course must be passed with a grade of C or better.

Prerequisite: HU 008 or ESL Placement Test.

COM 020

Fundamentals of Communication (4,0)

4 Credits

Designed to improve the student's reading and writing abilities through focusing on critical thinking. All three skills are approached as facets of each other and as processes that the student learns to control and take responsibility for. The fundamentals of grammar, punctuation, and sentence structure are strengthened when students write and revise multi-paragraph expository essays. A grade of C is required to pass this course, and it may not be dropped. (Credit is not applicable to any degree.)

COM 122

English Composition and Literature (3,0)

3 Credits

This course focuses on principles of writing in response to readings in the humanities, social sciences, and other interdisciplinary fields. Students develop their communicative, evaluative, critical thinking, and research writing abilities through the close examination of key texts across those disciplines.

Prerequisite: Satisfactory completion of basic skills requirements.

COM 219

Speech (3,0)

3 Credits

A continuation of the study of communication and communication theory with emphasis on overcoming communication apprehension, developing listening skills, mastering oral performance, and writing about communication. Individual sections may focus

on public speaking, group discussion, oral interpretation, or interpersonal communication. Section emphasis varies by instructor and is listed in the Schedule of Courses.

Prerequisite: COM 122.

COM 221

Technical Report Writing (3,0)

3 Credits

Preparation of formal and informal technical reports, abstracts, resumes, and business correspondence. Major emphasis placed on the long technical paper and the acquisition of advanced writing skills.

Prerequisite: Any course from the HU 140 series.

COM 222

Business Communication (3,0)

3 Credits

An introduction to effective business communication. Topics in oral, written, nonverbal, and intercultural communication are covered. Research methods, effective speaking, and the preparation of letters, memoranda, and reports are emphasized.

Prerequisite: Any course from the HU 140 series.

COM 225

Science and Technology Communication (3,0)

3 Credits

This course introduces the practices of communicating news and issues in science and technology to a variety of publics through magazine-style writing and public speaking. Guest speakers will present research questions, methodologies, and issues within the sciences. Coursework also includes readings from successful science and technology communicators, illustrating various solutions to writing about complex subjects. Special topics include identifying science and technological stories, evaluating sources and information, and communicating findings clearly, comprehensibly, and accurately for publication and speaking engagements.

Prerequisite: COM 221.

COM 230

Digital Photography (3,0)

3 Credits

This course introduces fundamental photographic skills through digital technologies. Emphasis is placed on the tools, techniques, and aesthetics of a range of photographic applications pertaining to graphic design and interactive media.

Prerequisite: Sophomore standing or permission of the program coordinator.

Course Descriptions

COM 260

Introduction to Media (3,0)

3 Credits

The structure of, professional opportunities in, and social issues arising from, media industries. Required of all Communication students. Must be taken within the first year of entering the program.

Prerequisite: COM 122.

COM 265

Introduction to News Writing (3,0)

3 Credits

COM 265 offers Communication majors theory and practice in the fundamentals of various journalistic genres: news reporting, features, interviews, spot news, page layout, interpretive journalism, and more. This course introduces students to use of the AP Stylebook, libel law, and ethical issues in journalism.

Prerequisite: COM 122 or permission of instructor.

COM 268

Sports Writing (3,0)

3 Credits

Training in interviewing, research, and writing skills and strategies employed by print sports journalists. This course involves rigorous practice in a variety of sports articles, including game stories, features, advanced-depth writing, opinion and hard news sports stories using Associated Press style.

Prerequisite: COM 122.

COM 320

Mass Communication Law and Ethics (3,0)

3 Credits

This course is based on case studies introducing students to the legal and ethical environments underpinning First Amendment rights in the United States from the nation's founding to the present. Topics in law include intents of the framers, prior restraint, libel, privacy, hate speech, freedom of information laws, shield laws, and copyright. Topics in ethics concentrate on models for decision-making in difficult situations. Practices of journalists, media relations practitioners, and Internet communicators will be examined. Topics in ethics concentrate on models for decision-making in difficult situations.

Prerequisite: COM 221.

COM 322

Aviation and Aerospace Communication (3,0)

3 Credits

This course introduces the practices of communicating news and issues in aviation and aerospace to a

variety of publics through magazine-style writing and public speaking. Students will learn how to recognize the news value of contemporary aviation issues, to gain an understanding of those issues through research and interviews with experts, and to write about and discuss the issues. Coursework also includes readings from respected aviation writers that illustrate aviation's economic and social impact on society. Special topics include safety, airport security and congestion, emerging legal issues, and international aviation trends.

Prerequisite: COM 221.

COM 350

Environmental Communication (3,0)

3 Credits

This course centers on national and regional environmental issues, including planning, regulation, and crises. Topics include responses to climate change, endangered species, wetlands preservation, coastal development, and hazardous materials regulation. Field trips and guest speakers will be included. Students learn how to research and write articles and stories for nature and environmental magazines as well as general-audience media.

Prerequisite: COM 221 or COM 225.

COM 351

Journalism (3,0)

3 Credits

Theory and practice of the techniques of journalism, familiarizing the student with the functions, skills, and responsibilities required in writing, editing, and producing news and technical publications.

Prerequisite: Any course from the HU 140 series.

COM 360

Media Relations I (3,0)

3 Credits

The course focuses on different theories of persuasive communication and the construction of persuasive messages. Individual instructors may explore persuasive communication in public service and political campaigns, interpersonal communication, social movements, persuasive writing, or advertising. Students are evaluated on their ability to recognize, apply, and evaluate the communication theories used to design persuasive messages.

Prerequisite: COM 219.

COM 364

Visual Design (3,0)

3 Credits

This course presents principles of visual design applying to print and electronic publications, including unity, emphasis, balance, line, shape, value, color, and texture. Special topics include ethics, typography, semiotics, and layout. Students analyze existing graphical artifacts and create print and electronic projects focused on communicating science and technology, using professional design software.

Prerequisites: COM 221, COM 222, or an equivalent professional writing course; COM 265.

COM 410

Advanced Professional Writing (3,0)

3 Credits

A sophisticated process approach to strategies for effective communication in the workplace. Balancing theory and practice in professional communication, students will work singly and in collaborative teams to integrate visuals, layout and design, editing and review systems, online documentation, and electronic publishing. All assignments carry written components with equal emphasis placed on oral execution.

Prerequisites: COM 219, COM 221, COM 265.

COM 411

Web Design Workshop (3,0)

3 Credits

In addition to highlighting theories of communication related to design and content, this course serves as a practical workshop in Web site development, with an emphasis on communicating science and technology in a professional context. In close consultation with the professor, students design and produce Web sites for University programs, departments, non-profit organizations, and businesses. Experience with Web development software is recommended.

Prerequisite: COM 221, COM 222, or an equivalent professional writing course.

COM 412

Advanced Technical Writing (3,0)

3 Credits

Communication specific to the technical communication profession is studied, and students prepare at least one formal project suitable for inclusion in a career portfolio. The projects may include, but are not limited to, the following: technical manual, grant or business proposal, product development and documentation, multimedia training or product presentation, training modules, and corporate reports. Projects may be in

paper, electronic, or combination of multimedia formats, depending on trends in the profession and use of technology. Professional technical communicators may serve as mentors or speakers.

Prerequisite: COM 221.

COM 415

Non-Verbal Communication (3,0)

3 Credits

This course entails the study of communication behaviors and processes not involving the expression of written or spoken words, which contribute information to a message. Special attention is directed to the study of voice qualities; facial expression and body language; space, personal distance, and touch; the use of time and objects; and personal appearance. Study also involves non-verbal communication in applied settings, as well as research strategies for observing, measuring, and understanding non-verbal phenomena.

Prerequisite: COM 219, equivalent Speech Communications course. (Also offered as HU 415. Students receive either Communication or Humanities credit, but not both.)

COM 440

Senior Employment Practicum (1,0)

1 Credit

Open only to Communication majors. Preparation and evaluation of resumes, employment correspondence, portfolios, and mock employment interviews. Must be taken the semester after completing 88 hours.

Prerequisite: COM 265.

COM 460

Media Relations II (3,0)

3 Credits

Mastery of writing and speaking genres in media relations with an emphasis on crisis communication.

Prerequisites: COM 265, COM 360.

Computer Science

CS 101

Introduction to Keyboard Operations (1,0)

1 Credit

Fundamental skills and techniques in the operation of the keyboard and the use of computers in word processing. Emphasis is placed on the fundamentals of word processing and the development of touch typing with speed and accuracy.

Course Descriptions

CS 111

Spreadsheet (1,0)

1 Credit

An understanding of spreadsheet applications and commands designed to develop an intermediate level of spreadsheet competency. An exploration of practical spreadsheet applications such as budgets, income taxes, profit and loss statements, and calculating grades, among many others. Specific commands include creating, editing, saving, retrieving, and printing spreadsheets using statistical data and financial functions; depicting spreadsheet information graphically in bar graphs, pie charts, and line graphs; linking and integrating spreadsheets; and using spreadsheet macros.

Prerequisite: IT 109 or equivalent knowledge.

CS 114

Presentation Graphics (1,0)

1 Credit

An overview of business graphics. Emphasis is on the design and creation of professional graphics such as charts and short documents to be used to clarify information in oral and written presentations. Specific topics include planning and organizing charts and presentation documents; creating pie charts, bar charts, line charts, and presentation documents; formatting, editing, and printing; using text, symbols, and graphics; importing artwork; and creating an automated presentation of charts and documents.

CS 116

Recent Trends in Application Software (1,0)

1 Credit

The content of the course is left to the specific needs of the student and new software.

Prerequisite: IT 109 or equivalent knowledge.

CS 117

Computer Configurations (3,0)

3 Credits

Provides the student with an in-depth understanding of the technical aspects of hardware and software and a study of the current trends in computing. The course will include hardware and software installations, troubleshooting, and a survey of resources in personal computing.

CS 118

Fundamentals of Computer Programming (3,0)

3 Credits

Introduction to basic concepts of structured programming with applications in business, technology, and

engineering. This course is intended for the student with little or no experience in programming.

CS 125

Computer Science I (3,3)

4 Credits

Introduction to problem-solving methods, algorithm development, and software engineering; software development process, program design, coding, review, testing, and documentation; and programming using a modern programming language that supports modular development. The course has a closed laboratory that includes activities dealing with the computing environment, the software development process, and programming exercises.

Prerequisite: Experience in programming in a high-level language, and proficiency in high school pre-Calculus mathematics.

CS 207

Network-Based Computing (3,0)

3 Credits

Local area network installation and operations. Topics covered include, but are not limited to, LAN, WAN, terminology, protocols, topologies, mail systems, network administration functions, and hardware.

Prerequisites: CS 117 and CS 118.

CS 210

Scientific Programming (3,0)

3 Credits

Introduction to problem-solving methods, algorithm development, program design, coding, debugging, testing, use of subprograms and documentation, and programming in a block-structured high-level language covering control structures and simple data structures such as arrays and files. This course emphasizes scientific/engineering programming techniques and applications.

Corequisite: MA 112 or MA 241.

CS 222

Introduction to Discrete Structures (3,0)

3 Credits

An introduction to the fundamental algebraic, logical, and combinatorial concepts of mathematics that provide a foundation for the study of computer science.

Prerequisites: Experience in programming in a high-level language, pre-Calculus mathematics.

CS 223

Scientific Programming in C (3,0)

3 Credits

This is a course in C programming for scientists and engineers. Using a problem-solving approach for developing algorithms, the algorithms are implemented in C and include the following topics: data types and related operations, input/output, control structures, functions, array, files, and strings.

Prerequisite: MA 112 or MA 241 or permission of instructor.

CS 225

Computer Science II (3,3)

4 Credits

This course emphasizes program design, style, data abstraction, information hiding, and testing; advanced programming features; and introduction to object-oriented concepts, basics of algorithm analysis, exception handling, string processing, recursion, pointers, and simple data structures. The course has a closed laboratory that includes activities dealing with the computing environment, the software development process, and programming exercises.

Prerequisite: EGR 115.

CS 235

Assembly Language Programming (3,0)

3 Credits

Introduction to computer architecture; assembler concepts and instruction format; addressing techniques; interrupt processing, especially input/output; segmentation, linkage, and external procedures; programming projects to develop understanding of assembly language concepts.

Prerequisites: CS 220, CS 225.

CS 303

Network Security (3,0)

3 Credits

This course introduces the principles and algorithms of modern encryption and some major issues and problems of computer security. Topics covered include the notion of block ciphers and implementations such as DES and Blowfish. Modern public key encryption techniques such as the RSA algorithm. Statistical attacks on encryption including traffic monitoring. Hash functions. Digital signatures and authentication methods. An introduction to some attacks and defenses such as viruses, worms, and firewalls. This course is intended to be a required course in an Information Security minor or a tech-

nical elective for students majoring in Computer Science or Computer Engineering.

Prerequisites: MA 242 or CS 222 or consent of the instructor. CS 225 or consent of the instructor. Junior status or consent of the instructor.

CS 305

Database Systems and Data Mining (3,0)

3 Credits

Introduction to database systems and data mining. The course will cover the relevant theory of database systems, the usefulness of data mining, and the examination of current data mining efforts. Assignments, papers, and projects will reflect real-life use of data mining and provide perspective for managing data mining activities.

Prerequisite: CS 225.

CS 308

Practicum (3,0)

3 Credits

This capstone project course is individualized to each student and uses most facets of their prior instruction.

Prerequisite: All other courses required in the computer applications minor.

CS 315

Data Structures and Analysis of Algorithms (3,0)

3 Credits

This course emphasizes the design, implementation, and analysis of algorithms dealing with searching, sorting, graphs, trees, and disk files.

Prerequisites: CS 222, CS 225.

CS 317

Files and Database Systems (3,0)

3 Credits

Introduction to file and database systems. The course will cover the theory of database systems, various database models, and the design of a database system. Course homework will reflect real-life problems requiring cooperation, problem formulation, and problem-solving skills. A team/group term project may be assigned.

Prerequisites: CS 222, CS 225.

Course Descriptions

CS 325

Programming in ADA (3,0)

3 Credits

Advanced systems concepts using the ADA language to implement software engineering, concurrent programming, and structured design techniques.

Prerequisite: CS 210, CS 225, or permission of the instructor.

CS 332

Organization of Programming Languages (3,0)

3 Credits

A comparative study of different programming paradigms. Students program in several languages chosen to illustrate the essential features of the paradigms studied. Formal language concepts are also introduced.

Prerequisites: CS 222, CS 225.

CS 335

Introduction to Computer Graphics (3,0)

3 Credits

Introduction to computer graphics, algorithms, graphics programming, graphics design, use of graphic packages, and applications of computer graphics to aviation, business, and scientific problems. A term project involving a graphics programming application may be assigned.

Prerequisites: MA 241 and a proficiency in implementation language.

CS 344

C Programming and UNIX (3,0)

3 Credits

This course is an advanced course in the C programming language and the UNIX programming environment and provides basic information about the general principles of operating systems. It begins with an introduction to the UNIX operating system, followed by an in-depth study of the C programming concepts and techniques in the UNIX environment. In addition, topics such as the function and structure of operating systems, process management, memory management, concurrency, UNIX system programming, and UNIX programming tools will be covered.

Prerequisite: CS 225 or equivalent experience in programming.

CS 350

Computer Modeling and Simulation (3,0)

3 Credits

Introduction to the basic aspects of modeling and simulation. Topics include statistical models, queuing theory, random variate generation, simulation languages, object-oriented programming, graphic output with animation, design and analysis of experiments, and verification and validation of simulation models. A term project involving the simulation of an element of aviation or aerospace may be assigned.

Prerequisites: MA 222 or MA 412, a proficiency in computer programming, and junior/senior standing.

CS 375

Algorithms (3,0)

3 Credits

This course covers strategies, mathematics, implementations, and performance properties of fundamental algorithms employed in computer science.

Prerequisites: CS 315 and MA 242 or permission of instructor.

CS 415

Human-Computer Interfaces (3,0)

3 Credits

This course introduces Computer Science students to several important aspects of how humans use computers and how software is designed for usability. Students are introduced to usability issues, graphical systems, and graphical interfaces.

Prerequisite: SE 320 or permission of the instructor.

CS 420

Operating Systems (3,0)

3 Credits

Development, structure, and functions of operating systems; demand service models; development of concurrent models.

Prerequisites: CS 225 and junior standing.

CS 425

Net-Centric Computing (3,0)

3 Credits

This course introduces Computer Science students and other engineering majors to areas of software and computer science that pertain to networks and network-based computation.

Prerequisites: CEC 320 and CS 317 or permission of instructor.

CS 432

Information and Computer Security (3,0)

3 Credits

The course will start with an overview of the larger context of information security, including the “softer” aspects of personnel and operational security, and then delve into the technical basis and practical difficulties of COMPUSEC itself. This course is intended to be a required course in an Information Security minor or a technical elective for students majoring in Computer Science or Computer Engineering.

Prerequisites: CS420 or consent of the instructor. Junior status or consent of the instructor.

CS 445

Interfacing (3,1)

3 Credits

Introduction to microcomputers and microcontrollers, effect of the microprocessor on the system, memory, and microcomputer input/output methods. The subject of interface components and their characteristics, designing interface components, interfacing to standard buses and peripherals. Interface layout and construction. Interface software design and implementation.

Prerequisite: CS 320 or equivalent.

CS 455

Artificial Intelligence (3,0)

3 Credits

This course introduces students to the basic concepts of artificial intelligence with emphasis on knowledge engineering. Students gain experience, through individual and group exercises, in the various phases of system development: planning, requirements and specification, design, implementation, and testing. Students study and apply commercial tools to the development of knowledge-base systems in the aerospace and aviation domain.

Prerequisite: CS 222 or permission of instructor.

CS 490

Computer Science Capstone Design (3,0)

3 Credits

This course is the continuation of SE 300 (Software Engineering Practices), where the students are given an opportunity to work on a term-long interdisciplinary (computer science, software engineering, and the student’s area of concentration) project culminating the knowledge and expertise they have gained throughout their program of study.

Prerequisite: SE 300.

CS 299, 399, 499

Special Topics in Computer Science

1-6 Credits

Individual independent or directed studies of selected topics in computer science.

Prerequisites: Consent of the instructor and the department chair.

Economics

Standing is based on credit hours earned toward the student’s declared degree program.

EC 200

An Economic Survey (3,0)

3 Credits

An introduction to macro and microeconomic principles, problems, and policies with a view to current economic problems.

EC 210

Microeconomics (3,0)

3 Credits

An introduction to the economic principles of free enterprise supply and demand, private and social implications of profit maximization, market structure, and resource markets. Current microeconomic issues in aviation (such as liability reform, evolution of airline competition, etc.) are discussed.

EC 211

Macroeconomics (3,0)

3 Credits

An introductory analysis of employment, inflation, recession, GDP economic growth, and international trade with an emphasis on practical policy alternatives. Macroeconomic aviation applications such as the counter-cyclical growth of start-up airlines and consideration of ATC privatization are incorporated.

EC 225

Engineering Economics (3,0)

3 Credits

An introduction to microeconomic principles, problems, and policies as well as basic financial principles such as time value of money, capital budgeting, and cost of capital. The course will provide the engineering graduate with the tools needed for success in the workplace.

Course Descriptions

EC 310

Labor Economics (3,0)

3 Credits

A survey of the economics of the labor market to include wage determination and employment theory, labor organization, labor legislation, and current developments in labor relations.

Prerequisites: EC 210 and junior standing.

EC 312

Money and Banking (3,0)

3 Credits

A preliminary investigation of the financial institutions of the United States and the relationship of monetary policy to income and price stabilization. Some analysis of international capital flows will also be undertaken.

Prerequisites: EC 210 and junior standing.

EC 315

Managerial Economics (3,0)

3 Credits

An analytical approach to the manager's role in understanding pricing, costing, production, and forecasting. Concentrates on simple quantitative models to explain the firm's position in the market and how the manager can react to and control this information. Aviation topics commonly discussed include airport privatization and employee ownership of airlines.

Prerequisite: EC 210.

EC 420

Economics of Air Transportation (3,0)

3 Credits

A study of the economic aspects of airline service with consideration given to the impact of federal aid and regulation, types of aircraft, airport problems, consumer interests, and competitive practices.

Prerequisite: EC 210.

EC 299, 399, 499

Special Topics in Economics

1-4 Credits

Individual independent or directed studies of combinations of selected topics in economics.

Prerequisite: Consent of the instructor and the department chair.

Electrical Engineering

EE 120

Introduction to Engineering Management (3,0)

1 Credit

Study of the tools engineers use to manage projects, programs, and research.

EE 200

Engineering Software Tools (3,0)

1 Credit

Study of software tools needed to solve engineering problems. Topics include but are not limited to the study of MATLAB, computer-aided design tools, and graphical simulation programs.

EE 220

Digital Circuit Design (3,0)

3 Credits

Introduction to logic design and interfacing digital circuits. Boolean algebra, combinatorial logic circuits, digital multiplexers, circuit minimization techniques, flip-flop storage elements, shift registers, counting devices, and sequential logic circuits.

EE 222

Digital Circuit Laboratory (0,3)

1 Credit

Laboratory experiments in the measurement and verification of digital circuits. Discrete and integrated logic circuit design analysis and measurements.

Corequisite: EE 220.

EE 223

Linear Circuits Analysis I (3,0)

3 Credits

Volt-ampere characteristics for passive circuit elements, resistive network circuit theory, and simplification. Kirchoff's current and voltage laws. Introduction to linear network theorems and transformations. Transient response of RC, RL, and RLC circuits. Steady state and impedance circuit analysis for sinusoidal sources.

Corequisites: MA 345, PS 250.

EE 224

Electrical Engineering Laboratory I (0,3)

1 Credit

Problem sessions, electrical instrumentation and measurement, verification of theory presented in EE 223, working knowledge of electronic test equipment.

Corequisite: EE 223.

EE 300

Linear Circuit Analysis II (3,0)

3 Credits

Continuation of EE 223. Study of the Laplace and Fourier transforms, Fourier analysis, complex plane, resonance and coupled circuits, Bode Diagrams, and two-port networks.

Prerequisite: EE 223.

Corequisite: MA 441 or permission of instructor.

EE 301

Electrical Engineering Laboratory II (0,3)

1 Credit

Problem sessions, analysis and simulation of analog and digital circuits using computer-aided design and analysis tools.

Corequisite: EE 300.

EE 302

Electronic Devices and Circuits (3,0)

3 Credits

Introduction to basic semiconductor theory and semiconductor device characteristics. Diode and transistor models used in the analysis and design of electronic circuits. Basic amplifier circuits. Single and multi-stage amplifier analysis, design, and frequency response. Integrated circuit implementation of differential stages and operational amplifier circuits.

Prerequisite: EE 223 or permission of the instructor.

Corequisite: EE 304.

EE 303

Signals and Filters (3,0)

3 Credits

Mathematics for filtering and spectral analysis of continuous and discrete systems. Solutions to filtering approximations via Butterworth, Chebyshev, elliptic, and others. Introductions to Z-transforms and digital filter design methods.

Prerequisites: EE 300 and MA 441 or permission of instructor.

EE 304

Electronic Circuits Laboratory (0,3)

1 Credit

Laboratory experiments in the measurement of electronic device characteristics. Design of biasing networks, small signal amplifiers, and switching circuits.

Corequisite: EE 302.

EE 305

Electronic Devices and Circuits II (3,0)

3 Credits

Study of the characteristics of operational amplifiers. Design of op amp circuits used in a variety of electronic signal conditioning applications. Analysis and design of popular analog-to-digital and digital-to-analog circuits and their system application and limitations. Further study of basic components found in instrumentation systems, such as sensors, signal conditioning circuitry, power supplies, A/D and D/A circuitry, and other special electronic devices. Final design project requires the design of a simple data acquisition system.

Prerequisites: EE 300, EE 302.

EE 306

Introduction to Electrical Systems (2,0)

2 Credits

Direct Current electricity; circuits, resistance, DC machinery. AC current; transformers, three-phase circuits, AC machinery, commercial applications, building codes.

EE 307

Avionics I (3,3)

4 Credits

Provides the first part of a comprehensive and rigorous study of avionics systems. A laboratory is provided to give the student the opportunity to gain hands-on experience. The course covers avionics systems from the basic physics of avionics to the latest technology.

Prerequisites: EE 223, EE 224, MA 345, PS 250, PS 253.

EE 308

Introduction to Electrical Communications (3,0)

3 Credits

This is an introductory course in communications and includes channels, networks, Shannon's law, random processes, modulation, and multiplexing. Transmitters and receivers are covered as an application of the theory introduced in this course. The Fourier transform is the major mathematical tool used in this course. The subjects are the basic foundation of both analog and digital communications, both wired and wireless.

Course Descriptions

EE 310

Avionics II (3,0)

3 Credits

Provides the second part of a comprehensive and rigorous study of avionics systems. This course includes practical laboratory examples. The course covers avionics systems from the basic physics of avionics to the latest technology. This course is a continuation of EE 307.

Prerequisite: EE 307.

EE 320

Microprocessor Systems (3,0)

3 Credits

Study of digital computer organizations. Introduction to microcomputer systems using a current microprocessor. Assembly language programming techniques for microcomputers will be used to study digital computer operation. Input and output techniques, memory devices, RS 232, and other interfacing techniques will be studied. Hardware and software relationships will also be discussed.

Prerequisites: EE 220 and experience in programming in a high-level language.

EE 322

Microprocessor Systems Laboratory (0,3)

1 Credit

Hands-on experience with a microcomputer is provided through weekly experiments involving hardware and software techniques.

Corequisite: EE 320.

EE 325

Unmanned Aerial Vehicles (3,0)

3 Credits

This course provides the student with an overview of the engineering requirements for unmanned aerial vehicles. Included are the understanding of the mission requirements, such as surveillance, tactical, high altitude, long endurance, and armed. The basic fundamentals of machine control are reviewed and specific applications of those fundamentals to aerial vehicles. Methods of minimizing detection such as electromagnetic radiation, radar cross section, and acoustic noise generation. Particular attention is paid to design for reliability and security.

EE 330

Measurements for Medicine and Physical Sciences from Spacecraft and Aircraft (3,0)

3 Credits

This course covers the unique problems associated with making measurements from aircraft and spacecraft. This includes problems associated with moving platforms including mechanical accelerations, high electrical noise environment, and unattended measuring. For physiological measurements particular emphasis is placed on safety and problems associated with very low level signals. Modern computer-driven data acquisition methods are discussed.

EE 335

Electrical Engineering I (2,0)

2 Credits

Introduction of the fundamentals of electrical engineering. Circuit theory and variables. Voltage-current relationship for passive elements. Circuit analysis and network solutions. Phasors and frequency-domain analysis. Transient analysis of first and second order systems. Equivalent circuits and power. The Electrical Engineering Lab, EE 336, must be taken during the same semester as EE 335.

Prerequisites: COM 221, MA 345, PS 250, PS 253.

EE 336

Electrical Engineering Laboratory I (0,3)

1 Credit

Laboratory experiments and techniques in electrical engineering. The Electrical Engineering Lab EE 336 must be taken during the same semester as EE 335.

EE 340

Electric and Magnetic Fields (3,0)

3 Credits

Electrostatics and magnetostatics. Study of magnetic and dielectric material properties; Maxwell's equations; energy and radiation of plane waves. Introduction of electromagnetic waves, transmission lines, the Smith chart, and radiation from antennas.

Prerequisites: MA 441, PS 250.

EE 355

CNS, Communications, Navigation Surveillance, Systems (3,0)

3 Credits

The basic fundamentals of airborne communications, navigation, and surveillance systems are covered in this course. Long-range and short-range communi-

cations are discussed, with particular emphasis on data transmission. En route and landing systems are covered. Space base navigation systems are covered with emphasis on the Global Positioning System. Surveillance systems include primary and secondary radar as well as ground proximity and terrain warning systems.

EE 401

Control Systems Analysis and Design (3,0)

3 Credits

Modeling, analysis, and design of analog and digital linear control systems using time and frequency domain techniques. Topics include feedback control system characteristics performance analysis and stability, Z-transforms, and controller design.

Prerequisite: MA 345.

EE 402

Control Systems Laboratory (0,3)

1 Credit

Laboratory experiments involving the principles of operation and design of linear control systems. Experiments to support theory introduced in EE 401.

Corequisite: EE 401.

EE 403

Avionics Communication Systems (3,0)

3 Credits

This course covers the fundamentals of communications systems, both digital and analog. This course is in preparation for other communications systems courses.

Prerequisites: EE 302, EE 303.

EE 406

Digital Signal Processing (3,0)

3 Credits

Discrete-time description of signals and systems. D/A and A/D conversion, sampling, and aliasing. Fourier transform of discrete signals, the discrete Fourier transform, and the Z-transform. Digital filter structures, filter implementation, and synthesis techniques. Digitization, quantization, and finite precision effects. Discrete system simulation and DSP applications.

Prerequisite: EE 303.

Corequisite: EE 407.

EE 407

Digital Signal Processing Laboratory (3,0)

1 Credit

Analog and digital filter design using MATLAB. Digital filter implementation with C programming and assembly code. Input/output, filtering, and waveform generation with a 32-bit floating-point DSP development system.

Corequisite: EE 406.

EE 408

Data Communications (3,0)

3 Credits

This course is a continuation of EE 403 and covers the fundamentals of data communications. Subjects include basic modulation, encoding, error detection, and error correction.

Prerequisite: EE 403.

EE 410

Communication Systems (3,0)

3 Credits

Theory and application of electronic communication systems; spectral analysis; modulation and demodulation techniques; transmitting and receiving systems. Behavior of receivers and transmitters in the presence of noise. Study of avionic radio systems presently in use, such as NAV, COMM, DME, ATCRBS, ILS, and others.

Prerequisites: EE 303, EE 340.

EE 412

Communication Systems Laboratory (0,3)

1 Credit

Laboratory experiments involving design and analysis of electronic communication circuitry and measuring performance characteristics and limitations of various communication components and systems.

Corequisite: EE 410.

EE 415

Satellite Communications Systems (3,0)

3 Credits

This course covers all aspects of satellite communications systems. Orbits are discussed, such as GEO, MEO, and LEO, including highly elliptical orbits. The RF link for satellites is discussed with special considerations for various types of orbits. Typical spacecraft and ground station characteristics are studied.

Course Descriptions

EE 417

Digital Communications (3,0)

3 Credits

This course covers digital codes, including the understanding of the generation of common codes and the advantages and disadvantages of the various types of codes. Bandwidth considerations are introduced. Common distortion and interference phenomena are studied in terms of intersymbol interference, bit error rates, and the tools for analyzing these impairments, such as eye diagrams and constellation diagrams. Techniques for improving digital communications, including matched filters, error detection, error compression, and data compression, are discussed.

EE 420

Avionics Preliminary Design (3,0)

3 Credits

Study of FAA requirements governing design of airborne electronic equipment. Study of component and subsystem specification and design practices. Application of the above in the preparation of a proposal/design plan for an airborne electrical/electronic subsystem. Integrate the knowledge gained throughout the curriculum with practical aspects of the practice of engineering to enable the student to comprehend engineering as a pivotal aspect of the business cycle and to responsibly participate in society by the practice of his/her profession. The course will introduce the combination of hardware and software requirements and preliminary design, preparation of project, and testing plans following established industry standards.

Prerequisite: Senior standing.

EE 421

Avionics Detail Design (3,0)

3 Credits

Continuation of EE 420 or EE 428. Senior-level project. Students will work as members of a team in the execution of winning proposals from EE 420/428. The course incorporates the combination of hardware and software detailed design, implementation, and testing following established industry standards.

Prerequisite: EE 420 or EE 428.

EE 422

Wired and Fiber Optic Communications (3,0)

3 Credits

This course applies the foundations laid down by EE 310 and EE 417 to wired and fiber optic communications. The course discusses the characteristics of theoretical and real transmission lines. The similarities of electrical transmission lines and fiber optic

transmission are studied. Methods of establishing networks using electrical transmission lines are discussed as well as the impairments encountered by such networks. Fiber optic networks are introduced, building on the foundation set down by the electrical transmission line networks.

EE 424

Wireless Communications (3,0)

3 Credits

This course studies the special situations associated with wireless communications, in particular from moving platforms. The basic physics of radio wave propagation are studied including signals, antennas, and multipath problems. Spread spectrum techniques are discussed along with other modulation methods applied to mobile radio including space-based systems. Cellular techniques are studied.

EE 425

Wireless Communications Lab (0,3)

1 Credit

This is the companion lab for EE 424. The lab provides practical experience through laboratory measurements and analysis in the subject areas covered by EE 424.

EE 427

Preliminary Design I (3,0)

1 Credit

Study of organizational structure, quality assurance, reliability, and system standards and specifications. Preparation of senior design specifications.

EE 428

Preliminary Design II (3,0)

1 Credit

Study of component and system testing. Preparation of senior design proposal.

Prerequisite: EE 427.

EE 430

Introduction to Radio Frequency Circuits (3,0)

3 Credits

This course introduces the fundamentals of Radio Frequency (RF) theory and circuits. The main topics in the RF theory part include: RF behavior of common devices, transmission lines, Smith chart, impedance matching, and S parameters. The main topics in the RF circuit part include filters, amplifiers, oscillators, and mixers.

Prerequisite: EE 302.

Corequisite: EE 430L.

EE 430L

Radio Frequency Circuits Laboratory (0,3)

1 Credit

This lab accompanies Radio Frequency (RF) Circuits. The main topics of this lab include: operating the RF measurement equipment, demonstrating the RF behavior of common devices, measuring the parameters of transmission lines, measuring the S parameters of transistors and integrated circuits, matching the impedances of networks, and designing/testing filters, amplifiers and oscillators, as well as mixers.

EE 450

Elements of Power Systems (3,0)

3 Credits

Electrical power conversion and control. Use of electronic devices as switches. Power computations for linear and nonlinear circuits, single and three-phase power distribution, and transformers. Controlled and uncontrolled rectification. AC voltage controllers, DC-DC converters, DC power supplies, DC-AC inverters, and resonant converters.

Prerequisite: Senior standing or permission from instructor.

EE 452

Power Systems Laboratory (1,2)

1 Credit

Laboratory projects in power conversion and control. Measurement techniques of average and apparent power, power factor, average and RMS voltage and current, and harmonics. PWM control circuits, power electronic circuit design, and thermal management techniques.

Corequisite: EE 450.

EE 460

Advanced Controls and System Integration (3,0)

3 Credits

Continuation of EE 401. Study of modern control methods including state variables, controllability and observability, and modern design techniques. Integration of avionics systems by different avionics bus protocols including ARINC-429, ARINC-629, Mil Std 1553, and RS-232. Study of avionics systems common to modern aircraft. Design project.

Prerequisite: EE 401 or equivalent.

EE 299, EE 399, EE 499

Special Topics in Electrical Engineering

1-6 Credits

Directed studies of selected topics in electrical engineering.

Prerequisite: Consent of instructor and department chair.

Engineering

EGR 101

Introduction to Engineering (1,2)

2 Credits

An introduction to the interdisciplinary aspects of the engineering of aerospace systems. This is a project-based course demonstrating how aerospace engineering, electrical engineering, computer engineering, civil engineering, and software engineering are combined to produce results. Students are involved in an array of conceptual exercises, simple design activities, and projects dealing with engineering in aerospace-related areas.

EGR 111

Engineering Drawing (2,0)

2 Credits

Freehand pencil sketching for graphical communication of engineering designs. Standard forms for design graphic and view layout, orthographic projection, section and auxiliary views, dimensioning, tolerancing, introduction to shop processes. This course is not equivalent to EGR 120.

EGR 115

Introduction to Computing for Engineers (3,0)

3 Credits

This is an introductory course in programming and computing for scientists and engineers. The course introduces students to the following aspects of software engineering: specification, requirements, design, code, and test. This course uses a problem-solving approach for developing algorithms. The following topics will be included: data types and related operations, looping, decision, input/output, functions, arrays, files, and plotting.

Prerequisite: Pre-Calculus or permission of the instructor.

EGR 120

Graphical Communications (2,2)

3 Credits

Freehand pencil sketching and CAD as tools for graphical communication of engineering designs.

Course Descriptions

Standard forms for design graphics and view layout, orthographic projection, section and auxiliary views, dimensioning, tolerancing, introduction to shop processes.

Prerequisite: Enrollment in an engineering program.

EGR 200

Computer Aided Conceptual Design of Aerospace Systems (2,3)

3 Credits

Application and use of a high-end computer-aided design (CAD) tool for graphical communication of conceptual engineering designs. Includes definition of standards and conventions for generating part and assembly drawings as well as introductory methods for creating and documenting conceptual aerospace systems design. Application of rapid prototyping methods for constructing and integrating aerospace models as well as conceptual aircraft design.

EGR 305

3D-CADD and Engineering Documentation (3,0)

3 Credits

Application and use of high-end computer-assisted drafting, design, and analysis tool (CATIA) to engineering challenges. Applications of CATIA workbenches: the product specification tree, knowledge, parametric design, part and assembly design, modification, document release and control, final drawings, and changes.

Prerequisites: EGR 120, ES 201, ES 204.

Electronics

EL 107

Direct and Alternating Current Fundamentals and Circuit Analysis (4,0)

4 Credits

A detailed study of basic DC and AC theory and circuit concepts. Subject areas include the physical nature of matter, Ohm's Law, DC and AC components, series and parallel circuits, reactance, resonance, and transformer theory.

Prerequisite: MA 111 or MA 145.

Corequisites: EL 108, MA 112.

EL 108

Direct and Alternating Current Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 107.

Corequisite: EL 107.

EL 203

Microelectronics Fundamentals and Circuit Analysis (4,0)

4 Credits

An introductory course in solid-state fundamentals and circuit analysis. Subject areas include semiconductor construction, biasing, small and large signal amplifier analysis, active devices, operational amplifiers, oscillators, and frequency considerations.

Prerequisites: EL 107, EL 108.

Corequisite: EL 204.

EL 204

Microelectronics Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 203.

Corequisite: EL 203.

EL 212

Digital Circuit and Systems Analysis (4,0)

4 Credits

An introduction to digital fundamentals and their applications to electronic and avionics systems.

Prerequisite: EL 107.

Corequisite: EL 213.

EL 213

Digital Circuit Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 212.

Corequisite: EL 212.

EL 301

Electronic Communication Systems (3,0)

3 Credits

Introduction to communications circuits and systems. Subject areas include AM, FM, and SS modulation and receivers, transmission lines, wave propagation, antennas, wave guides, microwave devices, data, communications, and radar fundamentals.

Prerequisites: EL 203, EL 204, and MA 112 or MA 241.

EL 302

Electronic Communications Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 301.

Corequisite: EL 301.

EL 303

Pulse Components and Circuit Applications (2,0)
2 Credits

An introduction to pulse fundamentals and circuits and their response in high-frequency applications.

Prerequisites: EL 203, EL 212, and MA 112 or MA 241.

EL 304

Pulse Circuits Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 303.

Corequisite: EL 303.

EL 307

Microprocessor Systems (3,0)

3 Credits

An advanced course designed to acquaint the student with microprocessor architecture, software, and hardware. Subject areas include microprocessor organization, instruction sets, memory mapping software and hardware, and microprocessor system design and interfacing to buses, I/O devices, memories, registers, and other digital devices.

Prerequisites: EL 212, EL 213, and CS 223 or CS elective.

EL 308

Microprocessor Systems Laboratory (3,0)

1 Credit

One three-hour laboratory session per week with experiments paralleling the material of EL 307.

Corequisite: EL 307.

Engineering Physics

A grade of C or better is required in MA 241, MA 242, PS 140, PS 141, PS 215, and PS 216 for entry into all EP and ES courses.

EP 101

Current Topics in Space Sciences (1,0)

1 Credit

A survey seminar intended to explore contemporary topics encountered in the exploration of the upper atmosphere and near space environment.

EP 320

Electro-Optical Engineering (3,0)

3 Credits

Geometrical optics of mirrors, thin and thick lenses, prisms, and systems. Ray tracing with optical CAD. Fiber optics applications. Physical optics including interference, diffraction, and polarization. Phaser methods. Engineering considerations in choice of different types of detectors. Space systems applications. Image processing. Emphasis on design.

Prerequisites: EGR 115, PS 303.

Corequisites: MA 345, PS 305.

EP 340

Introduction to Space Systems Design (2,1.5)

2 Credits

An introduction to space mission analysis and design process, mission characterization, evaluation, and requirements definition. Introduction to computer-aided design (CAD). Numerical modeling and simulation of engineering systems, the finite element method, the finite difference method.

Prerequisite: ES 202.

EP 391

Microcomputers and Electronic Instrumentation (2,3)

3 Credits

This course will provide students with a background in electronics as it applies to the design of circuits of measuring instruments and to interface sensors and computers. The program of study will concentrate on following the form of the electrical signal from light, pressure, temperature, and other sensors as it proceeds through signal conditioning circuits and into the microcomputer for further processing. In the laboratory portion of the course the student will explore the design of pertinent regulated power supplies, amplifiers, logic circuits, filters, stepper motors, servo motors, and A-to-D and D-to-A converters. This work will serve as the basis for design project assignments to produce one or two working instruments that are interfaced to a microcomputer.

Prerequisites: EGR 115, PS 219, PS 220, or instructor's waiver.

Corequisite: MA 345.

EP 393

Spaceflight Dynamics (2,0)

2 Credits

Basic topics in analytical dynamics, two body orbits and the initial value problem, the two body orbital

Course Descriptions

boundary value problem, Earth coverage and space mission geometry, non-Keplerian effects, orbital maneuvers and rendezvous, and interplanetary transfer. Fundamentals of ascent flight mechanics, launch vehicle selection, fundamentals of entry flight mechanics, and the associated thermal control problem.

Prerequisite: EGR 115.

EP 394

Space Systems Engineering (3,0)

3 Credits

Development of the fundamental principles used in the engineering and design of space systems. Several major subsystems including power, telemetry and command, communications, thermal control and guidance, navigation, and control subsystems are covered. Topics on space environmental control and life support systems, space system integration and testing, and space system operations are also discussed.

Prerequisite: AE 313 or EP 393 or consent of the instructor.

EP 400

Thermodynamics and Statistical Mechanics (3,0)

3 Credits

Basic thermodynamics, entropy, kinetic theory, distribution of molecular velocities, Maxwell-Boltzmann statistics, Bose-Einstein statistics, Fermi-Dirac statistics, microcanonical ensemble, canonical ensemble.

Prerequisite: PS 303.

EP 410

Space Physics (3,0)

3 Credits

Origin, evolution, and structure of neutral and ionized terrestrial atmosphere. Effect of sun's electromagnetic radiation on ozone shield. Photoionization and thermal structure of the neutral atmosphere as well as the ionosphere and magnetosphere. Solar disturbances and their effects on satellite orbit decay and on long-distance communication. Studies of composition, thermodynamics, and physical processes of the near-Earth space environment. Rocket and satellite monitoring and remote sensing. Numerical and instrument design projects.

Prerequisite: PS 320.

Corequisite: EP 440.

EP 420

Planetary Science (3,0)

3 Credits

Study of the planetary system: origin, evolution, composition, present configuration, dynamics, interiors, surfaces, atmospheres, and magnetospheres of the planets and, where appropriate, similar aspects of the satellites, asteroids, and comets. Interpretations of existing data and definition of future experiments to aid in determination of the origin and evolution of the solar system are stressed.

Prerequisite: PS 303.

EP 425

Observational Astronomy (2,3)

3 Credits

Basic design and use of an optical telescope, fundamentals of astronomical optics including refracting and reflecting systems, principles and applications of optical filters and adaptive optics. Design optimization and trade-offs in an observing system. Telescope system calibration and techniques for enhancing tracking accuracy. Visual observation and analysis of images of the sun, moon, planets, stars, nebulae, and galaxies. Electronic imaging including quantification of radiant energy, spectroscopy, and techniques for reducing the effects of noise sources. Optical and detector design trade-offs for measurement optimization.

Prerequisites: PS 303, PS 305, and either PS 301 or PS 401.

EP 440

Engineering Electricity and Magnetism (3,0)

3 Credits

Solutions of electrostatics problems using Poisson's equation and Laplace's equation, electrostatic energy, electric current, magnetic field, electromagnetic induction, physics of plasmas, Maxwell's equations, and application of Maxwell's equations (reflection, refraction, waveguides, antenna radiation). Students will write some simple computer programs.

Prerequisites: EGR 115, MA 442, PS 303, PS 305, PS 320, or instructor consent.

EP 455

Quantum Physics (3,0)

3 Credits

The Schrodinger equation in one and three dimensions and its solutions for step potentials, the harmonic oscillator, and the hydrogen atom. Operators and their matrix representations: Dirac bracket

formalism, angular momentum and spin, spin-orbit interaction. Identical particles and exchange symmetries. Time-independent and time-dependent perturbation theory and approximation methods: transition rates, Fermi's rule, scattering theory. Classical and quantum statistical distributions.

Prerequisite: EP 440 or instructor consent.

EP 496

Space Systems Design I (1,3)

2 Credits

A program of undergraduate research, supervised by physics or engineering faculty, leading to the writing of a technical design report in an area of current interest in engineering physics.

Prerequisites: EP 340 and EP 394.

EP 497

Space Systems Design II (2,4)

3 Credits

This is a required course in the Engineering Physics program. It is the second of a two-semester sequence and completes senior design project requirements of this program. Continuation and completion of EP 496.

Prerequisite: EP 496.

EP 199, 299, 399, 499

Special Topics in Engineering Physics

1-4 Credits

Individual, independent, or directed study of topics in the fields of applied physics, space systems, and allied engineering disciplines. Student design projects involve significant engineering design such as microgravity experiments and moon-buggy design. May be considered as an engineering elective with approval of the program coordinator.

Engineering Science

A grade of C or better is required in MA 241, MA 242, and either PS 150 or PS 215 and PS 216 for entry into all ES courses. A passing grade in all prerequisite courses or department consent is required for entry into all ES courses.

ES 201

Statics (3,0)

3 Credits

A vector treatment of the concepts and characteristics of forces and couples. Distributed forces. Center of

mass, centroid. Equilibrium of particles and rigid bodies. Trusses and frames. Internal forces. Shear and moment distribution in beams. Area moments of inertia.

Prerequisites: PS 150 or PS 215, EGR 120 or EGR 111, or consent of the instructor.

Corequisite: MA 243.

ES 202

Solid Mechanics (3,0)

3 Credits

The concepts of stress and strain and their tensor properties. Elastic stress-strain relations. Analysis of stress and deformation in members subject to axial, torsional, bending, and combined loading. Column stability.

Prerequisite: ES 201.

ES 204

Dynamics (3,0)

3 Credits

A vector treatment of the kinematics and kinetics of particles and rigid bodies. Acceleration, work, energy, power, impulse, and momentum.

Prerequisite: ES 201.

Corequisite: MA 345.

ES 206

Fluid Mechanics (3,0)

3 Credits

Physical characteristics of the fluid state. Fluid statics. Kinematics of fluid motion. Flow of an incompressible ideal fluid. The impulse-momentum principles. Similitude and dimensional analysis, fluid measurements.

Prerequisite: ES 201, PS 160, or PS 208.

ES 207

Fundamentals of Mechanics (3,0)

3 Credits

Vector analysis of forces and moments. Equilibrium analysis of static systems. Center of gravity. Kinematics, kinetics, work and energy, impulse and momentum.

Prerequisite: PS 150.

ES 305

Thermodynamics (3,0)

3 Credits

A study of the concepts of heat and work and their transformation as governed by the first and sec-

Course Descriptions

and laws of thermodynamics. Properties of pure substances. Ideal gas behavior and relationships. Reversible processes and temperature-entropy diagrams. Conventional power cycles. Properties of ideal gas mixtures. Combustion.

Prerequisite: ES 206 or consent of the instructor.

ES 306

Fiber Optics (2.5,5)

3 Credits

An introductory course on optical fiber technology and applications. Course covers optical waveguide theory (multi-mode and single-mode), light sources (LEDs and lasers), and light detectors and how these components work together to form an electro-optical system. Applications to communications, sensors, and aviation are studied. Some laboratory work, computer design, and literature research are required to broaden the student's viewpoint and to achieve 1 credit of engineering design.

Prerequisites: MA 441, PS 160.

ES 312

Energy Transfer Fundamentals (3,0)

3 Credits

First and Second Laws of Thermodynamics for control masses and control volumes. Fundamentals of heat transfer: conduction, convection, and radiation. Application of energy balances.

Prerequisite: PS 160.

ES 315

Space Environment and Effects (3,0)

3 Credits

This course studies the effects of the space environment on spacecraft and spacecraft design. The vacuum, neutral, plasma, radiation, and space debris environments and their effect on space missions are examined. Special emphasis is placed on investigating the effects of radiation on the electrical spacecraft subsystems and the space debris environment.

Prerequisite: PS 250, junior standing, or instructor consent.

ES 320

Engineering Materials Science (2,0)

2 Credits

Materials used in aeronautical engineering applications. Properties of materials and their measurements. Metals and their structures. Characteristics of metallic phases. Equilibrium diagrams. Processing of metals and alloys. Plastics, their structures, and

characteristics. Ceramics and their characteristics. Composite materials. Corrosion. The Engineering Materials Science Lab ES 321 must be taken during the same semester as ES 320.

Prerequisites: COM 221, ES 202, and PS 105 or PS 140 or consent of the instructor.

Corequisite: ES 321.

ES 321

Engineering Materials Science Laboratory (0,3)

1 Credit

Laboratory experiments and techniques in materials science, composites, and solid mechanics. The Engineering Materials Science Lab must be taken during the same semester as ES 320.

ES 403

Heat Transfer (3,0)

3 Credits

One- and two-dimensional steady and unsteady state conduction heat transfer including an introduction to finite-difference and finite-element methods of analysis. Free and forced convection heat transfer. Radiation heat transfer.

Prerequisites: ES 206 or permission of instructor, ES 305, MA 345.

ES 405

Electrical Engineering II (3,0)

3 Credits

Diode, transistor, and operational amplifier circuit analysis. System block diagrams, feedback, and transfer functions. Digital and analog computer principles. Boolean algebra, logic gates, and microprocessors. Rotating electrical machines, transformers, and other electro-mechanical energy conversion devices.

Prerequisite: EE 335.

ES 412

Structural Dynamics (3,0)

3 Credits

Simple harmonic motion. Undamped and damped free vibration and forced vibration. Multiple degrees of freedom. Multi-mass torsional and transverse systems. Equivalent torsional systems. Balancing. Dynamic damping. Computer analysis using finite element modeling.

Prerequisites: ES 202, ES 204, MA 345.

ES 413

Engineering Fundamentals Review (1,2)

1 Credit

This course is a review of fundamental engineering principles. Problem-solving tutorial sessions help engineering students prepare for the National Fundamental Engineering or Engineering-In-Training Examination.

Prerequisite: Senior status.

ES 299, 399, 499

Special Topics in Engineering Science

1-6 Credits

Individual independent or directed studies of selected topics in engineering science.

Prerequisites: Consent of instructor and department chair. May be repeated with change of content.

Flight-Academic

FA 109

Intermediate Flight Transition and Procedural Familiarization (3,0)

3 Credits

A review of elementary commercial pilot flight operations including basic aircraft control, elementary radio navigation, air traffic control procedure, cross-country operations, and solo flight. Associated ground instruction will include a review of knowledge areas required for Private Pilot certification. This course is specifically designed for students entering Embry-Riddle's Commercial Pilot program with a Private Pilot certificate and desiring advanced standing.

Prerequisite: FAA Private Pilot Certification with Airplane Single-Engine Land Rating.

FA 121

Private Single Flight (1,0)

1 Credit

During this course the student obtains the foundation for all future aviation training. The student will receive training in the maneuvers and procedures necessary for him/her to meet the standards contained in the FAA Private Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary

to attain a Private Pilot Certificate with an Airplane Single Engine Land Rating.

Corequisite: AS 121. *NOTE:* The FAA requires AS 121 to be completed at Embry-Riddle with a "C" or higher. Students who transfer credit for AS 121 will be required to complete additional ground training in FA 121 to meet the FAA requirement.

FA 122

Private Multi Flight with Laboratory (1, 0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Multi Engine Private Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain the addition of a Multi-Engine Rating for the Private Pilot Certificate.

Prerequisite: Private Pilot Certificate with an Airplane Single Engine Land Rating (FA 121).

Corequisite: FA 122 L.

FA 215

Upset Training

1 Credit

This flight course is designed to give certified pilots the experience and knowledge to immediately recognize aircraft upset situations and the skills to safely and precisely recover from such occurrences. This course will include flight recoveries from nose-high, nose-low, and inverted attitudes; spin entries and recoveries; and basic aerobatic maneuvers.

FA 221

Instrument Single Flight (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Instrument Rating Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain the addition of an Instrument Rating for the Private Pilot Certificate.

Prerequisite: Private Pilot Certificate with an Airplane Single Engine Land Rating (FA 121).

Corequisite: AS 221. *NOTE:* The FAA requires AS 221 to be completed at Embry-Riddle with a "C" or higher.

Course Descriptions

Students who transfer credit for AS 221 will be required to complete additional ground training in FA 221 to meet the FAA requirement.

FA 222

Instrument Multi Flight (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Instrument Rating Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain the addition of an Instrument Rating for the Private Pilot Certificate.

Prerequisite: Private Pilot Certificate with an Airplane Multi Engine Land Rating (FA 122).

Corequisite: AS 221. NOTE: The FAA requires AS 221 to be completed at Embry-Riddle with a "C" or higher. Students who transfer credit for AS 221 will be required to complete additional ground training in FA 222 to meet the FAA requirement.

FA 321

Commercial Single Flight (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Commercial Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain a Commercial Pilot Certificate with an Airplane Single Engine Land Rating.

Prerequisite: Private Pilot Certificate with Airplane Single Engine Land and Instrument Airplane Ratings (FA 221).

Corequisite: AS 321. NOTE: The FAA requires AS 321 to be completed at Embry-Riddle with a "C" or higher. Students who transfer credit for AS 321 will be required to complete additional ground training in FA 321 to meet the FAA requirement.

FA 322

Commercial Multi-Flight (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Multi Engine Commercial

Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain a Commercial Pilot Certificate with an Airplane Multi Engine Land Rating.

Prerequisite: Private Pilot Certificate with Airplane Multi Engine Land and Instrument Airplane Ratings (FA 222).

Corequisite: AS 321. NOTE: The FAA requires AS 321 to be completed at Embry-Riddle with a "C" or higher. Students who transfer credit for AS 321 will be required to complete additional ground training in FA 322 to meet the FAA requirement.

FA 323

Commercial Multi-Add On (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Multi Engine Commercial Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain the addition of a Multi-Engine-Rating for the Commercial Pilot Certificate.

Prerequisite: Commercial Pilot Certificate with Airplane Single Engine Land and Instrument Airplane Ratings (FA 321).

FA 326

Commercial Single Add On Flight (1,0)

1 Credit

The student will receive training in the maneuvers and procedures necessary to meet the standards contained in the FAA Commercial Pilot Practical Test Standards. Additionally, the student will receive training in safety awareness, crew resource management, and aeronautical decision-making. At the successful completion of this course the student will have gained the aeronautical experience necessary to attain the addition of a Single Engine Rating for his/her Commercial Pilot Certificate.

Prerequisite: Commercial Pilot Certificate with Airplane Multi Engine Land and Instrument Airplane Ratings (FA 322).

FA 370

Advanced Multi-Engine Instrument Flight

1 Credit

Introduction to autopilot and flight director operations to further develop instrument piloting skills to the ATP level. In addition, the student is introduced to advanced cross-country operations, with emphasis on precision flying skills and the use of automated flight management systems in an IFR environment.

Prerequisites: *Commercial Pilot Certificate with a Multi-Engine Class Rating and Instrument Airplane Rating (FA 322 or FA 323).*

FA 417

Flight Instructor Rating

3 Credits

The student will receive training in the maneuvers and procedures necessary for him/her to meet the standards contained in the Flight Instructor practical test standards, Single-Engine Land with Instrument Airplane rating. Additionally, the student will receive training in cockpit resource management and safe flying practices. Associated ground instruction will include completion of the Fundamentals of Instruction, the Flight Instructor Airplane, and the Flight Instructor Instrument written test.

Prerequisite: *FAA Commercial Pilot Certificate with Single-Engine and Instrument Rating (FA 321 or FA 326).*

FA 420

Airline Flight Crew Techniques and Procedures

2 Credits

Instruction in airline flight crew operations with emphasis on the transition of the professionally qualified pilot into a highly skilled member of an air carrier flight management team.

Prerequisites: *Commercial Pilot Certificate with Multi-Engine/Instrument Airplane Rating, AS 387, AS 435.*

Corequisite: *AS 420.*

FA 460

Multi-Engine Flight Instructor Rating

2 Credits

The student will receive training in the maneuvers and procedures necessary for him/her to meet the FAA standards required to add the Multi-Engine Flight Instructor Rating to his/her CFI/I Rating. Additional instruction will be provided in advanced multi-engine flight crew training techniques including cockpit resource management and safe flying practices.

Prerequisites: *FA 417 or FAA Commercial Pilot Certificate with Airplane Multi-Engine Land and Instrument-Airplane Ratings and an FAA Flight Instructor Certificate with an Instrument Airplane Rating.*

FA 199, 299, 399, 499

Special Topics in Flight

0-2 Credits

Flight training in selected areas for the purpose of gaining proficiency in required pilot operations for various certificates and ratings.

Prerequisites: *Approval of chief flight instructor and department chair.*

Honors

HON 150

Honors Seminar I (3,0)

3 Credits

This course is open only to freshmen enrolled in the Honors program, and will satisfy the lower-level Humanities requirement in general education. An interdisciplinary Humanities course, it focuses on aesthetic, philosophical, and historical aspects of a subject, making use of text materials from several disciplines and varied media. The course also emphasizes student participation in a seminar discussion format and requires that students develop their research, critical thinking, and oral and written communication abilities. Requirements will include (but will not be limited to) text and Web-based original research, written essays, oral presentations, and participation in group discussion. Topics may vary according to instructor.

HON 250

Honors Seminar II (3,0)

3 Credits

This course is open only to students enrolled in the Honors program, and will satisfy 3 credits of the lower-level Social Sciences requirement in general education. The course focuses on material pertinent to one or more disciplines within the broad arena of the Social Sciences. Specific emphases will vary by instructor. The course also emphasizes student participation in a seminar discussion format and requires that students develop their research, critical thinking, and oral and written communication abilities. Requirements will include (but will not be limited to) text and Web-based original research, written essays, oral presentations, and participation in group discussion.

Course Descriptions

HON 350

Honors Seminar III (3,0)

Honors Seminar III will satisfy either the Humanities or the Social Sciences upper-level elective requirement in general education. Building on the previous two Honors seminars, it will require students to further develop their ability to locate and assess primary and secondary research materials, to present effective verbal and written presentations that display more sophisticated research and presentational sensibilities, and to engage in discussion that is rooted in close reading of assigned and unassigned material. Whatever the specific course topic, the seminar will be an interdisciplinary exploration of the subject, will emphasize student participation in focused class discussion, and will foster further development of research, critical thinking, and oral and written communication abilities. Topics vary by instructor.

Human Factors

HF 201

Introduction to Human Factors (3,0)

3 Credits

This introductory course in Human Factors psychology will provide a survey of topics including, but not limited to, human information processing characteristics, ergonomics and biomechanics, physiology, workload, and fatigue as well as common training and selection practices. Basic human abilities and limitations will be discussed in an operational context. A variety of scenarios will be used to illustrate the potential conflicts between humans, machines and the operational environment and the potential negative impact of those conflicts. Consideration of the human operator or consumer and the operational environment during the system design process will be emphasized.

HF 210

Human Factors I: Principles & Fundamentals (3,0)

3 Credits

This course is intended to provide the student with an understanding of the basic principles of Human Factors Psychology and prepare students for further courses in the HF capstone sequence. The course includes the research, principles, and methods that are beneficial (and essential) in optimizing the interaction between people and machine elements of a system, while taking the environment into account.

HF 302

Human Factors II: Analytic Methods and Techniques (3,0)

4 Credits

Covers a variety of engineering and behavioral analytic methods and techniques critical to the study of work performance. Provides required tools needed to accomplish workload analysis as a requisite to a systems design or a redesign of an existing system.

Prerequisite: HF 201 or HF 210.

HF 305

Human Factors III: Test and Evaluation (3,0)

4 Credits

Studies quantitative means of modeling, analyzing, and predicting the performance of human-machine systems. Topics include queuing models, system simulation, model validation, data collection, quantitative analysis of system performance, and system design evaluation.

Prerequisite: HF 201 or HF 210.

HF 310

Human-Computer Interaction (3,0)

3 Credits

The application of cognitive principles, ergonomics, and human factors guidelines and principles to the design and evaluation of human-computer systems. Topics include display technologies, human visual capacities, design of display parameters, and image quality metrics.

Prerequisite: HF 201 or HF 210.

HF 312

Ergonomics and Bioengineering (3,0)

3 Credits

Advanced applications from a variety of bioengineering subfields are identified and defined with respect to their importance in the practice of human factors. Quantitative methods for the analysis of human movement. Topics include anthropometry, kinematics, kinetics, work and power, muscle mechanics, and electromyography. Introduces students to the application of ergonomic principles to the industrial environment. Includes subject matter on ergonomic planning and implementation, the work environment, NIOSHA work factors, and workstation equipment and design.

Prerequisite: HF 201 or HF 210.

HF 315

Automation and Systems Issues in Aviation (3,0)
3 Credits

This course will involve analyzing and discussing the most current issues relevant to the new generation of aviation systems. Assumptions on which current systems are based will be identified and alternatives examined.

Prerequisite: HF 201 or HF 210.

HF 325

Human Factors and System Safety (3,0)
3 Credits

This course emphasizes the integration of human factors in all phases of a system's life-cycle. Accident prevention, beginning with systems engineering together with sound management, are combined in this course to enable the student to fully comprehend the human's vital roles in preventing accidents. The total program, from basic design concepts through testing, maintenance/systems management, and operational employment, is fully examined and evaluated.

Prerequisite: HF 201 or HF 210.

HF 326

Human Performance in Extreme Environments (3,0)
3 Credits

This course will focus on the physiological, behavioral, and human factors issues of performance in extreme environments, particularly the human-technology-environment relationship common to many of these settings. With this focus, students will survey different occupations and environments and learn how research findings from one setting, such as submarines, have relevance to similar settings like long-duration spaceflight. Students will also learn how to apply human factors principles to enhance performance, safety, and health in extreme environments.

Prerequisite: HF 300.

HF 335

Human Factors in Air Traffic Control (3,0)
3 Credits

A comprehensive examination of the application of human factors to air traffic control systems. The course covers the full range of applications of human factors.

Prerequisite: HF 201 or HF 210.

HF 340

Human Factors and Product Liability (3,0)
3 Credits

This course will provide the student with an understanding of the legalities and liabilities of product manufacturing. Topics to be covered will include what is required of a manufacturer when designing a product for human use, what can go wrong, the role of expert witnesses in a product liability case, a review of specific case studies, and a discussion of awards to plaintiffs.

HF 400

Human Factors IV: System Design (3,0)
4 Credits

Application of human factors concepts to system design. Develops human factors influence on system dynamics, structure, and control as well as impact on reliability and maintainability. Emphasizes the design of control-display integration, cockpit configuration, maintainability, and reliability. Emphasizes the significant human factors contributions to the design of state-of-the-art aerodynamic and space systems.

Prerequisites: HF 302 and HF 305.

HF 410

Human Factors Engineering: Crew Station Design (3,0)
3 Credits

In-depth treatment of human factors principles applicable to the design of crew command centers for aerodynamic aviation/aerospace systems.

Prerequisite: HF 201 or HF 210.

HF 412

Simulating Humans in Complex Systems (3,0)
3 Credits

This course involves understanding the theory and applications for modeling human behavior in the operation of complex systems. The student will learn to program basic problems such as a traffic flow problem, a hospital transportation problem, and a bank teller efficiency problem. Several software architectures will be presented and the student will gain a working knowledge of these. Examples may include Micro Saint Sharp, ACT-R, and MIDAS. The use of human performance modifiers to discrete event simulations such as fatigue and thermal shock will be discussed as they impact task management plans. The goals of the class are to acquaint the student with how human behavior in complex systems can

Course Descriptions

be simulated, studied, and assessed with the goal of applying the results.

Prerequisites: HF20X or HF21X. Familiarity with a programming language or macro programming such as Microsoft Access or Excel is encouraged but not required.

Prerequisite: HF 201 or HF 210.

HF 415

Human Factors in Simulation Systems (3,0)

3 Credits

This course provides a comprehensive examination of the human factors aspects of simulation in modern aviation/aerospace. Topics will include history, state-of-the-art simulation systems, and current research and development. Discussion focuses on the extent and impact of human factors in simulator training. Topics from flight crew training, evaluation, effectiveness, and simulator sickness are examined in detail.

Prerequisite: HF 201 or HF 210.

HF 422

Applied Ergonomic Design, Analysis, and Evaluation (3,0)

3 Credits

This course will provide students with comprehensive exposure to the application of ergonomics analysis in the design of human/machine systems and products. Students will examine, verify, and correct the design of differently configured systems with CATIA's human modeling and ergonomics workbench. Students will learn to verify how well an existing design accommodates a specified population. Core parameters to be examined are comfort, reach, clearance, core of vision, posture analysis, range of motion, lift/lower, and push/pull analysis. Students will learn how to create a mannequin with unique characteristics of a specified population. Additionally, students will be exposed to the relevant methods of statistical analysis required to verify the output of the computer modeling simulations. Students are introduced to the statistical tools used in the corroboration of ergonomic design and verification.

HF 490

Practicum in Human Factors Psychology (3,0)

3 Credits

Supervised applied practicum experience. This requirement may be fulfilled in several ways, including co-ops, internships, or working on an on-campus research team. Practica provide opportunities to gain practical experience in real-world settings. The student completes a specific project under the supervi-

sion of an organizational sponsor and/or a faculty member.

Prerequisites: Approval of advisor and department chair.

HF 299, 399, 499

Special Topics in Human Factors Psychology (3,0)

1-6 Credits

An area of study under the direct supervision of a faculty member. The course requirements and area of study are negotiated between the faculty member and the student with the approval of the department chair.

Prerequisites: Approval of advisor and department chair.

Homeland Security

HS 201

Introduction to Homeland Security (3,0)

3 Credits

The primary focus of this course is on issues dealing with the security of the citizens and industries of the United States, with emphasis on the transportation system and critical infrastructure protection roles of the states, cities, and municipalities. Specific subjects introduced include the mission, the functions and responsibilities, and the legislative and regulatory framework governing the various agencies of the Department of Homeland Security, criminal acts against transportation, emergency management within the United States, the intelligence community and its role in homeland security, and issues pertaining to air, maritime, surface, and cargo security.

HS 301

Fundamentals of Transportation Security (3,0)

3 Credits

The primary focus of this course is on security in all modes of public transportation. Students will study the governmental organizations responsible for the security of people and property while being transported by air, rail, marine, or on the highways, as well as the federal regulations governing security in these modes of transportation. Specific subjects discussed include the federal regulations governing all modes of transportation, the role of safety and security program managers, airport security, air carrier security, foreign and indirect air carrier security, cargo security, transportation of dangerous goods, and the role of security-oriented technology.

Prerequisite: HS 201.

Course Descriptions

HS 302

Fundamentals of Occupational Security (3,0)

3 Credits

This course will review the fundamentals of security and emergency planning and management. The nature, scope, history and essential elements of security in the workplace are discussed with emphasis on personal protection and to a limited extent property protection. The workplace will include selected aviation and industrial settings. Operational aspects of security that include strategies for identifying and controlling security exposures and applicable legal issues are also discussed. Students develop and/or evaluate security programs for selected industries.

HS 306

Legal and Investigative Issues of Security (3,0)

3 Credits

This course is designed to provide the student with an understanding of the legal issues involved in the development, implementation, and operational aspects of administering a security program. Emphasis is placed on the framework of the legal system in the United States, as well as the international legal system. Specific subjects covered include the Patriot and Freedom of Information Acts, as well as other security-related acts, conventions, and agreements to which the United States is a party, the legal rights of the traveling public and those empowered to enforce security regulations, private security issues, and the part federal agencies play in supporting local law enforcement personnel.

HS 307

Law Enforcement in Security (3,0)

3 credits

This course is designed to provide the student with an understanding of the objectives and tactical issues and methods employed by those persons empowered to establish and enforce security programs. Emphasis is placed on the enforcement of required security programs involving transportation, including airports and air carriers. Specific subjects covered include the role of the law enforcement officer in security and in emergency response, counterterrorism, and witness interviewing.

HS 399

Special Topics in Homeland Security (3,0)

1-3 Credits

This is a variable credit independent study course. Students wishing to pursue an independent study in Homeland Security will need to coordinate and

establish the number of credits (for example 1-3), topics, etc. with a Homeland Security faculty member willing to work with him/her.

HS 401

Fundamentals of Emergency Management (3,0)

3 Credits

This course studies the various elements involved with planning for and responding to workplace, transportation, and natural disasters and emergencies. This course will adopt an all-hazards approach to the general and technical aspects of disaster planning and response, including the incident management system; alarm, warning, and communications systems; evacuation; medical response; search and rescue; media and information management; and business recovery. Case studies will be examined through the existing structures of government agencies such as FEMA, EPA, OSHA, FAA, NTSB, as well as local first responder organizations.

Prerequisite: HS 301, HS 302, or consent of the instructor.

HS 402

Security and Risk Analysis (3,0)

3 Credits

This course is designed as a capstone course for the Homeland Security degree and will focus on the fundamentals of risk analysis: threat identification, vulnerability analysis, and the consequent measures of risk as applied to critical infrastructures, with an emphasis on transportation systems. Topics include adversary characterization, critical asset identification, consequent analysis, vulnerability analysis of targets and facility characterization, risk ranking, assessment of countermeasures, cost benefit and analysis, and security auditing. A project dealing with the securing of a facility is an integral part of this course.

Prerequisite: HS 301, HS 302.

HS 405

Emerging Issues in Homeland Security (3,0)

3 Credits

This course will present multiple learning opportunities for students in either the transportation or the emergency management area of concentration. In a seminar format, this course will be facilitated by the instructor as an advanced reading class wherein current or emerging topics specific to a given area of concentration will be explored. The instructor will present a series of articles, case studies, and talking points that each student will read and be prepared to

Course Descriptions

discuss in class. In addition, the concept of business continuity planning will be described and illustrated. In the second half of the semester, each student will lead at least one class in the scholarly discussion of a topic assigned to him/her. Domestic and foreign policy implications will be considered. It is possible that this course could springboard the student into a research topic that will be completed in HS 490.

Prerequisite: Consent of the instructor, department chair, and program chair; 12 hours of HS courses.

HS 408

Control and Command Structures and Processes in Emergency Management (3,0)

3 Credits

This course will explore and define the nature and organization of the chain of command expected and proven most effective in managing emergencies. The student will be exposed to the current uses of incident control and command within FEMA and see how failure to establish a control and command infrastructure leads to chaos and a systemic inability to recover from emergencies. In addition, the incident command system (ICS) and the U.S. National Incident Management System (NIMS) will be explored in greater detail than in HS 401 including planning, implementing and evaluating either tabletop or field exercises. Connections between the NIMS, the philosophy of command and control, and interagency as well as interjurisdictional communication and cooperation will also be explored.

Prerequisite: HS 401.

HS 410

The EOC's Role in Emergency (3,0)

3 Credits

This course will explore the role of the emergency operations center (found frequently at the county level in each state) in a community's ability to prepare for, respond to, and recover from an emergency or a disaster. Specific emphasis will be placed on interagency (county, state, and federal levels as well as NGO's and private businesses) cooperation, interjurisdictional and interagency communication challenges, citizen training, education and outreach as primary activities of an EOC, and other activities that optimize citizen and community preparedness and disaster resilience.

Prerequisite: HS 401.

HS 412

Aviation and Transportation Security: 911 and Beyond (3,0)

3 Credits

This course will explore and define the progression of aviation security initiatives since September 11, 2001, by an in-depth look at the history of aviation safety and security regulations before the World Trade Center terrorist attacks of 9/11. The student will be exposed to the current laws, rules, and regulations governing both national and international aviation security and learn how these laws have changed as the terrorist threat to transportation systems in general, and aviation specifically, has expanded and changed in the 21st century. In addition, the organization, function, and interaction of the various governmental and non-governmental agencies that regulate aviation security, both at home and abroad, will be explored. Specific emphasis will be placed on such issues as the carriage of cargo on commercial aircraft, transportation of HAZMAT by air, determining future threats to the aviation transportation system, and identifying potential countermeasures or controls that could be implemented.

Prerequisite: HS 301.

HS 415

Business Skills for the Homeland Security Professional (3,0)

1 Credit

The main objective of this course is to better prepare graduates in Homeland Security to effectively enter the workforce. Students will learn how to prepare a resume and cover letter, practice interviewing, learn about how their personality matches job descriptions, search for internships, and will develop a web page that describes themselves, their professional aspirations, skills, etc. The Homeland Security program will then aggregate each of the student's web pages into a web site that can be distributed to constituents, agencies, organizations, and businesses interested in hiring a BS-prepared student in Homeland Security.

Prerequisite: Senior standing.

HS 417

Transportation Security Issues at Sea and on Land (3,0)

3 Credits

This course will explore the issues regarding security for the maritime, mass transit, highway, railway, and pipeline modes of transportation. Topics including history of security initiatives, global impact of transportation modal disruption, and the role of

the private sector in transportation security will be explored. Additionally, an in-depth examination will be made into the governmental and non-governmental agencies that control or impact transportation security, in these modes, both nationally and internationally. Specific emphasis will be placed on interagency cooperation, communication challenges, cargo container security, intermodal transportation security issues, concerns for transportation of HAZMAT, and the threats and countermeasures regarding cargo security in the maritime, rail, and highway environments.

Prerequisite: HS 301.

HS 490

Senior Project in Homeland Security (3,0)

3 Credits

This course is designed to allow the student to explore more deeply issues specific to the student's area of concentration. Each student will research a variety of topics, choose a specific topic, and develop a structured analysis of his/her homeland security topic as it applies to a topic within their chosen area of concentration. Each research project will contain an introduction, literature review, problem statement, risk/hazard analysis, risk mitigation plan, business continuity plan, and policy recommendations. Student will share their final products with their classmates and will formally present their projects at the end of the term. The expectation of this class is to develop a professional example of the student's thinking and writing.

Prerequisite: Senior standing, HS 401, HS 402, completion of advanced classes of chosen area of concentration, or consent of the instructor.

Humanities

Note: Foreign language courses are listed under the Language discipline (L).

HU 125

Choral Union (3,0)

1 Credit

A singing organization open to all members of the university community. Training in choral techniques, acquaintance with choral music of all periods. (May be elected up to eight times for open elective credit.)

The Humanities 140 Series

The HU 140 series constitutes an integral component of the University's General Education Program. This series offers students a variety of choices, with each course fulfilling a lower-level requirement in the humanities. Courses in the HU 140 series emphasize writing, reading, and appreciation skills and are designed to expose students to the complexity of human emotions and experiences. Students also explore the framework of historical and cultural contexts in which artistic and creative expressions have arisen.

In selecting a course from the HU 140 series, students have opportunities to concentrate their studies on one form of cultural expression, such as music, literature, or the visual arts. Others may opt for a course that provides a chronological examination of a cultural expression or a thematic approach to several disciplines in the humanities.

HU 140

Western Humanities I: Antiquity and the Middle Ages (3,0)

3 Credits

A continuation of COM 122 with an interdisciplinary emphasis. Traces the evolution of the Western humanistic tradition from antiquity to the Middle Ages using examples from art, architecture, music, philosophy, and literature. Emphasizes writing, reading, and appreciation skills.

Prerequisite: COM 122.

HU 141

Western Humanities II: Renaissance to Postmodern (3,0)

3 Credits

A continuation of COM 122 with interdisciplinary emphasis. Traces the evolution of the Western humanistic tradition from the Renaissance to the Postmodern using examples from art, architecture, music, philosophy, and literature. Emphasizes writing, reading, and appreciation skills.

Prerequisite: COM 122.

HU 142

Studies in Literature (3,0)

3 Credits

A continuation of COM 122 with emphasis on a survey of literature. Reading materials include selected novels, poems, and plays. Emphasizes writing, reading, and appreciation skills.

Prerequisite: COM 122.

Course Descriptions

HU 143

Introduction to Rhetoric (3,0)

3 Credits

A continuation of COM 122, HU 143 offers a broad survey of rhetorical theory and practice. Whether noble or base, rhetoric primarily uses language to achieve a desired end, usually persuasion. This course employs primary and secondary readings as a means to examine how rhetorical principles manifest themselves in a variety of cultural texts and to understand the powers of persuasion. Although instructors may choose various approaches to teaching this course, students should expect some exposure to classical rhetoricians.

Prerequisite: COM 122.

HU 144

Studies in Art (3,0)

3 Credits

A continuation of COM 122 with an emphasis on art. Provides a foundation in the basic vocabulary, concept, processes, and history of art. Works of art, sculpture, architecture, and film from various cultures are analyzed. Emphasizes writing, reading, and appreciation skills.

Prerequisite: COM 122.

HU 145

Themes in the Humanities (3,0)

3 Credits

A continuation of COM 122 with interdisciplinary emphasis. Through close reading of primary texts and analysis of visual and performing arts, Themes in the Humanities explores ideas central to the evolution of culture. The course is not restricted by period and is open to the full range of humanistic studies. Themes vary by instructor and are listed in the Schedule of Courses. Emphasizes writing, reading, and appreciation skills.

Prerequisite: COM 122.

HU 146

Music Appreciation and Criticism (3,0)

3 Credits

A continuation of COM 122 with an emphasis on listening to and writing about music. Elements of music (rhythm, meter, tempo, pitch, and pitch relationships), instruments of music, and musical forms. The course emphasizes Western classical music.

Prerequisite: COM 122.

HU 250

Introduction to Logic (3,0)

3 Credits

Principles of valid thinking; the nature of inductive and deductive inferences and their applications.

Prerequisite: Any course from the HU 140 series.

HU 300

World Literature (3,0)

3 Credits

Major works and literary trends in world literature. Course content varies by instructor and is listed in the Schedule of Courses.

Prerequisite: Any course from the HU 140 series.

HU 302

Contemporary Issues in Science (3,0)

3 Credits

This course bridges science and the humanities, examining how different disciplines approach problems of common interest. Students study selected contemporary issues such as stem cell use in medicine, evolution vs. intelligent design, imminent worldwide crises, DNA engineering, responses to climate change, and possible problems associated with autonomous machines and artificial intelligence. As they examine their own assumptions while participating in debates that encourage appreciation of other viewpoints, students demonstrate understanding of course topics in class discussion and formal papers. The course is team-taught by a Physical Sciences professor and a Communication professor, and will include guest experts on selected topics.

Prerequisite: COM 221.

HU 305

Modern Literature (3,0)

3 Credits

The mainstreams of literature of this century. Course content varies by instructor and is listed in the Schedule of Courses.

Prerequisite: Any course from the HU 140 series.

HU 310

American Literature (3,0)

3 Credits

A survey of intellectual backgrounds, major works, and literary trends in American literature. Course content varies by instructor and is listed in the Schedule of Courses.

Prerequisite: Any course from the HU 140 series.

HU 315

Drama Seminar (3,0)

3 Credits

Students are exposed to the theater arts and especially to performance. They acquire acting skill through class exercises and performance assignments. Dramatic literature is studied with special attention given to its stage applications. Students may participate either as actors or technicians in the theatrical production, which entails out-of-class rehearsal.

Prerequisite: COM 219.

HU 316

Studies in Music (3,0)

3 Credits

Musical works, musical instruments, and the important developments in the technology of making the music of a specific style, a group of related styles, or a historical sequence. Social and intellectual context of the music studied. Course content varies from semester to semester and is listed in the schedule of courses.

HU 319

Advanced Speech (3,0)

3 Credits

This course continues the study of oral communication with emphasis on effective public speaking. It includes the analysis and practice of modern and traditional methods of persuasion within and beyond the classroom.

Prerequisite: COM 219.

HU 320

Aesthetics of Visual and Musical Arts (3,0)

3 Credits

Provides a survey of the major artistic monuments of Western culture and discusses the methods by which artistic productions are analyzed.

Prerequisite: Any course from the HU 140 series.

HU 321

Mythology (3,0)

3 Credits

This course introduces the study of the myths of humankind, both ancient and modern, using perspectives and methods from archeology, anthropology, psychology, literature, and film. It explores what myths reveal about the human psyche and about historical and modern cultures. It builds facility in symbolic thinking and critical understanding of how

this thinking influences contemporary literature, art, film, communication, and politics.

Prerequisite: Any course from the HU 140 series.

HU 325

Exploring Film (3,0)

3 Credits

A survey of the art of the film. History of the cinema. Basic elements, photography, continuity and rhythm, movement, imaging, music and sound, script writing, directing, editing, acting, great film artists/directors, cinematographers, actors, etc.

Prerequisite: Any course from the HU 140 series.

HU 330

Values and Ethics (3,0)

3 Credits

This course focuses on the process of practical ethics as a way of resolving moral conflict and of understanding professional responsibility in a multiculturally diverse society without devaluing specific viewpoints of ethical or metaphysical theory, ideology, or religion. Students will use proposals, value judgments, observation statements, assumptions, and alternate-world assumptions in arguing contemporary issues of moral importance. With this basic moral logic, students will resolve issues in terms of rights, responsibilities, and the community of rational beings in terms of consequences and contingencies and in terms of habituated virtues and character. Free and unrestricted discourse will be encouraged to let students find common ground in diversity.

Prerequisite: Any course from the HU 140 series.

HU 335

Technology and Modern Civilization (3,0)

3 Credits

A humanistic analysis of technology, with special attention to its influence on modern American culture in a global context. Topics include the history and development of technology, the influence of technology on certain philosophies such as determinism and utilitarianism, the influence of technology on the ecosphere, and the depiction of technology in imaginative literature.

Prerequisite: Any course from the HU 140 series.

HU 338

Traversing the Borders: Interdisciplinary Explorations (3,0)

3 Credits

This course entails the study of different approaches to gathering, analyzing, and interpreting information.

Course Descriptions

Special attention is directed to recognizing connections between the boundaries of traditional disciplines. Study also involves in-depth research into a single reality-altering event. Investigation focuses on how people trained in different ways of thinking participate in and contribute to their society and the world by shaping new cultural meanings.

HU 341

World Philosophy (3,0)

3 Credits

This course focuses on an investigation of some of the central problems of philosophical inquiry such as what we can know and what we cannot know, how we reason, who we are, why we are here, and what we can hope for. Freedom, beauty, knowledge and logical thinking, mind, morality, god or gods, religion, truth, death, and existence might be explored using a variety of sources, including but not limited to contemporary thinkers of the European and the Anglo-American traditions. This course is designed to challenge assumptions and to help students deal with contemporary philosophical issues.

Prerequisite: Any course from the HU 140 series.

HU 345

Comparative Religions (3,0)

3 Credits

A survey of the major religions of the world, beginning with a brief examination of the nature of religion and its study, as a vital aspect of human experience in history. This is followed by a survey of the eastern religions of Hinduism, Buddhism, Jainism, Taoism, Confucianism, and Shinto, and finally a survey of the monotheistic religions: Judaism, Christianity, Islam, and Sikhism.

Prerequisite: Any course from the HU 140 series.

HU 355

Creative Writing (3,0)

3 Credits

The course culminates the interpretive and expressive elements of communications classes. The study, practice, and use of a personal style of creative composition and examples of contemporary literature and submittal of publications are included in this course.

Prerequisite: Any course from the HU 140 series.

HU 361

Interpersonal Communication in the Work Group (3,0)

3 Credits

Examination of interpersonal and small-group communication topics to focus on maximizing decision making in work groups. Students are assigned to simulated consensus-driven groups. Evaluation is based on the quality of the groups' decision making, exams, class participation, and presentation of the groups' findings in a public setting.

Prerequisite: COM 219.

HU 362

Communication and Organizational Culture (3,0)

3 Credits

Theory, survey, and application of research methods for the analysis of communication. Instructors may choose to apply methods in a variety of contexts, such as in-house publications, internal communication, speeches, and interview communication.

Prerequisites: COM 219 and COM 221.

HU 363

Communication and Society (3,0)

3 Credits

An examination of human communication in a variety of cultural settings. Topics vary from semester to semester. Communication behavior is viewed expansively to include verbal discourse, symbolic imagery, nonverbal communication, literature, music, and other art forms. Focus is on understanding communication behavior as symbolic action, as constructive of social reality, and as a means for entry into cultural and sub-cultural group experience.

Prerequisite: Junior standing or permission of professor.

HU 370

Advanced English Grammar (3,0)

3 Credits

This course introduces students to concepts of grammatical theory mainly at the level of syntax. Avoiding the niceties of linguistic distinctions, the course will introduce the student to useable concepts and terms that are also echoed in contemporary style checkers.

Prerequisite: Junior standing.

HU 375

The Nature of Language (3,0)

3 Credits

This course provides a practical investigation into how people use language functions as a system of meaning. The diversity, complexity, and intrinsic fascination of this most human of behaviors is studied largely with reference to the English language. Topics include popular ideas about language, language and identity, language structure and system, language media, language acquisition and learning, language and the brain, and world languages.

Prerequisite: COM 221 or COM 222.

HU 415

Non-Verbal Communication (3,0)

3 Credits

This course entails the study of communication behaviors and processes, not involving the expression of written or spoken words, contribute information to a message. Special attention is directed to the study of voice qualities; facial expression and body language; space, personal distance, and touch; the use of time and objects; and personal appearance. Study also involves nonverbal communication in applied settings, as well as research strategies for observing, measuring, and understanding non-verbal phenomena.

Prerequisites: COM 219, equivalent Speech Communications course. (Also offered as COM 415. Students receive either Communication or Humanities credit, but not both.)

HU 420

Applied Cross-Cultural Communication (3,0)

3 Credits

An examination of the challenges to communicating across the variety of subcultures present in work environments. Ethnicity, nationality, gender, physical impairment, and sexuality are among the areas of difference often present in business and professional environments that may influence the establishment of cooperative working relationships. Means for analyzing and developing strategies to transcend and make positive use of subcultural differences will be considered.

Prerequisites: COM 219, COM 221.

HU 475

Senior Thesis

3 Credits

As the culmination of the student's experience in the interdisciplinary aerospace studies major, senior thesis

requires the student to complete documented research under the guidance of the course instructor, involving subject matter that is demonstrably tied to at least two of the student's three chosen minor fields of study. A series of seminar discussions or extended individual consultations with the course instructor may accompany the guided writing of the thesis. Additional faculty may be interviewed or consulted during the thesis project.

HU 480

Senior Thesis Research (1,0)

1 Credit

Students will select a thesis committee and research problem, conduct appropriate research, and write and defend a thesis proposal and a full sentence outline. Course lectures will be integrated with faculty-guided workshops; topics include an overview of the thesis process, the development of a specific and contentious research problem, organization and format of the required thesis documents, citation standards, and appropriate academic language.

Prerequisite: COM 221 or COM 222.

HU 485

Senior Thesis Writing

2 Credits

Students using the work completed in HU 480, Senior Thesis Research, write their senior thesis in a workshop environment, defending the thesis at the end of the semester. Topics include problem-solution organization, documentation, argumentation, and successful presentation strategies.

Prerequisite: HU 480.

HU 299, 399, 499

Special Topics in Humanities

1-6 Credits

Individual independent or directed studies of selected topics in the humanities.

Prerequisites: Consent of instructor and approval of the department chair.

Information Technology

IT 109

Introduction to Computers and Applications (3,0)

3 Credits

Introduction to computers and an overview of PC applications. Computer literacy is presented through lectures on the computer process, the impact of computers on society, emerging technologies, and how to

Course Descriptions

make hardware and software purchasing decisions. A hands-on overview of the most popular computer applications such as word processing, spreadsheet, database, electronic mail, and Internet is provided.

Prerequisite: Proficiency in college preparatory mathematics.

IT 210

Web Page Authoring and Design (3,0)

3 Credits

This course will address the organization of the Internet, addressing, routing, DNS, and use of Internet applications. It will review such applications as FTP, telnet, and advanced Web searching methodology. This course covers Web page authoring and design techniques using both HTML and WYSIWYG authoring software. Students will study, create, and refine Web pages online as well as create Web graphics. Lastly, legal and ethical issues related to the Internet and emerging technologies are discussed.

Prerequisite: IT 109 or BA 120, or BA 221 or CS 223, or approval.

IT 220

Introduction to Networking (3,0)

3 Credits

Introduction to networking covers each of the seven layers of the OSI reference model, MAC and IP addressing, identification of IP class addressing schemes including subnet masks, network wiring standards, and TCP/IP network layer protocols.

Prerequisite: IT 109 or BA 120 or BA 221 or approval.

IT 310

Web Site Management (3,0)

3 Credits

The course addresses effective Web site design including page layout, user interface design, graphic design, content flow, and site structure. Additionally, students will learn the optimal use of keywords and search engine positioning to maximize page exposure. Web site management including security and Intranet management will be discussed. The use of design standards and templates will teach students to emphasize site consistency. Students will design and create a major Web site with multiple pages and cross-linked structure.

Prerequisite: IT 210.

IT 320

Network Configurations (3,0)

3 Credits

Introduces the four router elements, configuration vehicles, user and privileged mode commands, configuring IP addresses, and monitoring/troubleshooting of router functions. More advanced topics include LAN switching theory, VLANs, LAN switched design, Novell IPX, and threaded case studies.

Prerequisite: IT 220.

IT 330

Programming for the Web (3,0)

3 Credits

This course introduces programming the Common Gateway Interface for Web pages using scripting languages. The emphasis is on the fundamentals of programming and creating interfaces to handle HTML form data. Students will create basic scripting programs with Web interfaces, learn to adapt existing code, and process data flows from online forms with basic database structures.

Prerequisite: CS 118 or CS 223 or IT 210 or programming experience in a high-level language.

IT 340

WAN Theory and Design (3,0)

3 Credits

WAN theory and design covers WAN technology, PPP, frame relay, ISDN. It further discusses network troubleshooting, national SCANS skills, and threaded case studies.

Prerequisite: IT 320.

Languages

LAR 101

Arabic I (3,0)

3 Credits

Elementary oral-aural introduction to Arabic, including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high-school instruction or the equivalent, or native speakers of the language.

LAR 102

Arabic II (3,0)

3 Credits

A continuation of Elementary Arabic I.

Prerequisite: LAR 101 or permission of the instructor.

LCH 101

Mandarin Chinese I (3,0)

3 Credits

Introduction to Mandarin Chinese language, including the pronunciation system (pin yin), basic grammar, traditional character writing and reading, speaking simple sentences, as well as cultural contexts inseparable from the language. Open only to those without prior knowledge of Mandarin Chinese or with consent of instructor.

LCH 102

Mandarin Chinese II (3,0)

3 Credits

A continuation of Mandarin Chinese I.

Prerequisite: Satisfactory completion of Mandarin Chinese I or consent of instructor.

LCH 201

Mandarin Chinese III (3,0)

3 Credits

A continuation of LCH 102 with emphasis on communicative abilities in listening, speaking, reading, and writing.

Prerequisite: Satisfactory completion of Mandarin Chinese II or consent of instructor.

LCH 202

Mandarin Chinese IV (3,0)

3 Credits

A continuation of LCH 201.

Prerequisite: satisfactory completion of Mandarin Chinese III or consent of instructor.

LFR 101

French I (3,0)

3 Credits

Elementary oral-aural introduction to French including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high school instruction or the equivalent, or to native speakers of the language.

LFR 102

French II (3,0)

3 Credits

A continuation of LFR 101.

Prerequisite: LFR 101 or permission of the instructor.

LGE 101

German I (3,0)

3 Credits

Elementary oral-aural introduction to German including such topics as courtesy phrases, basic vocabulary, and patterns for questions and answers. Not open to students with two or more years of high school instruction or the equivalent, or to native speakers of the language.

LGE 102

German II (3,0)

3 Credits

A continuation of LGE 101.

Prerequisite: LGE 101 or permission of the instructor.

LSP 101

Spanish I (3,0)

3 Credits

Basic grammar and reading. Introduction to conversation. Not open to students with two or more years of high school Spanish or the equivalent.

LSP 102

Spanish II (3,0)

3 Credits

A continuation of LSP 101.

Mathematics

MA 005

Beginning Algebra (3,1)

3 Credits

Fundamentals and theory of algebra including exponents, radicals, factoring, linear equations, rational expressions, quadratic equations, polynomial arithmetic, and solutions to applied problems. One hour lab session per week. (Credit not applicable to any degree.) Required of all students who placed in this course.

MA 006

Intermediate Algebra (3,1)

3 Credits

An intermediate-level algebra course. Topics include fundamental concepts of algebra; linear equations and inequalities; polynomials; rational expressions; exponents and radicals; quadratic equations; functions and graphing; systems of linear equations and

Course Descriptions

inequalities. One-hour lab session per week. (Credit not applicable to any degree.)

Prerequisite: MA 005 or placement.

MA 106

Basic Algebra and Trigonometry (3,0)

3 Credits

A study of the basic laws of fractions, exponents, radicals, inequalities, quadratic equations, complex numbers, and the elements of trigonometry.

MA 111

College Mathematics for Aviation I (3,0)

3 Credits

A pre-calculus course designed for the student of aviation. Review of the fundamentals of algebra; linear equations and inequalities; quadratic equations; variation; polynomial, rational, exponential, logarithmic, and trigonometric functions; radian measure; right triangle solutions, vectors, and the laws of sines and cosines.

Prerequisite: MA 006, MA 106, or placement.

MA 112

College Mathematics for Aviation II (3,0)

3 Credits

Basic calculus designed for the student of aviation. Differentiation and integration of algebraic functions; applications to velocity, acceleration, area, curve sketching, and computation of extreme values.

Prerequisite: MA 111.

MA 120

Quantitative Methods I (3,0)

3 Credits

An algebra methods course with applications to business and economics. Operations, relations, functions, modeling, and problem solving; systems of linear equations and inequalities.

Prerequisite: MA 006 or placement.

MA 140

College Algebra (3,0)

3 Credits

Fundamentals of exponents, radicals, linear, quadratic, and absolute value equations, inequalities, and complex numbers. Introduction to functions, curve sketching, elementary theory of equations, sequences and series, matrix algebra, and systems of equations.

Prerequisite: MA 006, MA 106, or placement.

MA 142

Trigonometry (3,0)

3 Credits

Trigonometric functions and their graphs; identities; radian measure with applications; compound, half, and double angle identities; solving elementary trigonometric equations, right and oblique triangles; law of sines and cosines; inverse trigonometric functions; vectors and trigonometric form of a complex number.

Prerequisite: MA 006, MA 106, or placement.

Corequisite: MA 140.

MA 145

College Algebra and Trigonometry (5,0)

5 Credits

Fundamentals of exponents, radicals, linear and quadratic equations, inequalities, elementary theory of equations, sequences and series, functions, exponential, logarithmic, and trigonometric functions, radian measure, trigonometric identities and equations, vectors, laws of sines, cosines, solutions of right triangles, and complex numbers.

Prerequisite: MA 006, MA 106, or placement.

MA 220

Quantitative Methods II (3,0)

3 Credits

An introduction to the methods and concepts of calculus with applications to business and economics; marginal functions, graphing, extreme values, and area problems. A brief introduction to descriptive statistics.

Prerequisite: MA 111 or MA 120.

MA 222

Business Statistics (3,0)

3 Credits

Measures of central tendency and dispersion; histograms; algebra of probability; sample spaces; dependent events; Bayes' Theorem with applications; binomial, Poisson, normal distributions, and their interrelationships; sampling distributions; hypothesis testing; confidence intervals.

Prerequisite: MA 111 or MA 140.

MA 241

Calculus and Analytical Geometry I (4,0)

4 Credits

Graphs and functions; limits and continuity; differentiation and integration of algebraic and elementary

trigonometric functions; applications of first and second derivatives.

Prerequisite: MA 140 or MA 145 or equivalent.

Corequisite: MA 142.

MA 242

Calculus and Analytical Geometry II (4,0)

4 Credits

Differentiation and integration of transcendental functions; special integration techniques; polar coordinates; applications of the definite integral; numerical methods.

Prerequisite: MA 241.

MA 243

Calculus and Analytic Geometry III (4,0)

4 Credits

Solid analytic geometry; vector functions in three dimensions; elements of infinite series; partial differentiation; directional derivative and gradient; multiple integrals.

Prerequisite: MA 242.

MA 244

Combined Calculus (5,0)

5 Credits

Covers all the topics currently in MA 241 and MA 242.

Prerequisite: One year of calculus.

MA 245

Applied Differential Equations (3,0)

3 Credits

Applied treatment of ordinary differential equations; Laplace transforms; matrix algebra and applications; computer techniques; numerical methods; least squares fit; normal distribution and applications.

Prerequisites: CS 210, MA 242. (Not for Bachelor of Science degree in Aerospace Engineering credit.)

MA 320

Decision Mathematics (3,0)

3 Credits

The mathematical concepts and applications in mathematical model building and problem solving. Included are mathematical areas that are basic to decision theory.

Prerequisite: MA 211 or MA 222. (Not open to engineering students.)

MA 345

Differential Equations and Matrix Methods (4,0)

4 Credits

Treatment of ordinary differential equations to include principal types of first and second order equations; methods of substitution on simple higher order equations; linear equations and systems of linear equations with constant coefficients; methods of undetermined coefficients and variation of parameters; Laplace transforms; series solutions; linear algebra and matrix methods of solutions; applications to physics and engineering.

Prerequisite: MA 243.

MA 350

Partial Differential Equations (3,0)

3 Credits

Physical models leading to partial differential equations. Fourier series and Fourier transforms. Solution of linear partial differential equations, including solutions of the wave, heat, and Laplace's equation.

Prerequisite: MA 345.

MA 404

Statistics and Research Methods (3,0)

3 Credits

Elements of probability theory including finite probability spaces, conditional probabilities, independence, correlation, Bayes' Theorem, and Gaussian random variables. Statistical methods including contingency tables, regression, hypothesis testing. Experimental design. Ethical considerations in experimentation. Nonquantitative research methodologies. Numerical methods including the introduction of at least one computer-based statistics package.

MA 412

Probability and Statistics (3,0)

3 Credits

Finite sample spaces; conditional probability and Bayes' Theorem, discrete and continuous random variables and their functions; expected value, variance, and standard deviation; systematic study of the major discrete and continuous distributions; moment generating functions; hypothesis testing and estimation.

Prerequisite: MA 242.

Course Descriptions

MA 432

Linear Algebra (3,0)

3 Credits

Review of vector and matrix operations including matrix inverses, eigenvectors, and eigenvalues. Equations of lines and planes, vector spaces including basis and dimensions, linear transformations, change of basis, diagonalization of matrices, inner products and orthonormal bases, applications.

Prerequisite: MA 245 or MA 345.

MA 438

Numerical Analysis I (3,0)

3 Credits

Floating point arithmetic, error analysis, algorithms in interpolation, integration, differentiation, matrix algebra, approximation and solution of equations, use of numerical software packages.

Prerequisites: EGR 115, MA 245 or MA 345.

MA 441

Advanced Engineering Mathematics I (3,0)

3 Credits

Line and surface integrals; vector fields with the study of Green, Gauss, and Stokes Theorems; applications of vector field theory; Fourier series.

Prerequisite: MA 345.

MA 442

Advanced Engineering Mathematics II (3,0)

3 Credits

The solution of linear differential equations with variable coefficients; study of the derivation, characteristics, and solutions of partial differential equations; Fourier series, Fourier transform, Laplace transform, and Green's function; applications in science and engineering.

Prerequisite: MA 441.

MA 443

Complex Variables (3,0)

3 Credits

Algebra of complex numbers; complex functions, analytic functions; mapping by elementary functions; conformal mappings and their applications; additional topics may include complex integration, power series expansion.

Prerequisite: MA 441.

MA 444

Scientific Visualization (3,0)

3 Credits

Scientific visualization is the representation of data graphically as a means of gaining understanding and insight into the data. This course will introduce different aspects of scientific visualization: computer graphics and related mathematics concepts, application packages for interactive display, and analysis of data.

Prerequisites: CS 315 and CS 344.

MA 453

High Performance Scientific Computing (3,0)

3 Credits

This course is an introduction to parallel computing in computational mathematics and sciences with practical applications. We start with an overview of parallel computing and study the problem of program efficiency on parallel computers. Then we introduce two major programming paradigms: shared memory and message passing. The last third of the course will focus on applications of parallel computing in the sciences (engineering, physics, mathematics, etc.).

Prerequisites: CS 375 and MA 432.

MA 488

Numerical Methods in Fluids (3,0)

3 Credits

This course explores the theory and applications of numerical methods in fluid mechanics. The topics covered will include numerical methods for incompressible flows; primitive variable and vorticity-stream function on formulation; numerical treatment for inviscid and viscous flows, including restricted to incompressible flow. Emphasis will be placed on numerical methods based on finite difference, finite volume, or finite element formulations.

Prerequisite: MA 350 and WX 201.

Corequisite: ES 312.

MA 490

Capstone Project (1,6)

3 Credits

This course is focused on the development of a functioning software product as it applies to a computational problem in the area of aviation and aerospace. Also, material on business practices, professional practices, and ethics is included. Students, working in teams, are involved in management and planning, analysis and specification, design, implementation,

and testing of a software system. Project work is assessed using modern industrial software standards and review techniques. Laboratory work includes team building, project reports, walk-throughs and inspections, design activities, process analysis, and acceptance tests.

Prerequisites: SE 300, MA 444 or MA 453.

MA 299, 399, 499

Special Topics in Mathematics

1-6 Credits

Individual independent or directed studies of selected topics in mathematics.

Prerequisites: Consent of instructor and approval of the department chair.

Mechanical Engineering

ME 200

Machine Shop Laboratory (0,3)

1 Credit

Introduction to machine shop techniques to include familiarization with riveting, sheet metal forming, welding, and machining.

ME 302

Introduction to Robotics (3,0)

3 Credits

This course is an introduction to robotics with emphasis on the mathematical tools for kinematics and dynamics of robot arms. Topics include the geometry and mathematical representation of rigid body motion; forward and inverse kinematics of articulated mechanical arms; trajectory generation, splines, interpolation; manipulator dynamics; position sensing and actuation; and topics in manipulator control. Coursework includes weekly problem sets and computational laboratories (using the Matlab numerical programming environment), a mid-term examination, and a final examination.

Prerequisite: ES 204.

Corequisites: AE 430 or EE 401/402.

ME 303

Vehicle Dynamics (3,0)

3 Credits

This course covers design considerations for high-performance vehicles such as competition automobiles and high-speed mass transit vehicles. Considered are propulsion, aerodynamics, stability, down force enhancement systems, braking, and han-

dling. Engines for various vehicles are compared, such as the conventional internal combustion engine, the rotary or Wankel, for competition applications and long-life requirements such as traction engines for rail applications. Also investigated are crash safety issues for both mass transit and competition. Guided vehicles such as mass transit trains and the Intelligent Transportation System (ITS) are investigated. Future technologies such as magnetically levitated and very high-speed mass transit systems are analyzed.

Prerequisites: ES 202, ES 204, and ES 305, or consent of the instructor.

ME 304

Introduction to Machine Design (3,0)

3 Credits

Detail design of machine components; application of analytical methods in the design of simple machines. Failure mode analysis, theories of failure, yield, fracture, deflection, and fatigue analysis of machine elements. Introduction to computer methods of stress and deflection analysis using finite element analysis.

Prerequisites: ES 202, ES 204.

ME 305

Machine Design Laboratory (0,3)

1 Credit

A companion laboratory to ME 304.

Corequisite: ME 304.

ME 306

Robotic Mechanisms(3,0)

3 Credits

This course studies the application and design of robotic systems. Rover drives, suspension systems, tracked vehicles, gimbal-mounted cameras/sensors and walking robots are covered with an emphasis on space and aerial robotic applications. Several hands-on projects will be conducted and a final design project is required.

Prerequisite: ES 204.

ME 400

Vibration & Acoustics (3,0)

3 Credits

Basic concepts of vibration; free and undamped vibration; energy methods and Rayleigh's method for determination of natural frequencies; viscously damped vibration; various damping mechanisms; torsional vibration; harmonically excited vibration; transient vibration; multi degrees of freedom sys-

Course Descriptions

tems; rotor dynamics; basic principles of acoustics and wave propagation; electroacoustics; transducers, noise measurements; applications to land, airborne, and space vehicle acoustics generated by a structure's vibration or by aerodynamic sources.

Prerequisites: MA 345, ES 202 and ES 204, or approval of the instructor.

ME 401

Advanced Fluid Dynamics (3,0)

3 Credits

Development of application of Navier-Stokes equations, estimation of drag and lift, isentropic flow, normal and oblique shock waves, Fanno and Rayleigh flow, turbomachinery, introduction to computational fluid dynamics, application of CFD software.

Prerequisite: ES 206.

ME 402

Robotic Arms (3,0)

3 Credits

This course is an introduction to robotics with an emphasis on kinematics and dynamics of robotic arms. The Space Shuttle arm and the Mars Rover arms will be analyzed. Topics include forward and inverse kinematics, trajectory generation, interpolation, and position sensing. Students will complete a project where they program a robotic arm and/or robotic welder.

Prerequisite: ES 204.

ME 403

Thermal Power Systems (3,0)

3 Credits

Availability and evaluation of thermodynamic properties. The thermodynamics of compressible flow. Thermodynamic power and refrigeration cycles and systems; psychometrics and environmental control; mixtures of ideal gases; introduction to combustion; internal combustion engines, gas turbines, fuel cells; and direct energy conversion. Design and optimization of power systems and climate control with applications to land vehicles, robotics, aircraft, and spacecraft.

Prerequisites: ES 305, MA 345.

ME 404

Mechatronics (3,0)

3 Credits

This course includes the application of microprocessors to robotic systems with control. This course emphasizes the integration of aerospace, mechani-

cal, electrical, and computer systems in robotics.

Design and integration of microcontrollers, actuators, motors, power systems, and sensors are studied with significant group-oriented design experiments. High-level graphical programming is introduced. Simple autonomous algorithms such as line tracking, edge detection, and path planning are examined with and without feedback control.

Prerequisites: EE 401, ME 306.

ME 405

Vehicle Power Systems (3,0)

3 Credits

Modern analytical approach to the design and performance analysis of advanced internal combustion engines. Study of thermodynamics, fluid flow, combustion, and heat transfer. Engines for various vehicles are compared (such as the conventional internal combustion engine, the rotary or Wankel), for competition applications and long-life requirements such as traction engines for rail applications. Fuels and combustion, exhaust flows, emission and air pollution, fuel cell systems, hybrid vehicles. Ideas from aerospace technologies are implemented, such as jet engines and gas turbines for powering vehicles, and mass transit. Also, future technologies such as magnetically levitated and very high-speed mass transit systems are analyzed. Application of course techniques to engine research projects.

Prerequisite: ES 305.

ME 406

Robotics II (3,0)

3 Credits

This course studies the applications and design of robotic systems. Particular emphasis is placed on aviation and space applications of robotics. Typical robotic motion is investigated as well as the requirements for control systems for the needed accuracy, repeatability, and stability. Sensors such as position, force, and acceleration are explored and the signal conditioning circuits and analog-to-digital conversion required for interfacing these sensors. Activating devices such as electric motors, linear actuators, and other motion devices are analyzed. Systems are modeled and control laws are developed. Software for computer-generated control laws are studied.

Prerequisite: ME 302.

ME 407

Preliminary Design of Robotic Systems with Laboratory (3,3)

4 Credits

Mechanical design principles are developed and applied for robotic applications. The topic is selected and approved by the Mechanical Engineering Department. Principles of conceptual and detailed mechanical design, and component design, manufacture, and production are covered. A complete system is designed, resulting in a complete set of specifications, supporting analysis, drawings, and performance report. For senior undergraduate students only.

Prerequisites: ME 306, ME 400.

ME 409

Vehicle Aerodynamics (3,0)

3 Credits

Aerodynamic forces on land vehicles. Design requirements for lift, drag, stability, and safety for passengers. Cars, high-performance vehicles, commercial, and motorcycles. Noise control, heating, ventilation, and air conditioning. Engines for various vehicles are compared (such as the conventional internal combustion engine, the rotary or Wankel), for competition applications and long-life requirements such as traction engines for rail applications. Fuels and combustion, exhaust flows, emission and air pollution, fuel cell systems, hybrid vehicles. Ideas from aerospace technologies are implemented, such as jet engines for powering vehicles and the use of computational fluid dynamics codes to predict the aerodynamic performance of such vehicles. Also, future technologies such as magnetically levitated and very high-speed mass transit systems are analyzed.

Prerequisites: ES 201, ES 204, ES 206, ES 305.

ME 410

Advanced Machine Design (2,0)

2 Credits

Design and analysis of mechanics system, for fluctuating loading. Fatigue analysis. Application of design fundamentals to mechanical components, and integration of components to form systems. Fatigue failure of systems. Mechanical design of such systems as bearings, transmission gears, springs, joints, brakes, and clutches. Indeterminate systems.

Prerequisites: ES 320, ME 304.

ME 413

Preliminary Design of High Performance Vehicles with Laboratory (3,3)

4 Credits

Mechanical design principles are developed and applied for high performance vehicles. The topic is selected and approved by the Mechanical Engineering Department. Principles of conceptual and detailed mechanical design, and component design, manufacture, and production are covered. A complete system is designed, resulting in a complete set of specifications, supporting analysis, drawings, and performance report. For Senior undergraduate students only.

Prerequisites: ME 303, ME 400.

ME 415

Modeling and Numerical Simulations of Energy and Environmental Systems (3,0)

3 Credits

The course introduces students to the basic methods of numerical modeling for typical physical problems encountered in solid mechanics, thermal/fluid sciences, energy, and environmental systems. Students will learn how to formulate a model in terms of algebraic or differential equation. Problems that can be solved analytically will be chosen initially and solutions will be obtained by appropriate discrete methods. Basic concepts in numerical methods, such as convergence, stability, and accuracy, will be introduced. Various computational tools will then be applied to more complex problems, with emphasis on finite element and finite difference methods, finite volume techniques, boundary element methods, and gridless Lagrangian methods. Methods of modeling convective nonlinearities, such as upwind differencing and the Simpler method, will be introduced. Discussion and structural mechanics, internal/external fluid flows, and conduction and convection heat transfer. Steady state, transient, and eigenvalue problems will be addressed with emphasis on aerospace power and environmental systems.

ME 416

Robotics III (2,0)

2 Credits

This course builds on the theory of mechanisms and kinematics associated with Robotics I and II and expands on those concepts to design and analyze mobile robots as they are being used to explore planets and other inaccessible areas. The focus will be on locomotion, sensors and perception, navigation and state estimation, and environment modeling. Safety

Course Descriptions

and reliability and other aspects of mobile robot design such as energy supply will be studied. Finally the student will incorporate the learned material into the mobile robots available in the space systems laboratory.

Prerequisites: ME 306, AE 430.

ME 417

Advanced Propulsion (3,0)

3 Credits

Jet engines are analyzed in depth using the fundamental principles developed in AE 408 and by extensive computer programs. Parametric engine cycle analysis will investigate both ideal and engines with losses. The performance of a particular (actual) jet engine will be analyzed to determine how its performance is affected by operational conditions (altitude, throttle positions). In addition to the turbojet, turbofan, turboprop, and turboshaft family of jet engines, the scramjet will be analyzed.

Prerequisite: AE 408.

ME 422

Vehicle Safety and Structural Design (3,0)

3 Credits

Emphasis is on body concept for design using first order modeling of thin-walled structural elements. Practical application of solid/structural mechanics is considered to design automotive bodies for global bending, torsion, vibration, crashworthiness, topology, material selection, packaging, and manufacturing constraints. Also investigated are crash and safety issues for both mass transit and the Intelligent Vehicle Highway System (IVHS).

Prerequisites: ES 202, ES 204.

ME 423

Senior Design of High Performance Vehicles (3,0)

3 Credits

This is a continuation of the preliminary design course and is the capstone course for the degree.

ME 424

Automation and Rapid Prototyping (3,0)

3 Credits

Participants will study rapid prototyping and automated fabrication including the generation of suitable CAD models, current rapid prototyping fabrication technologies, and automation. The rapid prototyping processes will be illustrated by the design and fabrication of parts by the students.

Prerequisite: ME 304.

ME 426

Propulsion III (2,0)

2 Credits

Engines to provide the propulsion for general aviation aircraft are analyzed. While the standard Otto Cycle engines using avgas have served general aviation well, the fuel crisis and the environmental issues around the over 14,000 suburban airports in the United States have resulted in numerous proposals for new engines. The course will study the various options: electrical, diesel, rotary, turboprop, turbofan, as well as modifications to the conventional spark-ignition engine.

Prerequisites: ES 305, AE 408.

ME 427

Senior Design of Robotic Systems (3,0)

3 Credits

This is a continuation of the preliminary design course and is the capstone course for the degree.

ME 430L

Control Systems Laboratory (0,3)

1 Credit

A companion laboratory for AE 430.

Military Science Army ROTC

MSL 101

Basic Military Science I (1,0)

1 Credit

A study of the defense establishment and the organization and development of the U.S. Army. A study of the roles the active Army forces, the Army Reserve Forces, and the Army National Guard play in our nation's defense. A study of military courtesy, customs, and traditions of the service. A historical perspective of the role of the different branches of the U.S. Army and the role they have played in the freedom of our nation. An introduction to physical readiness training. Course includes lectures and laboratory. Field training exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations.

Corequisite: MY 103 Laboratory.

MSL 101L

Basic Military Science I Laboratory (0,1.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop

Course Descriptions

leadership abilities through hands-on practical experiences. Training is introductory in scope and includes operations and tactics and land navigation subjects. Practical training exercises familiarize students with the field environment and field survival skills. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 102

Basic Military Science II (1,0)

1 Credit

Continued emphasis on physical readiness training. Course includes lecture and laboratory. Field training exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations.
Corequisite: MY 104 Laboratory.

MSL 102L

Basic Military Science II Laboratory (0,1.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues the leader development process while remaining introductory in scope and develops basic operations and tactics and land navigation skills acquired in MY 103 Laboratory. Practical training exercises continue cadet field orientation with the focus on individual training. Special topics, including stream-crossing techniques, field survival skills, and bivouac techniques, are covered. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 201

Basic Military Leadership I (1,0)

2 Credits

A review of the customs and traditions of the service. The fundamentals of leadership development and the importance of understanding the principles that are important to effective leadership. This includes focus on goal setting, communication, problem solving, decision making, and group process. The course requires mandatory physical training and includes lecture and laboratory.
Corequisite: MY 203 Laboratory.

MSL 201L

Basic Military Leadership I Laboratory (0,1.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop

leadership abilities through hands-on practical experiences. Training continues the development of cadet leadership and critical skills while remaining basic in scope and includes operations and tactics, land navigation, first aid, and general military subjects. Practical training exercises stress development of basic skills with the focus on soldier-team development at the squad/team level. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 202

Basic Military Leadership II (1,0)

2 Credits

The fundamentals of military geography and their application in the use of navigational aids for the military forces. A study of preventive medicine countermeasures and first-aid techniques that every leader must know. The course requires mandatory physical training and includes both lecture and leadership laboratory. Two weekend training exercises normally include M16-A1 rifle firing, rappelling training, and airmobile helicopter operations.
Corequisite: MY 204 Laboratory.

MSL 202L

Basic Military Leadership II Laboratory (0,1.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences, strong focus on ethics, communication skills, time management, and leadership values. Training continues basic skills acquired in MY 203 Laboratory and includes operations and tactics and land navigation. Practical training exercises continue development of basic skills with the focus on soldier-team development at the squad/team level. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 301

Officership I (3,0)

3 Credits

This course examines the foundations of officership, and the character, responsibilities, and status of being a commissioned officer. It is dynamic, challenging, and stressful, for it is the course that emphasizes the warrior ethic. The course covers a wide spectrum of subjects, from training in common military skills to fostering a value system that emphasizes service to the nation, readiness to persevere in the face of obstacles, and willingness to make personal sacrifices in pursuit of the greater good. This course includes

Course Descriptions

lecture, advanced leadership laboratory, physical training, and practical field training exercises.

Prerequisites: Completed basic military science (or given constructive credit) and be a contracted Army ROTC cadet.

Corequisite: MY 303 Laboratory.

MSL 301L

Officership I Laboratory (0,2.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues development of cadet competencies and confidence through intermediate leadership and technical/tactical instruction. Practical training exercises are supplementary in scope and include operations and tactics, land navigation, and weapons training. Special topics including tactical bivouac techniques, individual tactical techniques, tactical foot march techniques, squad tactics, and small unit patrolling are covered. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 302

Officership II (3,0)

3 Credits

A continuing development of the processes that distinguish commissioned military service from other professional endeavors. The main emphasis of this class will be the preparation of cadets for the six-week advanced camp they normally attend at the end of the junior year. Here their capability to conceptualize, innovate, synthesize information, and make sound decisions while under stress will be evaluated. This course includes lecture, advanced leadership laboratory, enhanced physical training, and practical field training exercises.

Prerequisite: MY 303.

Corequisite: MY 304 Laboratory.

MSL 302L

Officership II Laboratory (0,2.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training continues development of intermediate leader and critical skills in preparation for Advanced Camp. Practical training exercises focus on soldier-team development at squad/patrol level. Training is supplementary and includes tactics, land

navigation, and weapons subjects. Special topics include tactical bivouac techniques, small unit patrolling, a mini-STRAC exercise, and drownproofing. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 401

Advanced Military Leadership I (3,0)

3 Credits

A study of military professionalism with emphasis on command and staff relationships, organizational functions, and duties of various staff officers who assist in the leadership of the organization. A study of personnel and logistical systems and the role they play in helping the organization optimize operations and improve life in the Army community. Training in staff briefings will be used as an introduction to military procedures. This course includes lecture, laboratory, and physical readiness training.

Corequisite: MY 403 Laboratory.

MSL 401L

Advanced Military Leadership I Laboratory (0,2.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training culminates the leader development process at the pre-commissioning level. Training is supplementary and includes operations and tactics, land navigation, and radio wire communication subjects. Students perform as subject matter experts and are responsible for conducting and evaluating training. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 402

Advanced Military Leadership II (3,0)

3 Credits

A study of ethics and professionalism in the military and the role they play in carrying out the defense policy of the United States. The fundamentals of military law, its impact on the American military society, and its place in the jurisdictional system. A history of the military courts martial as it relates to the jurisdictional process of American society. A study of the Law of Land Warfare and its relationship to the conduct of soldiers in combat. This course includes lecture, laboratory, and physical readiness training.

Corequisite: MY 404 Laboratory.

MSL 402L

Advanced Military Leadership II
Laboratory (0,2.5)

0 Credit

Leadership laboratory with emphasis on military leadership and small unit tactics. Students develop leadership abilities through hands-on practical experiences. Training culminates development of leader skills emphasizing the transition from cadet to second lieutenant. Expands the frame of reference and gradually shifts it to orient on future assignments as an officer. Training is supplementary and includes operations and tactics, land navigation, and radio wire communication subjects. Students perform as subject matter experts and are responsible for conducting and evaluating training. The Army Physical Fitness Test (APFT) is administered to assess the state of physical development.

MSL 199-499

Special Topics in Military Science (3,0)

1-3 Credits

Individual independent or directed studies of selected topics in general military science.

Prerequisites: Consent of instructor and approval of professor of military science.

Naval Science

NSC 100

Naval Science Lab

0 Credit

Military drill, cruise preparation, customs, traditions, and special areas of knowledge required of commissioned officers in the Navy and Marine Corps. Required for all midshipmen.

NSC 101

Introduction to Naval Science (2,0)

2 Credits

Introduction to the naval service with emphasis on the mission, organization, regulations, and components of the Navy and Marine Corps. Must be completed during the freshman year. Required for all midshipmen.

NSC 102

Seapower and Maritime Affairs (3,0)

3 Credits

This course provides an understanding of the significance of sea power throughout history from the Phoenicians to the post-Cold War era and the War

on Terrorism. Included is discussion of how naval forces constitute a vital component in promoting the national interests, policies, and overall military strategy of the United States. Midshipmen with the exception of Nurse Corps options are required to take this course in the spring of the first year. Nurse Corps option midshipmen may take the course during their second year.

NSC 201

Principles of Naval Leadership and Management (3,0)

3 Credits

Theory and principles of management, focusing on the officer-manager as an organizational decision maker. Includes interpersonal skills, behavior factors, and group dynamics. Required for all midshipmen.

Prerequisite: NSC 100.

NSC 202

Navigation (3,0)

3 Credits

This course provides a comprehensive study of ship navigation theory, principles, and procedures. Included is coverage of the international and inland rules for navigation, celestial and electronic navigation, piloting, dead reckoning, tides, weather, and use of navigational equipment, publications, and charts. Midshipmen with the exception of Nurse Corps and Marine Corps options are required to take this course.

Corequisite: NSC 202L.

NSC 202L

Navigation Laboratory

1 Credit

Laboratory work in piloting and celestial navigation to complement Naval Science 202. One hour per week. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine Corps option midshipmen. (Fall term only.)

NSC 301

Naval Engineering (3,0)

3 Credits

Naval ship systems to include hydrodynamic forces, stability, compartmentalization, electrical, and auxiliary systems. Theory and design of steam, gas turbine, and nuclear propulsion. Shipboard safety and firefighting.

Prerequisites: MA 111 or higher and PS 103. Required for Navy option midshipmen; not required for Nurse Corps and Marine Corps option midshipmen.

Course Descriptions

NSC 302

Naval Weapons Systems (3,0)

3 Credits

An introduction to the theory of weapons systems through the study of the fundamental principles of sensor, tracking, computational, and weapons delivery subsystems. Explosives, fusing, and naval ordnance. Required for all Navy option midshipmen. Not required for Nurse Corps or Marine Corps option midshipmen.

NSC 310

Evolution of Warfare (3,0)

3 Credits

Survey of military history emphasizing principles of warfare, strategy and tactics, and significant military leaders and organizations. May be taken in the sophomore or junior year. Required for all Marine Corps option midshipmen. Not required for Navy option or Nurse Corps midshipmen.

NSC 311

Amphibious Warfare (3,0)

3 Credits

The history of amphibious warfare emphasizing doctrine and techniques. May be taken in the junior or senior year. Required for all Marine Corps midshipmen.

NSC 401

Naval Operations & Seamanship (3,0)

3 Credits

This course provides an understanding of organizational interrelationships between authority, responsibility, and accountability, the concept of naval command and control, and concepts and philosophies of joint operations. Included is the study of ship handling, relative motion, basic forms of naval communications, and U.S. and adversarial weapons systems and platforms. Midshipmen with the exception of Nurse Corps and Marine Corps options are required to take this course. (Spring term only.)

Corequisite: NSC 401L.

NSC 401L

Naval Operations and Seamanship Laboratory

1 Credit

Laboratory work in maneuvering board (vector analysis) and communications, and conflict resolution to complement NSC 401. One hour per week. Required for all Navy option midshipmen. Not required for Nurse Corps and Marine Corps option midshipmen.

NSC 402

Principles of Naval Management II/ Leadership and Ethics (3,0)

3 Credits

Integration of professional competencies and qualities of effective leadership with emphasis on moral and ethical responsibilities, accountability, communications, and military law for the junior officer. Required for all midshipmen.

Physical Science

PS 101

Basic Chemistry (3,1.5)

3 Credits

Elementary chemical theory. Covers basic atomic theory, elements, compounds, and mixtures, calculation of weight and weight volume relationships, and basic descriptive chemistry. One 1.5-hour laboratory session per week. (Cannot be used for credit in chemistry toward a degree in Aerospace Engineering.) Passing grade required for Lab. Students who take PS 108 may not also take PS 101.

Prerequisite: MA 111 or corequisite: MA 140.

PS 102

Explorations in Physics (3,0)

3 Credits

Survey course in elementary physics. Stress will be placed on basic concepts, principles, and history of the development of physics. Presentations will include selected topics in mechanics, heat, light, sound, electricity and magnetism, and modern physics. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace, or Electrical Engineering, or Aeronautical Science.)

Prerequisite: MA 111.

PS 103

Technical Physics I (3,0)

3 Credits

A course in elementary physics. Stress will be placed on basic physics principles. Problem solving and problem-solving logic will be an important, integral part of this course. Topics will include Newton's Laws, projectile motion, circular motion, work, energy, conservation laws, and momentum. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace, or Electrical Engineering.)

Prerequisite: MA 111 or MA 140.

Corequisite: MA 112 or MA 241; PS 103L.

PS 103L

Technical Physics I Laboratory (0,1)

0 Credit

Techniques for data analysis and laboratory methods in the context of experiments dealing with Newton's laws, energy, and rotational motion. This laboratory is designed to complement PS 103.

Corequisite: PS 103.

PS 104

Technical Physics II (3,0)

3 Credits

Application of basic physics principles discussed in PS 103. Other areas will include fluids, properties of matter, thermodynamics, wave motion, sound, simple harmonic motion, kinetic theory, basic electromagnetic theory, and elementary circuits. (Cannot be used for credit in physics toward degrees in Computer Science, Engineering Physics, Civil, Aerospace, or Electrical Engineering.)

Prerequisites: PS 103, MA 112, or MA 241.

Corequisite: PS 104L.

PS 104L

Technical Physics II Laboratory (0,1)

0 Credit

Techniques for data analysis and laboratory methods in the context of experiments dealing with oscillatory motion, sound, heat, fluids, and electricity. This laboratory is designed to complement PS 104.

Corequisite: PS 104.

PS 105

General Chemistry I (3,3)

4 Credits

Fundamental principles of chemistry that include nomenclature, stoichiometry, atomic structure, periodic relationships, chemical bonding, geometry of molecules, properties of gases, solutions, and an introduction to organic chemistry. Laboratory includes both descriptive and quantitative work.

Prerequisites: High school chemistry or PS 101 and MA 140 or MA 111 or MA 120 or their equivalents.

PS 106

General Chemistry II (3,3)

4 Credits

Chemical principles that include thermodynamics, acids and bases, rates of reaction, electrochemistry, organic chemistry, synthetic materials.

Prerequisite: PS 105.

PS 107

Elements of Biological Science (3,0)

3 Credits

An introductory science course in general biology. Emphasis is placed on human anatomy, and on the chemical and biological foundations of human physiology. Provides background material that supports life science applications courses. Required for the minor in Aerospace Life Sciences.

PS 107L

Biological Science Laboratory (0,3)

1 Credit

Students will perform fundamental experiments to supplement discussions of selected topics in PS107 (Elements of Biological Science). Experiments will include use of the compound microscope to examine living and non-living cells and tissues, studies of DNA and chromosomes during mitosis and meiosis, and other types of biologically important compounds, and cell structure and transformation. Students will also measure their own pulse rate, blood pressure, and respiratory capacity.

Corequisite: PS107.

PS 108

Contemporary Chemistry (3,1)

3 Credits

Elementary chemical theory. The origins and development of chemistry with an overview of the present applications of chemistry and its future potential in human affairs. Applications to scientific decision-making in the business and industrial environment. One one-hour laboratory session per week. Students who take PS 108 may not also take PS 101.

PS 111

Plant Biology (3,3)

4 Credits

This course will study the principles and processes associated with the biology of plants, including a survey of fungi, green protista, and plants. Major emphasis on vascular plants, evolutionary origins, and ecological adaptations. One three-hour laboratory session per week.

Course Descriptions

PS 112

Animal Biology (3,3)

4 Credits

This course will study the principles and processes found in the animal kingdom, including a survey of the major animal groups. Major emphasis is on structure, diversity, phylogeny, and ecological adaptations. One three-hour laboratory session per week.

PS 140

Chemistry for Engineers (4,0)

4 Credits

Chemical stoichiometry, states of matter, solutions, thermodynamics, rate of reaction, equilibrium, oxidation-reduction, corrosion, organic compounds, and polymers.

Prerequisite: High school chemistry or PS 101.

Corequisite: PS 141.

PS 141

Chemistry for Engineers Laboratory (0,3)

1 Credit

One three-hour laboratory session per week, with experiments paralleling the material of PS 140.

Corequisite: PS 140.

PS 142

Introduction to Environmental Science (3,0)

3 Credits

An introductory course that stresses the interrelations of all aspects of the living and the nonliving world. Introduces the student to key concepts and principles that govern how nature works and the application of these concepts and principles to possible solutions to environmental and resource problems.

PS 150

Physics for Engineers I (3,0)

3 Credits

Vectors and scalar quantities, geometrical optics, kinematics, Newton's Laws of Motion, work, work-energy, conservation of energy, conservation of momentum, center of mass and its motion.

Corequisite: MA 241.

PS 160

Physics for Engineers II (3,0)

3 Credits

Special theory of relativity, rotational motion, simple harmonic motion, waves, fluids, heat, kinetic theory, thermodynamics.

Prerequisite: PS 150.

Corequisite: MA 242.

PS 208

Physics II (3,0)

3 Credits

Fluids, temperature, heat, first and second laws of thermodynamics, wave motion, acoustics.

Prerequisites: MA 242, PS 215, PS 216.

Corequisite: MA 243.

PS 210

Physics II Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments chosen primarily from wave motion, transverse and longitudinal waves, superposition of waves, traveling waves, and standing waves.

PS 215

Physics I (3,0)

3 Credits

Estimations, order of magnitude analysis, Newton's Law, gravitation, kinematics, work and energy, momentum, rotation, harmonic motion.

Prerequisite: MA 241.

Corequisites: MA 242, PS 216.

PS 216

Physics I Laboratory (0,3)

1 Credit

One three-hour laboratory session per week, with experiments chosen primarily from mechanics.

Corequisite: PS 215.

PS 219

Physics III (3,0)

3 Credits

Static electricity, Gauss's Law, potential, Ohm's Law, direct current circuits, magnetic fields, induced electromotive force, inductance, EM waves, the nature of light, images formed by mirrors and lenses and optical instruments.

Prerequisites: MA 243, PS 208.

Corequisite: PS 220.

PS 220

Physics III Laboratory (0,3)

1 Credit

One three-hour laboratory session per week with experiments chosen primarily from thermodynamics, electricity and magnetism, and geometric optics.

Prerequisites: MA 243 and PS 208.

Course Descriptions

Corequisite: PS 219.

PS 240

Natural History of the Region (3,3)

4 Credits

This course focuses on the geology, paleohistory, flora, fauna, and ecosystems of the region. The course covers such topics as the relationship between slope, elevation, topography, and plant communities.

PS 250

Physics III for Engineers (3,0)

3 Credits

Gravitational fields, electric fields and magnetic fields, Gauss's law, electric potential, linear accelerators, cyclotrons, capacitors, Ohm's law, Kirchoff's laws, Ampere's law, Faraday's law, Lenz's law, Maxwell equations, selected topics from modern physics.

Prerequisites: MA 242, PS 160.

PS 253

Physics Laboratory for Engineers (0,3)

1 Credit

One three-hour session per week. Experiments will vary from semester to semester, but will be chosen from laboratory report writing workshop, error analysis, damped harmonic oscillations, spectrometers, optics, fiber optics, atomic physics, thermodynamics, and R-C circuit theory.

Corequisite: PS 250.

PS 290

Physics Laboratory Practicum (0,1)

0 Credit

Required, noncredit course. Requires the student to direct the operation of a basic laboratory for one semester. Includes laboratory preparation, laboratory discussion, and grading of laboratory reports.

Prerequisite: COM 219.

PS 301

Astronomy (3,0)

3 Credits

A descriptive course dealing with the structure and evolution of the physical universe. Topics include the solar system (Earth, Moon, Sun, and planets), stars, black holes, galaxies, quasars, cosmology, and exobiology. Planetarium trips and night observing sessions optional.

Prerequisite: PS 102 or PS 103 or PS 150 or PS 215.

PS 302

Evolution of Scientific Thought (3,0)

3 Credits

Traces the development of science from the earliest times through the modern period, with particular emphasis given to our changing concepts of nature and of science itself. (Also offered as SS 302. Students receive either Social Sciences elective credit or Physical Sciences elective credit, but not both.)

Prerequisites: Either HU 140 or HU 141 or HU 142 and either PS 101 or PS 102 or PS 103 or PS 150 or PS 215.

PS 303

Modern Physics (3,0)

3 Credits

Modern concepts in physics including optics. Topics include refraction, diffraction, and scattering of electromagnetic radiation, special relativity, wave-particle duality, the uncertainty principle, quantum theory of atomic structure, X-rays, lasers, and nuclear reactions.

Prerequisites: PS 219 and PS 220.

PS 304

Environmental Science (3,0)

3 Credits

A survey course in the environmental problems arising from human use and abuse of the environment. Ecological, economic, sociologic, and technologic principles will be applied to the management control of pollution of the atmosphere and water sources of the Earth.

Prerequisites: PS 101 or PS 140 and PS 141.

PS 305

Modern Physics Laboratory (0,3)

1 Credit

Experiments in atomic and nuclear physics, including spectroscopy, nuclear particle analysis, X-ray analysis, and laser applications.

Corequisite: PS 303.

PS 306

Consumer and Hazardous Waste (3,0)

3 Credits

Introduction to sources, characteristics, and concerns of hazardous materials in environmental systems. Examination of general approaches toward site assessment, risk analysis, site remediation, and other issues pertinent to hazardous waste management. Development of environmental literacy is emphasized.

Prerequisite: One year of high school chemistry or concurrent enrollment in PS 105 or PS 106.

Course Descriptions

PS 308

Atmospheric Environmental Studies (3,0)

3 Credits

Overview of atmospheric environmental topics on local and regional issues as well as global change issues. Introduction to the chemistry of atmospheric pollution. Examination of sources of air pollution especially from aerospace industries. Includes discussion of monitoring, regulation, and control of air pollution.

Prerequisites: PS 108 or equivalent, PS 142, or permission of instructor.

PS 309

Principles of Ecology (2,3)

3 Credits

This course is designed to provide practical experience in the scientific measurement of environmental parameters. Experience in collecting and identifying plants and animals in different ecosystems will be developed by field and laboratory work.

Prerequisites: PS 107, PS 108, or equivalent (PS 101 or PS 140), and PS 142, or permission of instructor.

PS 310

Air Quality and Sound Pollution (3,0)

3 Credits

The examination of the fundamental principles that govern air quality, its pollution, and its management. Also the fundamental principles associated with sound pollution and its management.

Prerequisites: PS 105, PS 106, PS 142, and WX 201.

PS 311

Water Quality (3,0)

3 Credits

The hydrologic cycle, with emphasis on atmospheric, land surface, shallow subsurface, and groundwater processes. Examination of physical, chemical, and biological properties of these aquatic systems and the effects of common pollutants. Development of environmental literacy is emphasized.

Prerequisites: PS 105, PS 106, and PS 142.

PS 312

Plant Identification (2,3)

3 Credits

This course is designed to provide practical experience in identification of local flowering plants through the use of regional floras and recognition of common plant families. Elements of plant collec-

tion, identification, and herbarium techniques will be taught through classroom lectures and field and lab work. Students will be required to prepare their own plant collection.

Prerequisite: PS 111.

PS 313

Riparian Ecology (2,3)

3 Credits

The analysis of the structure, function, and classification of riparian habitats with special emphasis on Southwestern waterways. Evaluation of limnological, floral, and geomorphic resources that create specific riparian habitats will be covered.

PS 314

Environmental Chemistry (3,3)

4 Credits

This course is an introduction to the chemistry of natural systems, including cycling of elements, complex equilibria, oxidation and reduction, atmospheric chemistry, nuclear processes, energy use, and toxic substances. Laboratory work includes wet and instrumental analyses related to environmental analytical chemistry.

Prerequisite: PS 106.

PS 320

Classical Mechanics (3,0)

3 Credits

Fundamentals of mechanics, oscillatory motion, systems of particles, varying mass, motion under central forces, motion in three dimensions, gyroscopic motion, generalized coordinates, normal coordinates, Lagrangian and Hamiltonian formulations. Students will write some simple computer programs.

Prerequisites: MA 345, PS 219.

Corequisite: PS 303.

PS 400

Senior Physics Laboratory I (2,3)

3 Credits

Study of geometrical and physical optics including plane waves, mirrors, lenses, emission and absorption line spectroscopy, diffraction gratings, lasers and interferometers.

Prerequisite: PS 305.

PS 401

Astrophysics (3,0)

3 Credits

Study of the basic physical processes operating in the astronomical environment, stellar structure and evolution, the interstellar medium, galaxies, and cosmology. Astrophysical concepts are emphasized, thus underlining the common features operating in many astronomical systems.

Prerequisites: MA 345, PS 303.

PS 402

Environmental Quality Laboratory (0,3)

1 Credit

A laboratory course using field techniques and equipment commonly found in an environmental workplace. Projects and demonstrations will use local flight-line and airport municipalities as examples.

Prerequisites: PS 306 and PS 310.

PS 403

Wildlife and Airports (3,0)

3 Credits

An examination of the problems and solutions associated with wildlife and their impact on airport safety. Special emphasis on problems correlated with birds.

Prerequisite: PS 309.

PS 405

Atomic/Nuclear Physics (3,0)

3 Credits

Multi-electron atoms, X-rays and gamma rays, radiative transitions in the atom and the nucleus. Basic properties of nuclei, systematics of nuclear stability, dynamics of nuclear reactions, nuclear models, and nuclear forces. Introduction to particle physics and its applications to cosmic rays, stellar energy, and the formation of the elements.

Prerequisite: EP 440.

PS 408

Astrophysics II (3,0)

3 Credits

Radiative transfer in astrophysical environments; stellar atmospheres, stellar interiors, and gaseous nebulae. Emission and absorption processes. Interaction of radiation with matter.

Prerequisites: MA 345, PS 401 or permission of the instructor.

PS 410

Senior Physics Laboratory IIa (2,3)

3 Credits

Binary stars, spectroscopic binaries, proper motion, galaxy rotation curves, image processing.

Prerequisites: PS 400, PS 401.

PS 412

Particle Physics and Cosmology (3,0)

3 Credits

Study of the evolution of the universe including large-scale structure, Big Bang cosmology, general relativity, and the search for dark matter.

Prerequisites: MA 441, PS 405.

PS 414

Senior Physics Laboratory IIb (2,3)

3 Credits

Measurements of nuclear and particle systems using high-precision detectors and high-speed data acquisition.

Prerequisites: PS 303, PS 305, PS 400.

PS 199, 299, 399, 499

Special Topics in Physical Science

1-4 Credits

Individual independent or directed study of topics in the fields of the physical sciences impinging on aerospace development or practices that are of current or anticipated interest.

Prerequisites: Consent of instructor and approval of the department chair.

Psychology

PSY 101

Introduction to Psychology (3,0)

3 Credits

A survey of the biopsychosocial continuum and the intrapsychic, interpersonal, and organizational factors affecting human behavior. A primary feature of the course is its focus on the scientific method as the route to psychological knowledge. Students study the rationalist, empiricist, and experimental foundations of the scientific method and how these foundations can be critiqued. Topics include sensation, perception, learning, memory, personality, psychopathology, physiological psychology, and social processes. Emphasis is placed on the application of the basic

Course Descriptions

principles of psychology to engineering, aviation, public policy, and business.

PSY 310

Sensation and Perception (2,1)

3 Credits

How organisms sense and perceive the environment. Topics discussed include types of stimuli affecting the sensory receptors, the anatomy and physiology of the sensory systems responding to those stimuli, and current knowledge and theories about perceptual abilities. Laboratory/research experience is included. The laboratory will include experimental investigations and demonstrations of sensory and perceptual phenomena. Vision, audition, taste, smell, the skin senses, and balance will be included.

Prerequisite: PSY 101.

PSY 312

Research Analysis in Psychology (3,2)

4 Credits

This course is an elementary program in data analysis and statistics. The focus is on basic statistical concepts for the social sciences. Although computer data analysis is a component of the course, it is secondary to statistical theory and computational procedures. The body of the course covers parametric procedures including t-tests, analysis of variance, correlational techniques, descriptive statistics, and frequency distributions. Some attention is devoted to nonparametric analysis. The emphasis is on decisions to choose the appropriate statistical technique and computational work. Statistical computations using computer software will be covered. Data setup and analysis, as well as graph generation and statistical output interpretation, will be focused on.

Prerequisites: MA 111 or MA 140, PSY 101.

PSY 315

Cognitive Psychology (3,0)

3 Credits

Contemporary theories of human information processing. Major topics include attention, mental representations, categorization, short-term and long-term memory, psycholinguistics, reasoning, problem-solving, judgment, and decision making.

Prerequisite: PSY 101.

PSY 320

Aviation Psychology (3,0)

3 Credits

A study of the complexities of human factors research in aviation. Drawing extensively on such

diverse areas as human physiology, basic learning theory, aviation safety, and pilot training. The course surveys the study of human behavior as it relates to the aviator's adaptation to the flight environment.

Prerequisite: PSY 101.

PSY 322

Research Design (3,1)

4 Credits

This is a research design course that incorporates research design practices with direct experience in the laboratory that includes data collection and analysis and the description of research findings. The course includes coverage of various research models including surveys, scaling techniques, field studies, case studies, and experimentation. Techniques commonly used by Human Factors professionals are presented with considerable attention devoted to designing experiments. Concepts in controlling, manipulating, and measuring dependent and independent variables and the elimination of experimental confounds are applied to the experimental context. Topics such as sampling techniques, construct and content validity, reliability, error variance, sampling error, and ethical concerns are discussed. The course culminates in the design, conduct, analysis, and reporting of an experiment.

Prerequisite: PSY 30X.

PSY 335

Physiological Psychology (2,1)

3 Credits

A study of the neural and biochemical bases of behavior with special emphasis on sensory processing, motivation, emotion, learning, and memory. Both experimental analysis and clinical implications are considered. Activities are conducted on the anatomy and physiology of the nervous system, and on the development, evolution, and function of behavior.

Prerequisite: PSY 101.

PSY 340

Industrial-Organizational Psychology (3,0)

3 Credits

A survey of major topics in industrial-organizational psychology, with emphasis on organizational and personnel psychology applied to business, industry, and government. An examination and critical review of theories and research in selected areas of organizational behavior. Emphasis is on intrapersonal behavior, such as motivation, job stress, and job satisfaction.

Prerequisite: PSY 101.

PSY 345

Training and Development (3,0)

3 Credits

A review of the principles and techniques applicable to training and training development.

Prerequisite: PSY 101.

PSY 350

Social Psychology (3,0)

3 Credits

This course examines the interactional forces between groups and the individual in society. Since the major focus of the course is on social interactions, such diverse topics as group dynamics, interpersonal relationships, prejudice, discrimination, and antisocial behavior will be considered. Special attention is given to the topic of stress in the aviation environment.

Prerequisite: PSY 101.

PSY 400

Introduction to Cognitive Science (3,0)

3 Credits

An introduction to the science of the mind from the perspective of cognitive psychology, linguistics, neuroscience, philosophy, and artificial intelligence. The focus is on the similarities and differences in the approach taken by researchers in these different fields in their study of cognitive mechanisms. Issues to be addressed: What does it mean to be able to think? What kind of computational architecture is most appropriate to describe cognitive mechanisms? Is the mind an emergent property of the brain? What kind of hardware is required for thinking to occur? Can a computer have a mind?

Prerequisite: PSY 315.

Regional Studies

RS 200

Modern Asia (3,0)

3 Credits

A survey course of the major political, economic, cultural, and historical changes in Asia since the 19th century. A regional and/or thematic focus may be created depending on the instructor's expertise. For example, an instructor may focus on East Asia rather than South Asia, on history rather than economy.

Prerequisites: HU 14X and sophomore standing or consent of instructor.

RS 300

Observing Asian Cultures (3,0)

3 Credits

An interdisciplinary course that takes an anthropological, philosophical, and geographical approach to traveling in Asia. Topics include geographical changes in Asia, philosophical issues of travel, and the theory and methodology of studying other cultures and societies. The course culminates in an optional yet strongly recommended field trip to an Asian country.

Prerequisite: Sophomore standing or consent of the instructor.

RS 305

Asian Literature (3,0)

3 Credits

Asian literature in translation. Representative readings are chosen from ancient times to the present, from poetry to prose, from female writers to male writers, from South Asia to East Asia. Synthesis of major literary themes and development, as well as the cultural contexts for literature, is an important part of the course. The course uses both books and films as study material. A regional and/or thematic focus may be created depending on the instructor's expertise. For example, an instructor may focus on East Asia rather than South Asia, on prose rather than drama.

Prerequisite: Sophomore standing or consent of the instructor.

Software Engineering

SE 300

Software Engineering Practices (3,3)

4/3 Credits

This variable credit course introduces students to the fundamental principles and methodologies of large-scale software development. Students learn about the theory and practice of software engineering and work as part of a team on a full life-cycle software project that includes planning, software specification, software design, coding, inspections, and testing. A closed laboratory is required, and includes activities that guide project teams through a software development process and support team project activities such as team building, planning, requirements analysis and specification, design, testing, and the use of tools.

Prerequisite: CS 225.

Course Descriptions

SE 310

Analysis and Design of Software Systems (3,0)

3 Credits

This course focuses on the fundamental methods employed in the analysis and design of software systems. Analysis is the process of determining a complete and consistent set of system requirements. Design is the process of producing a system architecture, both logical and physical, and determining an appropriate way to construct the software. The result of these processes is a documented model of the desired system. The student will learn and practice methods appropriate for both object-oriented and procedural systems.

Prerequisites: CS 315, SE 300.

SE 320

Software Construction (3,0)

3 Credits

This course provides the student with advanced instruction in programming with an object-oriented programming language. The course objective is proficiency in use of a language widely used for general purpose software development. In addition, the student will be introduced to tools and processes appropriate for employing this language in a significant software development environment. Students attending this course must already be proficient in the use of one major programming language and have knowledge of basic software engineering practices.

Prerequisites: CS 315, SE 300.

SE 410

Formal Software Modeling (3,0)

3 Credits

This course focuses on the study of formal concepts and techniques used to model and analyze software artifacts (requirements, design, and code). The course includes a survey of mathematical modeling techniques used in software engineering. Course activities include reading, discussion, and exercises concerned with the use of formal mathematical models in software engineering (for example, work on a formal specification project, study of concepts and technology of formal model checking, use of a formal modeling tool, and presentations on articles about recent work in application and research in formal methods).

Prerequisites: CS 222, SE 300.

SE 420

Software Quality Assurance (3,0)

3 Credits

This course exposes the student to the key concepts and practices in software testing and quality assurance. The objective of this course is to introduce students to the concepts of Software Quality through testing, inspection, and walkthrough. The process of software testing and different testing techniques and methodologies will be covered. This course also covers topics related to the management of a testing project. Finally, different software-testing tools and their advantages and disadvantages will be discussed.

Prerequisite: SE 300.

SE 450

Software Team Project I (2,3)

3 Credits

This is the first course in the sequence of a two-course senior project (SE 450 and SE 451). The senior project sequence of courses is the continuation of SE 300. They provide for additional student activities with the management, analysis, design, implementation, and testing of a software system. Students work in teams and use a defined software process to develop or modify a software product. Project work is assessed using industrial software standards and review techniques. The senior project sequence is considered the capstone course for undergraduate students in software engineering. The first course in this sequence (SE 450) emphasizes the early stages of the software development life cycle (requirements, analysis, and design). The artifacts developed during this course will be used as the foundation for further development during the second course in the sequence (SE 451).

Prerequisites: Senior standing, SE 310, SE 320.

SE 451

Software Team Project II (1,6)

3 Credits

This is the second course in the senior project sequence (SE 450 and SE 451). This is the continuation of SE 450. This course provides for additional student activities with the management, analysis, design, implementation, and testing of a software system. Students work in teams and use a defined software process to develop or modify a software product. Project work is assessed using industrial software standards and review techniques. The senior project sequence is considered the capstone course for undergraduate students in software engi-

neering. The second course in this sequence (SE 451) emphasizes the later stages of the software development life cycle (design, implementation, testing, and maintenance). The artifacts developed during the first course (SE 450) will be used as the foundation for further development during this course (SE 451).

Prerequisites: SE 410 and SE 450.

Corequisite: SE 420.

SE 299, 399, 499

Special Topics in Software Engineering

1-6 Credits

Individual independent or directed studies of selected topics in software engineering.

Prerequisite: Consent of the instructor and the department chair.

Safety Science

SF 201

Introduction to Health, Occupational, and Transportation Safety (3,0)

3 Credits

This course introduces the student to the field of safety and covers basic health, safety, and regulatory issues that apply to aviation and non-aviation business in the United States. Included is a comprehensive health and safety overview of legislative development and enactment of appropriate statutes, regulations, and laws. This course also provides an introduction to hazard recognition, reporting, analysis, and control used in risk management and accident prevention. Additional topics include accident investigation, safety data statistics, ergonomics, security and emergency preparedness, safety culture, aircraft systems, air traffic control, and workers' compensation. This course reviews theories, applications, and practices of the field of safety.

SF 205

Principles of Accident Investigation (3,0)

3 Credits

This course is an introduction to the process required for the investigation of accidents. Topics will include different methods of accident investigation, such as root cause analysis and Management Oversight Risk Tree (MORT), among others. Further topics will include filing appropriate accident reports and applications of corrective actions.

SF 210

Introduction to Aerospace Safety (3,0)

3 Credits

This course provides an introduction and overview of the theories, concepts, applications, and practices of the field of aerospace safety. This course is designed for the beginning aviation safety student and covers topics such as human factors, mechanical factors, accident investigation, safety programs, and safety statistics.

SF 311

Industrial Security (3,0)

3 Credits

This course reviews the fundamentals of security and emergency planning and management. The nature, scope, and essential elements of security in the workplace are discussed with emphasis on personal protection and to a limited extent property protection. The workplace includes selected aviation and industrial settings. Students develop and/or evaluate security programs for selected industries.

Note: Also offered as HS 302, *Fundamentals of Occupational Security.*

SF 315

Environmental Compliance and Safety

3 Credits

This course examines matters associated with health and safety relating to the environment including air and water quality and sanitation. The course concentrates on hazardous materials, their storage, handling, and transportation by air, rail, marine, and highway. Additional study includes waste management and cleanup as well as a detailed study of environmental laws, regulations, and the protection of workers involved in activities associated with hazardous materials.

SF 316

Workers' Compensation, Insurance, and Risk Management (3,0)

3 Credits

Loss control activities related to workers' compensation and injury prevention practiced by major insurance companies are studied. Concepts of measuring, evaluating, and ensuring safety and health hazard risks are addressed. Basics of workers' compensation are covered together with evaluating, quantifying, and managing risk due to safety and health hazards.

Course Descriptions

SF 320

Human Factors in Aviation Safety (3,0)

3 Credits

An examination of the major human causative agent in aircraft accidents: the human being. Emphasis is placed on the psychology and physiologic factors that enhance accident probability. Included is a detailed analysis of ergonomics (human engineering) and its influence.

SF 330

Aircraft Accident Investigation (3,0)

3 Credits

A detailed evaluation of the methods and procedures involved in aircraft accident investigation. The organization, duties, and procedures of the Aircraft Accident Board are analyzed. The student explores procedures for determining accident causes through analysis for such elements as the function and techniques employed by the trained accident investigator and the role of the specialized laboratory. Analyses are also made of reporting procedures and the all-important followup work designed to avoid similar or related aircraft accidents.

Prerequisite: SF 201 or SF 210 or approval.

SF 325

Human Factors and Ergonomics I (3,0)

3 Credits

This course is an introduction to cognitive and physical ergonomics. Topics will include musculoskeletal anatomy and physiology, anatomy and physiology of the perceptual system, and basic introduction to perception, experimental psychology, and cognitive psychology. Applications will include design of both the physical and cognitive interfaces with the work environment.

SF 326

System Safety (3,0)

3 Credits

This course will emphasize the specialized integration of safety skills and resources into all phases of a system's life cycle. Topics will include qualitative and quantitative tools and techniques for system analysis and design applied to accident analysis, prevention, and mitigation.

Prerequisites: SF 210, MA 222.

SF 335

Mechanical and Structural Factors in Aviation Safety (3,0)

3 Credits

This course examines the influence that design, manufacturing, metallurgy, and maintenance have on aircraft accidents. A detailed analysis of the failure process will be conducted. Additional topics include stress and design loading, fatigue, corrosion, and the envelope of operation.

Prerequisite: SF 330.

SF 345

Safety Program Management (3,0)

3 Credits

A study of the principles of the development and management of an effective safety program. The philosophy and historical development of major concepts are examined with particular emphasis on areas of special concern in organizational accident prevention. Students analyze the influence of morale, education, and training, the role of the supervisor, and other substantial program elements of value to the safety manager.

Prerequisite: SF 201 or SF 210 or approval.

SF 341

Safety and Security of Airport Ground Operations

3 credits

This innovative course discusses general aviation airport ground operations, particularly from the pilot and ramp worker perspectives. Focus will be on increasing awareness of airport operations and improving airport safety by creating an enhanced awareness of rules, policies, procedures, and potential hazards that affect the safety and security of aircraft, crew, passengers, and others within the airport ground operations environment. Specific topics include aircraft marshaling procedures, airfield security issues, ground vehicle operations, and accident/incident response and reporting.

SF 350

Aircraft Crash and Emergency Management (3,0)

3 Credits

Theories, practices, and techniques used in the response phase of aircraft crashes and emergencies are explored. Designed as a real-world introduction to the field of emergency response at the Code of Federal Regulation (CFR) agency level, the airport response and administration levels, and related and associated entities involved in aircraft mishaps.

Course Descriptions

SF 355

Industrial Hygiene and Toxicology (3,0)

3 Credits

This course examines principles associated with industrial hygiene. Topics include recognition, evaluation, and control of hazards related to noise, vibration, ionizing and non-ionizing radiation, thermal conditions, chemicals, airborne contaminants, cumulative trauma, and biological substances. These subjects will be discussed in relation to all regulatory requirements using engineering and non-engineering controls for reducing or eliminating health hazards in the workplace.

Prerequisite: SF 201 or approval.

SF 365

Fire Protection (3,0)

3 Credits

This course introduces the basics of fire and fire protection. Students will study the physics, chemistry, characteristics, and behavior of fire, fire hazards of material, fire suppression systems, extinguishing agents, and detection and alarm systems. Primary emphasis will be on transportation-related fire hazards and the regulatory requirements associated with air, rail, marine, and highway modes of transportation.

SF 375

Propulsion Plant Investigation (3,0)

3 Credits

A technical course in aircraft reciprocating and turbine engine fundamentals and relevant accident investigative procedures. Areas of study include basic construction and design with emphasis on major sections, components, and their mechanical relationships. Power plant systems and system mishap investigation is also covered and includes fuel, lubrication, ignition, and start systems. A study of propeller basics and investigative techniques is also included. On-site field investigation as well as engine teardown/disassembly procedures are presented.

Prerequisite: SF 330.

SF 380

Internship I (3,0)

3 Credits

This internship is designed to give students hands-on experience in the field of safety, health, and the environment. Students apply concepts and theories learned in the program to real-world industrial settings. Students develop inspection and audit-

ing procedures, conduct on-site measurements and evaluations of hazards, and formulate comprehensive reports detailing findings and recommendations.

Prerequisites: SF 201, SF 315, SF 355, SF 410, or approval.

SF 395B

Safety and Security of Airport Ground Operations (3,0)

3 Credits

This innovative course discusses general aviation airport ground operations, particularly from the pilot and ramp worker perspectives. Focus will be on increasing awareness of airport operations and improving airport safety by creating enhanced awareness of rules, policies, procedures, and potential hazards that affect the safety and security of aircraft, crew, passengers, and others within the airport ground operations environment. Specific topics include aircraft marshaling procedures, airfield security issues, ground vehicle operations, and accident/incident response and reporting.

SF 405

Applications in Industrial Hygiene (3,0)

3 Credits

This course advances and expands on the concepts discussed in SF 355 and emphasizes the measurement and evaluation of workplace health hazards. Design and regulatory compliance of environments in office settings and manufacturing environments are addressed. Students develop and/or evaluate industrial hygiene programs for selected industries.

Prerequisite: SF 355 or approval.

SF 410

Design of Engineering Hazard Controls (3,0)

3 Credits

This course addresses the application of scientific and engineering principles and methods to achieve optimum safety and health through the analysis and design of processes, equipment, products, facilities, operations, and environments. Subjects will include product design, plant layout, construction maintenance, pressure vessels, and transportation vehicles and systems. These subjects will be discussed in relation to all regulatory requirements.

Prerequisite: SF 201 or approval.

Course Descriptions

SF 420

Analysis of Observational Data (3,0)

3 Credits

Methods for the analysis of observational data are primarily drawn for the discipline of epidemiology. This will include a set of heuristics and quantitative methods used to analyze the distributions of events (diseases, crashes, fatalities, etc.) in populations to infer the causes of those events. This course is a survey of these quantitative methods with an emphasis on occupational applications. Topics will include rates, standardized mortality ratios, methods of assessing agreement, case-control studies, cohort studies, recognizing and assessing causes of error, and advanced techniques in observational data analysis.

Prerequisite: MA 222.

SF 425

Human Factors and Ergonomics II (3,0)

3 Credits

This course is an extension of Human Factors and Ergonomics I and will provide greater depth in such topics as biomechanics, work physiology, ergonomics field methods, psychophysical methods, signal detection theory, information theory, and human error/reliability.

Prerequisite: SF 325.

SF 435

Aircraft Crash Survival Analysis and Design (3,0)

3 Credits

An in-depth analysis of the accident environment with particular emphasis on the protection of the occupants. The injury mechanisms and causes will be analyzed, as will the physics and kinematics of the impact sequence. The intent of the course is to familiarize the student with what can be done to minimize the effects of an accident.

Prerequisite: SF 335 or approval.

SF 440

Design of Engineering Hazard Controls II (3,0)

3 Credits

This course covers all relevant standards and regulations related to construction together with the development and implementation of construction safety programs. OSHA Standards 29 CFR 1926 and work methods design will serve as a basis for this course.

Prerequisite: SF 201 or approval.

SF 445

System Safety in Aviation (3,0)

3 Credits

This course entails specialized integration of skills and resources in all phases of the life cycle of a given system in furtherance of accident prevention. Its heritage is systems engineering and management theory but it is amplified to include modern safety practices derived from numerous disciplines. Accordingly, this course reviews the development and implementation of system safety technology in aviation, both civil and military. Students will acquire an understanding of how accident prevention is designed into an aircraft under development, evaluated and enhanced during flight test, and ensured or otherwise controlled during operational use. This learning is juxtaposed with other elements of the total aviation system.

SF 450

Internship II (3,0)

3 Credits

This internship is designed to give students hands-on experience in the field of safety, health, and the environment. Students apply concepts and theories learned in the program to real-world industrial settings. Students develop inspection and auditing procedures, conduct on-site measurements and evaluations of hazards, and formulate comprehensive reports detailing findings and recommendations.

Prerequisite: SF 380.

SF 462

Health, Safety, and Aviation Law (3,0)

3 Credits

This course introduces the student to the legal issues and concerns confronting the health and safety industry. Included is an overview of the historical legal precedence established for the aviation industry, as well as a comprehensive examination of laws, regulations, and legislation that govern the actions and authority of the health and safety professional. This course also provides an introduction to the governing bodies and associations that are tasked with setting the legal standards by which the industry must operate, including the scope and level of their authority.

SF 475

Senior Project (3,0)

3 Credits

This course requires senior-level students to conduct research in a safety-related topic of his or her choosing under the direction of a faculty member.

SF 299, 399, 499

Special Topics in Aviation Safety

1-3 Credits

Individual independent or directed studies of selected topics in aviation or non-aviation safety topics.

Prerequisites: Approval of program chair, and department chair, and consent of instructor, and 12 hours of SF courses.

Simulation

SIM 200

Aviation Simulation Systems (3,0)

3 Credits

This course emphasizes the importance of building a simulation system that delivers a flight experience that is realistic to the pilot. The student will develop a thorough understanding of the relationships between fidelity, FAA criteria for simulation approval, and pilot modal interaction with the simulation regarding senses, including proprioceptive, visual, tactile, and aural. Students will conduct an analysis of the need for motion and motion cueing to gain inferences on the associated effects on fidelity.

SIM 300

Flight Dynamics Algorithms

3 Credits

This course will derive the equations of motion of a 6 DOF aerospace vehicle. Stability derivative will be defined mathematically. The equations for static and dynamic stability of the longitudinal and lateral directional motion will be derived. Numerical integration methods in a suitable computer language will be used to solve these equations. Physical understanding of stability derivatives will be discussed at length.

Prerequisite: MA 345.

Corequisite: AE 302.

SIM 400

Instrumentation for Flight Test (3,0)

3 Credits

Advanced instrumentation setups for aircraft flight testing. The following aircraft quality transducers will be discussed theoretically: accelerometers, rate gyros, strapdown gyro packages, digital pressure transducers, thermocouples, linear displacement transducers, load cells, and RPM transducers. Installation of the above instruments will be discussed. Calibration and errors will be investigated. This course includes a lab for installation and calibration of transducers on an aircraft.

Prel/Corequisites: MA 345, SIM 300 or AE 413.

SIM 402

Introduction to Flight Testing (3,0)

3 Credits

An overview of the role and function of flight testing in the aerospace industry. Major topics will include past, present, and future of flight test, FAA and DOD certification processes, risk management, test planning and reporting, and an overview of the principal flight test methods and procedures for aircraft and engine performance, stability and control, handling qualities, avionics systems performance and integration, human factors evaluation, production and maintenance flight test, homebuilt flight test, and DOD operational flight test. Final project will involve team evaluation of an aircraft using Embry-Riddle simulators, including test planning and reporting. Lab fee required.

Prerequisites: AS 309 or equivalent, SIM 200.

SIM 404

Fly-By-Wire Aircraft Simulation and Design (3,0)

3 Credits

This course addresses recent advances in automated flight control systems. Fly-by-wire aircraft architecture will be discussed. Aircraft simulations will be used to enhance and stabilize aircraft stability and handling qualities. Strategies such as theta control, c-star, and flight path angle control will be addressed.

Prerequisites: AE 413, MA 345.

SIM 405

Simulation Visual Systems (3,0)

3 Credits

This course focuses on what is required to develop a simulation visual system that is realistic to the end user. The student will develop a thorough understanding of the hardware and software required to

Course Descriptions

develop and display a visual database. Students will also understand requirements for visual systems in FAA-qualified devices and understand how a display system is constructed. In the laboratory the student will obtain hands-on experience with visual database development software by designing and testing a model that meets an actual requirement of the flight department and incorporating that model into the department's global database.

Prerequisite: SIM 200.

SIM 406

Aviation Simulation Systems Integration (3,0)

3 Credits

This course addresses recent advances and new applications in the expanding field of telecommunications and computer networks and their relationship with computer-based simulations. Students learn the principles for creating a distributed interactive simulation (DIS) environment that realizes a common operational environment among the systems. The course addresses creation of a DIS environment that is coherent in time and space. Students learn aspects of networking necessary to create real-time seamless simulated flight environments. Topics include: ATM (asynchronous transfer mode), SONET/SDH (synchronous optical network/synchronous digital hierarchy), gigabit ethernet, 10 gigabit ethernet, OSI (open systems interconnection) reference model, TCP/IP (transmission control protocol/Internet protocol) transmission media, network topologies, network protocols, and network performance.

SIM 410

Flight Test and Simulation

3 Credits

An interdisciplinary, capstone course in flight-testing and simulation. This course will rely on interdisciplinary groups to perform flight tests and simulation matching for typical FAA certification of aircraft and simulators. Lab fee required.

Prerequisite: At least one of the following: SIM 300, AE 413, AS 340, HF 310.

Global Security and Intelligence Studies

SIS 100

Introduction to Global Security and Intelligence Studies (3,0)

3 Credits

SIS 100 is the introductory course for the Global Security and Intelligence Studies program. It discusses the whole range of contemporary international issues, from questions of realism versus idealism in foreign affairs, to changes in the nation-state, the implications of climate change, the proliferation of weapons of mass destruction, international development, the rise of China, and international public health. The course requires the student to closely follow breaking international developments and learn to discuss these objectively and analytically. An important emphasis throughout the course is for the student to learn and demonstrate critical thinking and imagination.

SIS 200

Introduction to the American Legal System (3,0)

3 Credits

This course will provide a general overview of the legal system in the United States. It is a core course for the GSIS program, designed to give the student a foundation in legal theory and philosophy, the sources of law, the place of the judicial system in the United States, the structure of the courts, original through appellate jurisdiction, judicial review, the role of the legal profession, the structure of civil and criminal cases, the adversarial process, constitutional law and protections, and the application of law to security and intelligence issues.

Prerequisite: College-level history or permission of the instructor.

SIS 312

Global Crime and International Justice Systems (3,0)

3 Credits

This course presents the current status and future trends in global crime and criminal justice systemic approaches to combating global crime. First, the course describes the rise of novel criminal activities in the context of globalization as well as the influence of globalization on pre-existing criminal activities. Second, the course describes globalization's effects on the structure, function, and process of criminal justice systems. Third, the course explores the reciprocal interactive and contextual relationships between global crime and criminal justice systems. The course

emphasizes global, multicultural, and world historical perspectives of crime to professionally and personally prepare students for the challenge of 21st century life.

Prerequisites: SS 204, SS 235, SS 310; and SIS 200 or permission of the instructor.

SIS 315

Studies in Global Intelligence I (3,0)

3 Credits

This course will examine the uses of strategic intelligence by world leaders in shaping policy and the effects of strategic intelligence on world events. Issues to be covered include theoretical models of strategic intelligence; intelligence collection, evaluation, analysis, production, and dissemination; intelligence oversight; covert and clandestine operations; intelligence bureaucracies; ethical and moral issues in intelligence; counterintelligence. The course emphasizes strategic intelligence in the business, political, military, scientific, and technological domains.

Prerequisites: Junior standing or permission of the instructor.

SIS 317

Political Change, Revolution, and War (3,0)

3 Credits

This course is designed to familiarize the intelligence professional with how major events and systemic changes occur in the international system through wars and revolutions. It also examines political changes that occur in a slower, more evolutionary way. In both cases, the approach is through a study of historical and contemporary examples. The signals that political systems give off as they approach major structural change are examined in some detail, as are the structures of revolutions and conventional and unconventional wars, including asymmetrical wars. Social and economic trends that shape more evolutionary political change are also studied. All forms of change in the international system are of importance to the intelligence analyst, who must warn the policy community of anticipated developments of importance to the government and, subsequently, explain the implications of what has occurred. The course will enable the student to understand predictive analysis and modeling and provide analytical tools with which to deal with changing events.

Prerequisites: SS 110 and 235; SIS 315; or permission of the instructor.

SIS 320

Topics in Global History, Politics, and Culture (3,0)

3 Credits

This course provides the student with an opportunity to focus more deeply on a region of the world, a particular culture or period in history, or a specific international problem. The topic covered by the course in a particular semester will vary according to student and program needs. The regions to be covered on an as-needed basis will include Europe, Latin America, the Middle East, Africa, and Asia. Alternatively, the course could focus on a topic such as Islam in the contemporary world, the weaponization of space, the implications of world migratory patterns, changing issues in international development, or the spread and implications of pandemics. Students may repeat the course in order to study another region or topical area.

Prerequisites: SS 110 and 235; or permission of the instructor.

SIS 323

Intelligence and Technology (3,0)

3 Credits

This course will examine the whole arena of intelligence and technology, beginning with the World War II period, when science and technology came to play a critical role in intelligence. The course will cover technical intelligence collection methodologies and systems, the use of aircraft and space-based vehicles as collection platforms for photo-optical and digital imagery, radar imaging, infrared and multi-spectral imagery, signals intelligence, etc. The course will provide a technical understanding of these methodologies, as well as an analysis of their place in all-source collection. The course will also examine the current development and implications of intelligence technologies, such as the emergent UAV systems.

Prerequisite: SIS 315 or permission of the instructor.

SIS 325

History of Terrorism (3,0)

3 Credits

This course will introduce the student to the history of terrorism, from the 19th century up to the present day. It will evaluate the causes of terrorism, the capabilities and limitations of terrorist groups, the requisites of effective counterterrorism responses, and the future prospects of terrorism. It will address the implications of terrorism and asymmetrical warfare for U.S. national security, including the possible use of weapons of mass destruction. The constitutional and legal implications of counterterrorist strategies

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will also be discussed. It will examine the organization, objectives, and methodologies of key terrorist groups operating in the 21st century, particularly those showing ideological hardening, religious revivalism, and ethnic militancy.

Prerequisites: SS 110 and SS 235.

SIS 326

Personal Security and Defensive Skills (3,0)

3 Credits

Basic instruction in personal security through historical, technological, and practical education and training in the art and science of personal security awareness and defense for the professional. A comprehensive education on firearms history, laws, mechanics and ballistics, technology, current events, cultural philosophies and psychology, and very large emphasis on safety from varying perspectives. This is a two-phase course in which phase one is mandatory and phase two is an optional lab.

SIS 328

Intelligence Analysis, Writing, and Briefing (3,0)

3 Credits

This course is designed to strengthen the student's analytical and communications skills, preparatory to a career in intelligence and corporate security arenas. The course will enable the student to understand predictive analysis and modeling and will provide analytical tools with which to deal with changing events. Included among the latter are computer-based analytical programs currently used intensively in the intelligence community, as well as familiarity with intelligence and warning matrices and link analysis. The student also is trained to write intelligence briefs and required to practice this style and format under short deadlines. The student also will write a longer intelligence assessment and then brief that to the class.

SIS 400

International Security and Globalization (3,0)

3 Credits

An analysis of 21st-century international security issues related to scientific and technological change. Topics include the nature of security-economic, sociocultural, and military; political leadership/followership, decision making, and conflict resolution; political violence, especially terrorism and ethnic conflict; intelligence and counterintelligence analysis and operations; weapons proliferation; information warfare; the politics of international organized crime; bureaucratic evil; internal dislocation and immigration; and the politics of public health. A special focus

throughout the course will be on the aviation and aerospace industries: policies and operations, safety, and security. This course will emphasize science, technology, and globalization as the environment in which concepts of international security evolve and as impacted by international security phenomena.

Prerequisites: College-level psychology and college-level history or permission of instructor.

SIS 405

Environment and Security (3,0)

3 Credits

This course is designed to introduce students to the contingencies and conflicts posed by the intersection of security and environmental issues, including disputes over ground water rights, international rivers, scarce energy resources, manipulation of crop gene pools, genetically modified crops, global migration, international treaties and conventions on environmental issues, and global climate change. Students will be introduced to environmental issues that pose significant security risks to a nation, affect a nation's economic wellbeing and/or military preparedness, and pose challenges to those laws governing the protection of the natural environment. Ethical issues will also be addressed, particularly as these relate to policy making on issues that span both environmental and security concerns.

Prerequisite: SIS 315 or permission of the instructor.

SIS 410

Business Security and Competitive Intelligence (3,0)

3 Credits

This course will focus on the security requirements of corporations, in both the domestic and international arenas. Among the topics addressed are personnel security, due diligence in hiring, physical security and access controls, government classification systems and requirements, political and security risk analysis, and corporate crisis and emergency planning and management. Included in the international sphere will be stakeholder analysis; the implications of cultural factors, legal systems, and international criminal threats; emergency extraction methodologies and actors; and kidnap and rescue. In addition, the course will develop approaches to competitive intelligence. This is the use of methods in the legal domain and using open source information to seek out and analyze the strategic plans of one's competitors, of their intended actions and investments, methods of operation, and corporate financial position.

Prerequisites: SIS 312 and 315; or permission of the instructor.

SIS 415

Studies in Global Intelligence II (3,0)

3 Credits

This course provides an intensive, semester-long simulation for teams of students assuming the roles of political, military, economic, or scientific and technological intelligence case officers. Through the semester-long immersion with an intelligence tasking, students will be expected to demonstrate sophistication with case officer-agent relationships; staffing and coordination involving the various combinations in one's intelligence station, among stations, and between one's station and regional and central headquarters; intelligence briefings, executive summaries, and estimates; credibility and risk analysis, both of sources and of recommendations concerning specific covert action, espionage, and counterintelligence operations; operations/physical/communications/personnel securities; and the intelligence opportunities, limitations, and threats presented by today's era of globalization.

Prerequisite: SIS 315 or permission of the instructor.

SIS 420

Aviation Security and Technology (3,0)

3 Credits

This course will concentrate on the disciplines of security and intelligence as applied to aviation. Students will learn to apply the four core security disciplines: communications security, operations security, physical security, and personnel security. Of prime concern in this course is airport/aviation readiness to prevent and respond to the following threats: hijackings, CBRN attacks, bombings, missiles, and shootings as perpetrated by terrorists and/or various nonpolitical hijackers. Other topics include airport familiarization and safety; post 9/11 responses by the public, industry, and government; airport hardening; security screening; first responder roles and needs; the off-airport interface and multimodal infrastructure; cargo and general aviation issues; international security; biometrics and other emerging technologies; and airline security issues.

Prerequisites: SIS 312 and SIS 315; or permission of the instructor.

SIS 422

Homeland Security and Technology (3,0)

3 Credits

This course will examine the whole range of issues relevant to the defense and security of the U.S. homeland. These will include transportation security, immigration and border security, cargo security, the presence of radical elements in the United States, the

statutory and regulatory structure, and the institutions and agencies responsible for homeland security at the federal, state, and local levels. Legal and ethical issues also will be examined, as these relate to national security and privacy.

Prerequisite: SIS 315 or permission of the instructor.

SIS 425

Personnel Security (3,0)

3 Credits

This course will focus on how to minimize violations of trust in the professional world. It does this through a detailed analysis of the selection, orientation, management, training, resignation, termination, and retirement of personnel in security, intelligence, business, and government organizations. The scope of this course embraces relevant material from the behavioral and social sciences, philosophy, history, computer science, engineering disciplines, and personnel security case histories. Of special relevance are the constructs of personality, morals and ethics, deception, genetic epistemology, corruption, coercion, profiling, and private and public self-consciousness.

Prerequisite: SIS 315 or permission of the instructor.

SIS 199, 299, 399, 499

Special Topics in Global Security and Intelligence Studies

1-3 Credits

Individual independent or directed studies of selected topics in Global Security and Intelligence Studies related topics.

Prerequisites: Consent of instructor and approval of department or program chair. May be repeated with a change of subject.

Space Studies

SP 110

Introduction to Space Flight (3,0)

3 Credits

A survey of the major aspects of space flight. Topics covered include the history of space flight, space shuttle operations, and present and future commercial, industrial, and military applications in space.

SP 200

Planetary and Space Exploration (3,0)

3 Credits

This is a survey course of U.S. and international space programs. The student will be introduced to the Earth and its space environment, to methods of

Course Descriptions

scientific exploration, and to spacecraft and payload criteria at the introductory physics level.

SP 210

Space Transportation System (3,0)

3 Credits

A survey course of the space transportation system (STS) at the introductory physics level. Included are manned space flight operations, supporting systems, and the space shuttle mission, both present and future. A review of space shuttle flight profiles, guidance and navigation control, proximity operations and rendezvous, and a brief review of hypersonic orbiter aerodynamics are included. Also covered are future STS applications to space station logistical operations, commercial applications, and Department of Defense operations.

SP 215

Space Station Systems and Operations (3,0)

3 Credits

This course is designed to provide a brief study of the space station's flight operations, its supporting elements, and planned systems. The survey study will include commercial applications, logistical support, and maintenance and servicing design concepts at the introductory level.

SP 220

Life Support Systems (3,0)

3 Credits

This course is a survey at the elementary physics level of the requirements and design considerations for life support systems in space and on other planets. Included are an introduction to basic human physiology, a description of the space environment, a survey of historical life support systems, and a presentation of spacecraft limitations and requirements.

Prerequisite: PS 102 or PS 103.

SP 300

Satellite and Spacecraft Systems (3,0)

3 Credits

Orbital satellites and spacecraft are discussed according to their application, design, and environment. The power system, shielding, and communication systems are reviewed along with their missions, space environment, and limitations.

Prerequisite: MA 112 or equivalent.

SP 340

Russian Space Operations and Technology (3,0)

3 Credits

Dramatically different space programs in the U.S. and the Soviet Union accomplished many of the same goals, with one important difference. This course will examine the Russian space flight efforts in light of the dramatic race to space, from the first concepts of Tsiolkovsky to today's International Space Station project. Discussion of the highlights of Russia's well-known as well as obscure space programs will offer the student insight into the space flight record that is often missing because of the secretive Soviet Union.

SP 400

Introduction to Space Navigation (3,0)

3 Credits

This course will introduce the student to basic elements of space navigation at the introductory physics level. The consequences of Newton's law of gravitation and central force motion, including Kepler's three laws of planetary motion, are explained. The physical characteristics of the solar system and the Earth/Moon system are reviewed. The basic methods and techniques of navigating in near-Earth orbit and the Moon and planets are described.

Prerequisites: MA 112 and PS 103 or equivalent.

SP 425

Selected Topics in Space and Aerospace (3,0)

3 Credits

This course introduces students to problems in space operations, space flight, or other space-related topics that can be critically addressed from a knowledge base of elementary calculus, elementary physics, and the subject matter of any two space studies courses. The specific topics will be selected by the course monitor and instructor and published in the Schedule of Courses in the preceding semester. This is a required course for the Space Studies minor.

Prerequisites: PS 104 and any two SP courses or equivalent.

SP 299, 399, 499

Special Topics in Space Studies

1-3 Credits

Individual independent or directed studies of selected topics in space studies related topics.

Prerequisites: Consent of instructor and approval of department or program chair. May be repeated with a change of subject.

Social Sciences

SS 110

World History (3,0)

3 Credits

Designed primarily as a survey of the development and evolution of Western civilization from 1500 to the present. Emphasis is placed on the effect of Western influence on the world.

SS 120

American History (3,0)

3 Credits

From 1865 to the present. Reconstruction, the age of big business, the United States as a world power. World War I, World War II, the Great Depression and its aftermath.

SS 130

History of Aviation in America (3,0)

3 Credits

A survey of the history of America in the 20th century, emphasizing the explosive growth of aviation as a major influence on the economic, military, and societal development of the United States.

SS 204

Introduction to Geography (3,0)

3 Credits

A survey course designed to acquaint the student with types of maps, map reading and use, as well as to show relationships between geography and economics, culture, and geopolitics. Humans and their use of their environment are stressed, along with the usual emphasis on places, names, and locations. Ancillary topics will include climate, demography, and transportation.

SS 210

Introduction to Sociology (3,0)

3 Credits

Integrated survey of the fundamental concepts of culture, forms of collective behavior, community and social organization, social interaction, and social change. The social effects of aviation and the impact of science on the social order living in an air age will also be investigated.

SS 302

Evolution of Scientific Thought (3,0)

3 Credits

Traces the development of science from the earliest times through the modern period, with particular

emphasis given to our changing concepts of nature and of science itself. (Also offered as PS 302. Students receive either Social Sciences elective credit or Physical Sciences elective credit, but not both.)

Prerequisites: Any course from the HU 140 series and either PS 101 or PS 102 or PS 103 or PS 150 and PS 215.

SS 307

Global Policy Studies (3,0)

3 Credits

A crossnational survey and analysis of the processes of policy making for science and technology, environment, and security. Emphasis on how local, national, international, and global policy making are related in these three areas of global change.

Prerequisites: Two Social Sciences courses and one History course or permission of instructor.

SS 310

Personality Development (3,0)

3 Credits

A survey of selected theories of human nature and functioning from the beginning of modern psychology to present developments, including psychodynamic, cognitive, behavioral, biological, humanistic, and other types. Various concepts of personality and the associated methodologies for gathering and validating knowledge are explored. Theories are applied to normal issues in personal, professional, and relational life, and theory-related skills are taught for self-awareness, problem-solving, habit change, and emotional and interpersonal competence.

SS 311

U.S. Military History 1775-1900 (3,0)

3 Credits

Military history with emphasis on military policy, organization, and technology as they relate to U.S. political, social, and economic developments from 1775 to 1900.

SS 320

American National Government (3,0)

3 Credits

Basic issues of American democracy, constitutional principles, and the executive, legislative, and judicial branches of government.

Prerequisite: College-level history or permission from the instructor.

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SS 321

U.S. Military History 1900-Present (3,0)

3 Credits

Military history with emphasis on military policy, organization, and technology as they relate to U.S. political, social, and economic developments from 1900 to the present.

SS 325

International Studies (3,0)

3 Credits

An overview of the land, the people, the culture, and the history of one region of the world, with emphasis on current events and policies on the world scene. Specific content varies from year to year.

Prerequisite: College-level history or permission from the instructor.

SS 326

Russian-American Relations (3,0)

3 Credits

This course explores the development of Russian-American economic and political relations, emphasizing the era of the 20th century.

Prerequisite: College-level history or permission from the instructor.

SS 331

Current Issues in America (3,0)

3 Credits

A course in selected political-economic issues of national and international importance. Extensive use of journals, magazines, and newspapers to supplement lectures and discussions.

Prerequisite: College-level history or permission from the instructor.

SS 332

Gender, Ethnicity, and Class in 19th and 20th Century Global History (3,0)

3 Credits

The social and cultural conceptualization of gender, ethnicity, and class, and their significance and role in global history during the 19th and 20th centuries.

SS 333

U.S.-Asian Relations (3,0)

3 Credits

This course explores the development of U.S.-Asian political, cultural, and economic relations, from their beginning in the 19th century to the present. The

course will examine America's domestic motivations for expanding into the Pacific, the various impacts that the United States has had on Asian nations, and Asia's collaboration with and resistance to the American presence.

Prerequisite: Lower developmental history course or junior standing.

SS 334

Contemporary Africa and the World (3,0)

3 Credits

A historical examination of Africa's land, societies, and cultures with a focus on the political and economic changes and challenges that have marked the continent's relations with major world powers during and after the Cold War.

Prerequisite: College-level history or permission from professor.

SS 336

The Modern Middle East in World Affairs (3,0)

3 Credits

A historical examination of the land, societies, cultures, economics, and politics of the Middle East from World War I to the present in relation to recent and current world events and policies.

Prerequisite: College-level history or permission from professor.

SS 337

Globalization and World Politics (3,0)

3 Credits

Globalization and World Politics is a study of the contemporary debate on globalization and new world order. Key topics include but are not limited to problems of definition in globalization; transborder issues and the role of the state; multinational corporations; labor and the terms of international trade; issues of environmental degradation; international organizations and nongovernmental organizations in global affairs; terrorism, global crime, and international security; human rights, democracy, and cultural nationalism; technology and global communication.

Prerequisite: College-level history or permission from the instructor.

SS 340

American Foreign Policy (3,0)

3 Credits

A survey of the evolution of present American foreign policy, stressing the factors that affect and shape

this policy. Attention is given to current governmental offices, agencies, and departments and the role each plays in policy formulation. Emphasis is on the period since World War II.

Prerequisite: College-level history or permission from the instructor.

SS 350

Psychology of Relationships (3,0)

3 Credits

Empirical, theoretical, and practical knowledge of the components of intimate relationships, involving friendship, romance, marriage, divorce, and non-traditional relationships, and embedded in lifespan development. Disciplines include social, behavioral, clinical, family, and biological psychology, as well as sociology, anthropology, sociobiology, and neuroscience. Consideration of how relationship knowledge is gathered and interpreted, along with the social and political consequences of such knowledge for relationship descriptions, prescriptions, and power. Development of self-awareness and interpersonal skills through writing, experiential exercise, improvisational drama, and communication games.

SS 351

Relationship Skills Laboratory (0,3)

1 Credit

This laboratory provides small group practice of principles taught in SS 350, Psychology of Relationships. Methods of practice include individual mental, emotional, and imaginal awareness techniques, pair-interactional exercises interspersed with individual writing and reflection, role playing, and group discussion.

Colprerequisite: Open to students who are taking or have completed SS 350.

SS 360

Environmental Law (3,0)

3 Credits

Provides a general introduction to the field of planning, and examines the procedural approaches shared by practitioners working in all areas of contemporary planning. Introduces legal concepts and doctrines relevant to pollution control, assessment of environmental impacts, and land use.

Prerequisite: PS 142 or permission of instructor.

SS 361

Labor and Technology (3,0)

3 Credits

This course examines the relationship between labor and technology from historical and cultural perspectives. This examination ranges from the industrial revolutions of the 18th and 19th centuries to the present with extrapolations into the future of industry, labor, and society. Particular emphasis will be placed on analyzing the change from mass production (Fordism) to flexible production (post Fordism), and the relationship between the mobility of labor and capital with the globalization of technology. This course will look at case studies from aviation/aerospace telecommunication, and automobile industries in the United States, Pacific Rim, European Community, and Latin America.

Prerequisite: College-level history or permission from the instructor.

SS 363

Inter-American Relations (3,0)

3 Credits

This course explores the development of U.S. political and economic relations with Latin America from their beginning in the 19th century to the present.

Prerequisite: SS 110 or SS 120 or SS 130 or junior standing.

SS 299, 399, 499

Special Topics in the Social Sciences

1-6 Credits

Individual independent or directed study of selected topics in the areas of history, sociology, psychology, and human culture in general.

Prerequisites: Consent of instructor and approval of the department chair.

Systems Engineering

SYS 301

Introduction to Systems Engineering (3,0)

3 Credits

Provides an overview of systems engineering in the development of large systems, including genesis and need, characteristics of systems and system engineers, the system life cycle (from birth to death), design for operational feasibility, project management, structure, and system control, statistical/probabilistic models in dealing with risk inherent in

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large, complex systems. Emphasis on the importance of system requirements regarding total system performance, interfaces, cost, schedule, optimization, and trades.

Prerequisite MA 243.

SYS 302

System Engineering Design Considerations (3,0)
3 Credits

This course examines the considerations in developing systems that meet specified system performance requirements while also achieving necessary levels of reliability, maintainability, and supportability consistent with the operational requirements. In addition, consideration is given to issues associated with producibility and disposability. Mathematical methods associated with reliability, maintainability, and supportability are discussed and applied. Liberal use of examples is incorporated to illustrate the interactions and relationships of these metrics, and how they are used to measure and trade off among these elements. The intent is to sensitize the systems engineer to the need for technical, schedule, and cost trade-offs to achieve desired yet safe and affordable system performance.

Prerequisite: SYS 301.

SYS 303

Optimization in Systems Engineering (3,0)
3 Credits

This course emphasizes that the optimization of some subsystems may be detrimental to others and hence to overall system performance or cost. Topics include traditional optimization methods, such as classical parameter optimization linear programming, dynamic programming, numerical methods (for example, perturbation and gradient techniques), and genetic algorithms. In addition, techniques such as Pareto or multi-objective optimization are examined with the aim of achieving a sufficient balance among subsystem performance and cost, ultimately to obtain an overall optimal system.

Prerequisite: SYS 301.

SYS 304

Systems Engineering in Management, Risk, and Decision Making (3,0)
3 Credits

An understanding of the decision-making process usually requires simplification of the complexity facing the systems engineer and associated decision-making. This course examines methods such as modeling and simulation (M&S) for identifying/

generating alternatives, evaluating their outcomes in terms of risk and benefit, and ultimately providing management authority with options and recommendations on such alternatives to support effective decision-making. Topics include both technical and economic evaluation models and methods. The course also emphasizes the importance of program controls (for example, PERT) and system configuration control.

Prerequisites: SYS 301, EC 225.

SYS 403

Systems Engineering Life Cycle Costing (3,0)
3 Credits

Current trends in system development indicate that, in general, complexity is increasing, and many systems in use today are not meeting the needs of customers. These trends, combined with past practices, have tended to create an imbalance between cost and effectiveness. This course addresses this important aspect of systems engineering by examining cost and economic factors under the general theme of design for affordability. An introduction to life-cycle costing is followed by a focus on costs as they occur throughout the system life cycle. Types of contracts (for example, fixed price, cost-plus) are studied. The steps in the life-cycle cost analysis process are examined through the use of examples, and the applications and benefits of life-cycle costing are summarized.

Prerequisite: SYS 304.

SYS 405

Aerospace Systems Guidance and Control (3,0)
3 Credits

Provides a second, advanced course in control systems, with emphasis on the multidimensional state-space approach. Application of digital control systems in aerospace instrumentation, sensors, guidance, and navigation. Addresses optimal control systems, including multi-objective control, and introduction to advanced methods such as fuzzy systems control, neural networks, and genetic algorithms.

Prerequisite: EE 401 or equivalent control systems course.

SYS 410

Space Systems and Mission Analysis (3,0)
3 Credits

This course provides an arena for applying many of the important techniques in systems engineering through the development of a deep space exploration mission, from mission definition through system concept and design. Considerations will be given

to all aspects of mission development and operations including spacecraft design, communications, navigation, payload data handling, personnel, and cost. Students will be assigned to discipline teams, working together in a systems engineering context to produce project documents (concept of operations, project plans, schedules, budgets, mission operations plans, and system design documents).

Prerequisite: SYS 403 or permission of the instructor.

SYS 417

Senior Systems Engineering Project (3,0)

3 Credits

This is the capstone course for the systems engineering track. The project will involve setting system characteristics, specifications, interfaces, and so on, and planning and scheduling the design process. Complete analysis is required from performance, costs, and reliability. Although an electrical component is dominant, other disciplines such as software, mechanical, and fluid will be involved. The course requires the completion of a detailed project document package.

Prerequisite: SYS 403 or permission of the instructor.

College Success

UNIV 101

College Success (2,0)

1 Credit

A course in which students assess and develop the personal, interpersonal, intellectual, and social skills necessary to succeed in college. Time management, study skills, goal clarification, career information, and college resources are included. This course is available to freshmen only.

UNIV 102

Self-Assessment and Portfolio Preparation (2,0)

1 Credit

This course is required of all adult undergraduate students seeking an assessment of their prior experiential learning by portfolio. Students will assess their prior learning experiences in light of career and educational goals. The online learning course is designed to assist students in life and career planning, goal clarification, career concerns, portfolio preparation, and the development of college success skills. The focus is on methods of self-assessment of prior learning work/education/training experiences and procedures for assembling a portfolio to document learning experiences. This course is

graded Satisfactory/Unsatisfactory and is required for students who seek prior learning portfolio evaluation. Students must register for UNIV 102 within six months of course registration.

UNIV 400

Career Development (1,0)

1 Credit

Introduces students to various elements involved in obtaining a position in their chosen fields. Topics include self-assessment, research and selection of a career path, sources of jobs, job-search techniques, resumes and letters of application, references, interviewing skills, business etiquette, and professional image. Each student will develop a career portfolio including personal and professional information related to career goals.

Applied Meteorology

WX 201

Survey of Meteorology (3,0)

3 Credits

This survey course in atmospheric science includes applications to flight. Included is a systematic development of the following: thermal patterns, atmospheric moisture, horizontal and vertical pressure patterns, clouds, atmospheric circulation, local winds, stability, air masses, fronts, fog, icing, thunderstorms, jet streams, and turbulence. Students will study and make use of surface weather observations, surface maps, and constant pressure maps.

Prerequisite: MA 006 or equivalent.

WX 210

Introduction to Geographic Information Systems (3,0)

3 Credits

Geographic Information Systems (GIS) encompass all aspects of spatial data analysis from data acquisition and manipulation through problem solving to the graphic presentation of results. This course surveys GIS theory and applications as students learn to store, retrieve, manipulate, analyze, and display spatial data according to a variety of user-defined specifications. Lectures will emphasize fundamental principles of GIS while computer-based exercises will emphasize training.

Course Descriptions

WX 215

Physical Geography (3,0)

3 Credits

Students will acquire a thorough comprehension of various physical and chemical forces that sculpt the landscape. From alluvial fans and distinct dune formations of the arid and semi-arid West to the karst terrain of the humid East, these features reveal a rich history of climatological conditions. A greater understanding of weathering processes and the resultant landforms should lead to a heightened appreciation of geophysical properties and products.

WX 220

Data Analysis and Visualization (3,0)

3 Credits

This course builds on CS 125 to include fundamentals of programming in IDL (Interactive Data Language), addressing a wide range of meteorological problem-solving, data analysis, and visualization techniques. Students will use a problem-solving approach for understanding IDL structures, procedures, and functions, with emphasis on scientific techniques and applications. The students will also receive a brief introduction to Fortran and C++.

Prerequisite: CS 125.

WX 252

Introduction to Meteorology (3,0)

3 Credits

A survey course in meteorology for meteorology majors, covering the following topics: atmospheric composition and structure, energy exchange, thermal patterns, atmospheric moisture, clouds, stability, precipitation processes, wind and pressure, global circulation, upper-level winds and jet streams, local winds, air masses, fronts, mid-latitude cyclones, weather forecasting, thunderstorms, and tropical meteorology. Students will also be introduced to weather observations, surface and upper-air maps, the Skew-T log-P chart and satellite and radar imagery.

WX 261

Applied Climatology (3,0)

3 Credits

An in-depth survey of the varied climates of the world, the weather systems that contribute in the aggregate to those climates, and their cumulative influence on aircraft system performance and the National Air Space over very small to global space

and time scales. Included is a historical perspective on how our climate is changing and the atmospheric processes involved in the global change process. Emphasis is placed on developing a broad-based working knowledge of the impacts of present-day climate and its variability on aviation-related practices, procedures, and operations.

Prerequisite: WX 201 or WX 252.

WX 265

Climate Change (3,0)

3 Credits

This course makes use of multimedia instructional techniques to examine the physical, economic, and political dynamics of climate change. The curriculum includes an appraisal of assorted websites, computer-based simulations, and analysis of relevant data as well as a review of the literature and other media including video documentaries. The so-called global warming debate also is discussed with the goal of disseminating information concerning the evidence, the impacts, and actions that can be taken to minimize the negative effects of altering Earth's climate system through ways and means that are truthful, understandable, and comprehensive.

Prerequisite: WX 201.

WX 270

Weather Information Systems (3,0)

3 Credits

An introduction to the various states of weather-sensing equipment modernization and the systems that deliver weather information to various users. The development of various sensing devices are explored and the current technology explained.

Prerequisite: WX 201 or WX 252.

WX 280

Introduction to TV Weathercasting (3,0)

3 Credits

This course introduces the student to the world of broadcast meteorology. Using the most modern of facilities in our state-of-the-art building, students will learn to prepare and present TV presentations. A local on-camera meteorologist will help instruct, critique, and assist other faculty in making weather come alive on the University's local cable network.

Prerequisite: WX 201.

WX 301

Aviation Weather (3,0)

3 Credits

The course is an expansion of WX 201, a Survey of Meteorology, with a focus on aviation weather hazards such as thunderstorms, strong winds, fog, icing, turbulence, snow storms, and volcanic ash. Practical application of theoretical concepts such as thickness, thermal winds, jet streams, cyclone formation, and stability is achieved through lab exercises and projects utilizing current or historic weather examples and is designed to complement lecture materials. Emphasis is on navigating today's online environment for obtaining real-time aviation weather products and information to gain practical experience in making informed weather-sensitive decisions.

Prerequisite: WX 201.

WX 310

Advanced Geographic Information Systems

3 Credits

Advanced GIS is designed to further develop the concepts and principles learned in WX 210, Introduction to GIS. Lectures will focus on current theories and technology trends in geographic information sciences integrating theoretical knowledge with hands-on technical training in the computer classroom. Weekly discussion of the latest developments in GIS will reinforce these experiences while fostering an appreciation of GIS as an effective analytical tool for understanding complex processes. The course culminates in a class project involving scholarly research by teams of students based on GIS applications.

Prerequisite: WX 210.

WX 353

Thermodynamics of the Atmosphere (3,0)

3 Credits

A course for those requiring an in-depth understanding of the physical processes governing the atmosphere. Includes discussion and quantitative treatment of meteorological conventions, atmospheric state and structure, radiation, heat/energy transfer, boundary layer structure and fluxes, moisture, stability, cloud formation, and precipitation.

Prerequisites: PS 104 (or PS 160 or PS 208), WX 201 or WX 252.

WX 354

Dynamics of the Atmosphere (3,0)

3 Credits

A course for those requiring an in-depth understanding of the dynamic processes governing the atmosphere. Includes discussion and quantitative treatment of atmospheric forces, the equations of motion, local and global winds, air masses and fronts, middle latitude cyclones, quasi-geostrophic theory, thunderstorms, and hurricanes.

Prerequisites: PS 104 (or PS 160 or PS 208), WX 353.

WX 355

Weather Analysis (5,0)

5 Credits

This course presents conceptual models of synoptic weather features and applies them to analysis of meteorological data fields. Meteorological codes for surface and upper air data are surveyed and the basic conventions of surface and upper air charts are introduced. Labs cover the standard tools of weather analysis and give students practice constructing and using isopleths of pressure, temperature, dew point, and geopotential height. The horizontal and vertical structure of fronts is examined through pattern recognition of standard meteorological variables, atmospheric thickness, and cross-section analyses. Methods for analyzing wind fields, such as streamlines, air parcel trajectories, and jet stream identification, are presented. Students practice conceptually integrating satellite and radar data to verify and refine their analyses in accordance with dynamical principles. This course covers both manual (hand-drawn) weather map techniques and computer meteorological analysis software packages.

Prerequisite: WX 353.

Corequisite: WX 354.

WX 356

Synoptic Meteorology (3,0)

3 Credits

This course uses observations and analyses of current weather systems to explain atmospheric structures and behavior on the synoptic scale. An important component of this course is the introduction of sophisticated computer graphics software as primary analysis tools for the students. Individual and team lab exercises provide practice in applying principles and techniques learned in lecture sessions. Topics may include pressure, temperature, and moisture field analyses, diagnoses of clouds, frontal structure, thermal wind, temperature advection, and vertical motion fields within the context of examining present

Course Descriptions

weather conditions to include extratropical and perhaps tropical systems. Atmospheric soundings and spatial/temporal cross sections are also used to examine atmospheric stability, environments favorable for deep moist convection, and possibly mesoscale systems. Satellite imagery is also used when applicable. The student is expected to retrieve raw data from Internet sources and the department's computer system.

Prerequisite: WX 353.

Corequisite: WX 354.

WX 363

Thunderstorms (3,0)

3 Credits

This course provides tools for analyzing and forecasting thunderstorms and their associated hazards. Key characteristics of the thunderstorm and its environment are explored using both case studies and real-time weather data. Students examine atmospheric soundings to determine the likelihood of storm development and the amount of energy available for thunderstorms. Vertical wind shear is analyzed for clues about storm organization and severity. Other information, such as weather charts, computer models, satellite imagery, and Doppler radar imagery, is used to observe the characteristics of thunderstorms and the weather patterns that favor them. Students gain a basic scientific understanding of thunderstorm behavior as well as practical experience observing and predicting them.

Prerequisite: WX 252 or WX 301 or WX 353.

WX 364

Weather for Aircrews (3,0)

3 Credits

Making use of the Weather Center and the Internet, students collect and study weather data from around the world. Emphasis is placed on decoding information contained in the remarks section of weather observations and on the differences between North American weather charts and those produced in other parts of the world. Students investigate the flying conditions and aviation environment over the seven continents. The proper operation of airborne weather radar is studied. Students identify weather hazards by using ground-based weather radar and satellite imagery. This is the capstone course for the Aviation Weather Minor.

Prerequisite: WX 252 or WX 301.

WX 365

Satellite and Radar Weather Interpretation (3,0)

3 Credits

A practical introduction to meteorological interpretation of satellite and weather radar imagery. This course surveys the basic physics of electromagnetic (EM) radiation and shows how characteristics of the EM spectrum are exploited in passive (satellite) and active (radar) remote sensing to create digital images of geophysical information. The theory of radar signal propagation and precipitation estimation is applied to the meteorological interpretation of radar imagery and supplemented with practical analysis of various radar product types. Weather satellite image types, including visible, conventional infrared, and water vapor channels and their meteorological applications, are examined. Real-time satellite identification of meteorological phenomena will be emphasized, including mountain waves, midlatitude cyclones, fronts, jet streams, troughs, ridges, vorticity, cloud types, fog, precipitation, ordinary and severe thunderstorms, tropical waves, and hurricanes. Surface and upper-air weather maps will be used to enhance the students' understanding of satellite image signatures.

Prerequisite: WX 252 or WX 301 or WX 353.

WX 370

Planetary Atmospheres (3,0)

3 Credits

The knowledge of mechanisms and forces that cause the Earth's atmosphere to move will be applied to the other planets. Solar effects on space travel will be studied. Emphasis will be placed on the weather of the planets that will most likely be visited in the early 21st century. Students will present a project that examines the solar and atmospheric effects of travel to their favorite planet. This course can be used to satisfy a requirement in the Space Studies Minor.

Prerequisite: WX 252 or WX 301 or WX 353.

WX 380

Advanced TV Weathercasting (3,0)

3 Credits

This course builds on the student meteorologist's radio and television weathercasting abilities and introduces the additional skills required for entry-level employment in the fields of radio and television weathercasting. The student will develop techniques for live in-studio and remote reporting of severe weather events and natural disasters. Additionally, the student will gain valuable experience writing, preparing, and delivering scientific and environ-

mental reports and acquiring techniques for remote broadcasting.

Prerequisite: WX 280, WX 356.

WX 390

Atmospheric Physics (3,0)

3 Credits

Topics covered include elements of Earth-Sun geometry, radiative transfer, photochemistry, and remote sensing of the atmosphere. Additionally, properties of aerosols and clouds, cloud nucleation, precipitation processes, and atmospheric electricity will be discussed.

Prerequisites: MA 112 or MA 242, WX 353.

WX 420

Advanced Atmospheric Thermodynamics (3,0)

3 Credits

This course provides an application of physics and calculus to the study of atmospheric thermodynamics. The course covers such topics as hydrostatics, conservation of energy, the Ideal Gas Law, temperature relationship to kinetic energy, specific heats, enthalpy, and entropy. Additionally, water and its transformations, the thermodynamics of dry, moist, and saturated air, and thermodynamic diagrams are covered.

Prerequisites: PS 160 or PS 208, WX 353, MA 242.

WX 422

Statistical Applications for Meteorological Data Analysis (3,0)

3 Credits

This course illustrates the applications of a broad range of statistical applications to meteorology, as well as more general data analysis techniques. The course will include the following topics: basic statistical properties for various types of spatial and temporal data collections, including the standard statistical measures of mean, median, mode, standard deviation, and variance. Additional application topics will include correlations, confidence tests, probability distributions, time-series sampling theory, as well as data processing practices including regression analysis, Fourier analysis, and Eigen-vector analysis. The meteorological-specific applications would include data assimilation error covariance functions, Model Output Statistics (MOS), Perfect Prog forecasts, statistical forecast models, and Ensemble forecasts of model uncertainties as well as a number of forecast verification metrics including such quantities as Probability of Detection, False Alarm Rate, and Critical Success Scores. The course will include

a number of laboratory exercises using various computer software resources ranging from spreadsheet calculations through higher-level programming methods.

Prerequisite: Any course in computer programming (EGR 115, or CS 118, or CS 223, etc.) or permission of the instructor.

WX 427

Forecasting Techniques (3,0)

3 Credits

This course provides an introduction to the world of weather prognostication. Topics include the traditional forecast methods based on weather analysis techniques, up through the latest computer-generated weather prediction models. The student is exposed to techniques for forecasting tomorrow's weather as well as seasonal weather trends.

Prerequisites: WX 353, WX 354, WX 355, and WX 365.

WX 456

Advanced Weather Analysis (3,0)

3 Credits

This course builds on the concepts learned in WX 356 (Synoptic Meteorology) by using the governing meteorological equations to explain what is causing the current weather, thereby integrating atmospheric dynamics principles into weather analysis and forecasting. The computer graphics programs introduced in WX 356 are used as primary analysis tools for the students. Individual and team lab exercises provide practice in applying principles and techniques learned in lecture sessions. Topics may include analysis and prediction of clouds, precipitation, flight hazards, and convective weather using conventional and model-based analyses. Diagnoses of vertical motion fields, atmospheric soundings, and spatial/temporal cross sections are also used to examine atmospheric stability, environments favorable for deep moist convection, and possibly mesoscale systems. Satellite imagery is also used when applicable. The student is expected to retrieve raw data from Internet sources and the department's computer system.

Prerequisite: WX 356.

Corequisite: WX 365.

WX 457

Weather Operations Seminar (3,0)

3 Credits

This course simulates a number of industry/agency operational weather environments. The student will acquire and evaluate the significance that weather impact variables have on all phases of the operational

Course Descriptions

environment. Real-time as well as preprogrammed scenarios are used to provide the student the opportunity to become knowledgeable in the methodologies employed by decision-makers in flight and marine planning/operations, multimedia productions, and agribusiness operations.

Prerequisite: WX 355.

WX 480

Environmental Security (3,0)

3 Credits

Students will learn how environmental issues may give rise to socio-political instability around the world. This course will explore how development and execution of U.S. domestic and foreign policy, and ultimately, U.S. national security, can be impacted by emerging threats to nations from environmental health issues, infrastructure vulnerabilities, and natural resource shortages caused by rapid industrialization, population growth, and urbanization in less developed countries. It will also examine transnational threats from ozone depletion, deforestation, and climate change. In a seminar format, students and faculty will cover a variety of readings and discuss their conclusions. Students will have the opportunity to lead class discussions on assigned readings.

Prerequisite: WX 201, HS 201 or permission of the instructor.

WX 490

Advanced Dynamic Meteorology I (3,0)

3 Credits

This is the first course in atmospheric dynamics that uses calculus. The focus of this course is on the full development of the momentum equation on a rotating earth and the subsequent applications of this equation to atmospheric flows. Applications will include the concepts of geostrophic balance and the geostrophic wind, gradient balance and the gradient wind, hydrostatic balance, the hypsometric equation, and thermal wind balance. Synoptic examples will be examined to illustrate these concepts.

Prerequisites: MA 243, WX 354, and WX 420.

WX 491

Advanced Dynamic Meteorology II (3,0)

3 Credits

This is the second course in atmospheric dynamics that utilizes calculus. The dynamical set of equations and expressions that govern atmospheric phenomenon will be developed and applied. These equations and expressions will include the primitive set of equations, a kinematic description of the atmosphere, the absolute and barotropic vorticity equation, and the quasi-geostrophic set of equations. Applications will include the use of these equations to better understand Rossby wave dynamics and the cyclogenesis process.

Prerequisite: WX 490.

WX 299, 399, 499

Special Topics in Meteorology

1-6 Credits

Individual independent or directed studies of selected topics in applied meteorology.

Prerequisites: Consent of the instructor and approval of the program coordinator.

GRADUATE COURSE DESCRIPTIONS

Embry-Riddle course offerings are listed in alphabetical order, according to the following course designations:

AE	Master of Aerospace Engineering/Master of Science in Aerospace Engineering
AED	Aviation Education
BA	Master of Business Administration
CEC	Computer Engineering
EE	Electrical Engineering
EMBA	Executive Master of Business Administration
EP	Engineering Physics
HFS	Master of Science in Human Factors and Systems
MA	Mathematics
MAAF	USAF Safety Education
ME	Master of Science in Mechanical Engineering
MSA	Master of Aeronautical Science
MSF	Master of Science in Safety Science
SE	Software Engineering
SYS	Systems Engineering
TM	Technical Management

The following courses are not necessarily offered every term, nor are they necessarily offered at all campus locations.

Graduate Course Descriptions

AE - Aerospace Engineering

AE 501

Numerical Methods for Engineers and Scientists
3 Credits

Numerical methods for the solution of engineering physics problems; systems of linear equations, ordinary differential equations, including one-dimensional initial value problems and boundary value problems; partial differential equations (PDEs), including elliptic, parabolic, and hyperbolic PDEs; finite difference method. Application to problems such as diffusion, transport, remote sensing, inversion, and plasma waves. Emphasis will be on computer implementation of numerical solutions.

AE 502

Strength and Fatigue of Materials
3 Credits

Analysis of stress and deformation in rods, beams, plates, shells, and solids using the elementary theories of elasticity and plasticity. Theories of strength, impact fatigue, and creep. Computer methods and applications.

Prerequisite: Consent of the department.

AE 504

Advanced Compressible Flow
3 Credits

Classification and solution of compressible flow problem, basic conservation laws, and fundamental theorems of compressible flows. Wave phenomena; normal and oblique shocks. Method of characteristics and wave interactions. Perturbation theories and similarity rules. Linearized supersonic flow, axisymmetric flow wing theory, and wave drag. Nonlinear theories of transonic and supersonic flows.

Prerequisite: Consent of the department.

AE 506

Airplane Dynamic Stability
3 Credits

Small-disturbance theory and linearized solutions of the general equations of motions. Aerodynamic derivatives, derivative analysis, aerodynamic transfer functions. Dynamic stability of uncontrolled longitudinal and lateral motions. Computer solution of dynamic stability problems. Inverse problems. Automatic stability and control. An introduction to automatic flight controls and feedback control system analysis.

Prerequisite: Consent of the department.

AE 508

Heat Transfer
3 Credits

One- and two-dimensional steady and unsteady-state conduction heat transfer including an introduction to finite difference and finite element methods of analysis. Free and forced convection heat transfer. Radiation heat transfer.

Prerequisite: Consent of the department.

AE 510

Aircraft Structural Dynamics
3 Credits

Vibrations of deformable elastic structures using the assumed modes method. Analysis of a continuous system for specialized cases. Undamped and damped free and forced vibration of single-degree-of-freedom and multiple-degree-of-freedom system. Computer programming skills are necessary.

Prerequisite: Consent of the department.

AE 512

Combustion
3 Credits

Equilibrium and kinetics of combustion processes. Law of mass action, Arrhenius reaction rate law, heat of reaction, and adiabatic flame temperature. Conservation equations of reacting flows. Applications of conservation equations.

Prerequisite: Consent of the department.

AE 514

Introduction to the Finite Element Method
3 Credits

Basic equations of the theory of elasticity. Energy principles. Formulation and assembly of stiffness matrices and load vectors for elastic solids. Modeling considerations. Solution methods. Computer implementation of finite element and stress analysis procedures. Interpretation of computer solutions. Design applications.

AE 516

Computational Aeronautical Fluid Dynamics
3 Credits

Potential flow theory. Panel methods. Applications of numerical methods and the digital computer to inviscid flow analysis. Lifting line, vortex lattice fundamentals. Use of computer codes.

Prerequisite: Graduate standing.

Graduate Course Descriptions

AE 518

Acoustic Emission Nondestructive Testing

3 Credits

Fundamentals of acoustic emission testing. Macroscopic origins. Wave propagation. Acoustic emission sensors and their calibration. Source location. Applications. Survey of commercial acoustic emission sensors and systems. Current research.

AE 520

Perturbation Methods in Engineering

3 Credits

Investigation of gauge functions, asymptotic expansions and singular perturbation problems. Use is made of the method of straining parameters and method of multiple scales along with the evaluation of self-excited systems. The Duffing equation. The Mathieu equation. Boundary-layer problems and gyroscopic problems are reviewed.

AE 522

Analysis of Aircraft Composite Materials

3 Credits

Fiber materials, tapes cloths, resin systems. Theory of elastic anisotropic materials. Elastic constants for multi-ply composites. Matrix formulation. Computer analysis. Strength and theory of failure. Sources and use of experimental data. Design considerations.

Prerequisite: Graduate standing.

AE 524

Rocket Engine Propulsion Systems

3 Credits

Analysis of combustion and expansion processes. Thrust nozzle performance analysis and design techniques. Characteristics of liquid propellants and liquid propellant rocket motors. Characteristics of solid propellants and interior ballistics of solid propellant rocket motors. Cooling techniques. Thrust vector control methods.

Prerequisite: Graduate standing.

AE 526

Engineering Optimization

3 Credits

Numerical optimization methods are presented and applied to the solution of engineering problems. Constrained problems and Kuhn-Tucker conditions. Optimization model construction. Sequential unconstrained optimization. Direct methods for con-

strained problems. Structural optimization. Genetic algorithms and the method of simulated annealing and their applications in research and engineering problems. Case studies in mechanical and aerospace engineering.

AE 528

Advanced Incompressible Aerodynamics

3 Credits

Kinematics and dynamics, thin airfoil theory, finite wing theory, bluff body flow, the Panel Method, numerical techniques, unsteady loads, vortex flows.

AE 530

Aeroacoustics

3 Credits

Sound and wave characteristics, levels and directives, hearing and physiological effects of noise, noise control criteria and regulations, instrumentation, acoustic materials and structures, aircraft components, acoustic analogy, computational aeroacoustics.

AE 590

Graduate Seminar

1-3 Credits

A study of the most current advancements in a particular field of study as determined by the instructor of the course. The course will have a different topic each term depending on the varied interests of the students, the graduate faculty, or the research requirements of the Aerospace Engineering department.

Prerequisite: Consent of the department.

AE 606

Finite Element Aerospace Applications

3 Credits

Development of finite element representation of continuum using Galerkin and variational techniques. Boundary elements. Applications to statics and dynamics of solids, structures, fluids, and heat flow. Includes the use of finite element codes.

Prerequisite: Graduate standing.

AE 610

Advanced Computational Fluid Dynamics

3 Credits

Application of vortex lattice, panel element, and boundary element methods to incompressible and compressible three-dimensional aerodynam-

Graduate Course Descriptions

ics flow problems. Wing and wing-body analysis. Incorporation of boundary integration for more complete modeling.

Prerequisite: Graduate standing.

AE 612

Analysis of Aircraft Plate and Shell Structures

3 Credits

Bending and buckling of plates. Cylindrical bending. Boundary value problems. Axisymmetric problems. Deformation of shells. Energy principles. Stress and stability analysis. Approximate methods. Finite element methods. Computer applications.

Prerequisite: Graduate standing.

AE 616

Advanced Aircraft Structural Dynamics

3 Credits

Analysis of structures subjected to dynamic loads. Hamilton's principle and Lagrange's equations. Rayleigh's principle. Numerical evaluation of natural frequencies and modes. Mode superposition and direct integration methods for dynamic response. Finite element modeling. Component mode synthesis. Computer applications.

Prerequisite: Graduate standing.

AE 620

Boundary Layer Theory

3 Credits

Navier-Stokes equations for laminar and turbulent flows. Boundary layers. Jets, wakes, elementary turbulence modeling. Skin friction, separation, drag and aerodynamic heating. Approximate and exact finite-difference solutions including the effect of suction and blowing. Solutions of turbulent boundary layer equations.

Prerequisite: Graduate standing.

AE 640

Turbine Engine Propulsion Systems

3 Credits

Advanced theory of turbojet, multispool fan jet, variable cycle engines, and bypass air-breathing propulsion systems. Design and off-design performance analysis, theory and design of inlets, compressors, burners, and turbines. Component matching, cooling, regenerative systems, test methods, and corrections. Engine post-stall behavior.

Prerequisite: Graduate standing.

AE 646

Nonlinear Dynamical Systems and Chaos

3 Credits

Mathematical and experimental methods for the study of bifurcation and chaos in dynamical systems are described. Systems described by difference equations. Bifurcations of equilibrium points. Systems described by ordinary differential equations. Phase plane analysis. Limit cycles, nonlinear oscillations, and chaotic vibrations. Chaotic transitions, period doubling, and intermittency. Examples of chaos in mechanical, electrical, magnetic, fluid, chemical, and biological systems.

AE 648

Thermal Stresses in Aerospace Engineering

3 Credits

Basic equations of thermoelasticity. Thermal structures problems; rods, beams, and plates. Thermally induced vibration. Thermal buckling. Thermoviscoplasticity.

AE 652

Turbulent Flows

3 Credits

Laminar-turbulent transition, turbulent flow equations of motion. Definition of turbulence. Modeling, coherent structure, and large-Eddy simulations. Longitudinal and lateral correlations in homogeneous turbulence. Integral scales of turbulence. Eulerian space and time correlations. Lagrangian time correlations and diffusion. One- and three-dimensional energy spectrums. Hot-film anemometry.

AE 696

Graduate Internship in Aerospace Engineering

1-3 Credits

Temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. They are academic/professional activities coordinated by the University between offering organizations and the graduate student.

Prerequisite: Graduate standing.

Graduate Course Descriptions

AE 699

Special Topics in Aerospace Engineering

3 Credits

Guided independent study of selected topics not offered in regularly scheduled classes. Arrangements and work requirements established by prior agreement of instructor and students. Students should expect to spend at least 60 hours of research for each credit hour.

Prerequisite: Graduate standing.

AE 700

M.S.A.E. Thesis

9 Credits

A master-level research project in Aerospace Engineering conducted under the supervision of the student's advisor and thesis committee. Submission of a final report, approved by the thesis committee, and an oral defense of the research work are required for thesis credits to be earned.

AED - Aviation Education

The University recognizes that certified elementary and secondary school educators interested in incorporating aviation/aerospace concepts into their existing curricula may not have the necessary background or resources to fulfill this desire. Courses developed and offered as summer workshops address these deficiencies during a time that is compatible with educators' schedules. The course length of two weeks fulfills the requirements of the Florida Department of Education for earning three graduate course credits, or 60 in-service points. These courses may not fulfill other states' Department of Education requirements.

AED 501

Aviation/Aerospace Foundations for the Elementary Curriculum

3 Credits

A foundations course that provides elementary teachers who have little background in integrating aerospace and aeronautical concepts into the classroom curriculum with an opportunity to enhance their knowledge in these areas. This course includes such subjects as engineering, space sciences, historical aviation/aerospace applications, meteorology, astronomy, environmental sciences, aviation literature, and human physiology. This course also provides a survey of methods and demonstrations to adapt materials to the educators' respective grade

level. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

AED 502

Aviation/Aerospace/Earth Science Foundations for the Secondary Curriculum

3 Credits

A foundations course that provides a comprehensive examination of aviation/aerospace teaching concepts using state-of-the-art simulator applications, emphasizing the classroom organizational skills needed in today's high-technology environment. Topics from engineering, space sciences, historical aviation/aerospace applications, meteorology, geography, environmental sciences, geology, and human physiology are examined in detail. Each student has the opportunity to become familiar with a specific area of aviation by developing a sample curriculum that is presented to the rest of the class at the end of the course. Each student uses simulators, videos, computers, and other resources to supplement his/her academic instruction. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

AED 503

Natural Sciences with Aviation Applications

3 Credits

An applications course providing educators who have a background in science with the opportunity to experience real-world applications using aviation and aerospace concepts. This applications course also provides strategies and techniques to facilitate the use of aviation/aerospace applications in natural science instruction in the classroom.

Prerequisite: Basic algebra and trigonometry. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

AED 504

Introduction to Space Flight

3 Credits

A study of the concepts, development, and application of space flight technology, emphasizing the U.S. role in current and future space operations. Topics covered include history of space flight, space shuttle operations and crew training, commercial space applications, spacecraft systems, and the outlook for the future. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

Graduate Course Descriptions

AED 601

Advanced Pedagogical Applications of Aviation/
Aerospace Concepts

3 Credits

An advanced course that provides educators with background in mathematical, meteorological, engineering, psychological, and physiological principles as applied to the aviation and aerospace fields. The course also provides educators with techniques and strategies used to implement aviation and aerospace concepts in the classroom.

Prerequisites: AED 501 and/or AED 502, or Flight Training. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

BA - Business Administration

BA 503

Business Foundations (503A, 503B, 503C, 503D,
503E, 503F)

1 Credit Each

This course examines in depth the major competencies that have been identified as essential prerequisite knowledge for a graduate student enrolled in the MBA/A degree program to successfully complete the coursework. The course is broken down into six stand-alone modules in the discipline areas of management, quantitative methods, marketing, accounting, economics, and finance. Each student will take only those modules identified through advisement as being required. Emphasis is placed on understanding the core knowledge and skills in each of the disciplines. Credit for this course is not applicable to the requirements of any Embry-Riddle degree.

BA 511

Operations Research

3 Credits

An advanced study in the use of mathematical and scientific tools and techniques in managerial decision making. Operations research seeks to determine how best to design and operate a system, usually under conditions requiring the allocation of scarce resources. Emphasis will be on the applications of these methods in aviation and aviation-related industries. Topics include linear programming, probabilistic dynamic programming, game theory, forecasting, queuing theory, transportation, decision making under uncertainty, network models, and Markov Chains.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 514

Strategic Marketing Management in Aviation

3 Credits

The traditional role of marketing management is enlarged to include the development, implementation, and control of marketing strategies in the dynamic aviation/aerospace organization. Emphasis is on the application of the strategic marketing process in the turbulent global aviation business environment. Strategic marketing decisions, analysis, and issues are integrated with the goal of achieving customer satisfaction to gain a sustainable competitive advantage in the aviation industry.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 517

Accounting for Decision Making

3 Credits

A study of management's use of accounting information to make decisions related to planning, controlling, and evaluating the organization's operations. Using electronic spreadsheets, the budgeting function and use of performance reports is demonstrated. The behavior and management of costs, as well as techniques used to evaluate and control results of operations, are discussed. Topics include cost-volume-profit analysis, activity-based costing in production and service companies, decentralized operations, and differential analysis techniques. Through the use of case studies, current readings, and course projects, emphasis is placed on aviation and aviation-related industries.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 518

Managerial Finance

3 Credits

A study of the theoretical and practical approaches to effective financial management. Planning, analyzing, and controlling investment, and short- and long-term financing are examined for decision-making purposes. Emphasis is placed on the application of these methods in the aviation and aviation-related industries. Topics include capital budgeting, risk and

Graduate Course Descriptions

diversification, asset liability management, airport financing, aircraft financing, financial derivatives, financial engineering, swaps, options, financial future, and international finance.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 520

Organizational Behavior, Theory, and Applications in Aviation

3 Credits

This course focuses on current organizational issues that have a direct impact on management in the aviation industry. The emphasis is on human development and the development of effective work elements as well as the personnel concerns that must be resolved for successful leadership. Topics will provide insights into behavior, structure, authority, motivation, leadership, organizational development, and social responsibility.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 521

Global Information and Technology Management

3 Credits

The course will develop knowledgeable and effective users of information technology in aviation and aerospace management occupations. A combination of technical and managerial material is presented. This material is necessary to achieve an understanding of the operations and strategic uses of management information systems in the aviation industry. Emphasis is placed on the use of computers as an information processor, a decision tool, and a means of linking management more closely to the organization. In addition, topics relating to the management of information resources are presented.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 522

Business Research Methods

3 Credits

An introduction to the art and science of solving aviation business research problems and making students better users of research. Topics include research design, the scientific method and other

research methodologies, problem formulation, operational definition, measurement and its impact on error and design, classification, and modeling. The application of statistics, sampling surveys, decision analysis, management science techniques, and the use of statistical/operations research computer software are studied. An introduction of a style manual for the preparation of a research proposal. Weekly lab session required.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 523

Advanced Aviation Economics

3 Credits

A study of economic applications to the aviation and aerospace industry. Students will examine the evolution of market forces in the industry with particular emphasis on airlines, airports, and manufacturing. Concepts of yield management, air passenger demand forecasting, price and cost study, airport economics, air and land space optimization strategies, government's role in aviation, international implications of competition and government regulation, economic analysis of safety, and other relevant industry issues are examined. Emphasis is placed on an increasingly international air transportation environment.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 590

Graduate Seminar

1-3 Credits

A study of the most current advancements in a particular field of study as determined by the instructor. The course will have a different topic each term depending on the varied interests of the students, the graduate faculty, or the research requirements of the Aviation Business Administration department.

Prerequisites: As announced by the instructor conducting the seminar.

BA 603

Aerospace Production and Operations Management

3 Credits

An advanced study of production and operations management as it relates to the planning, coordinating, and executing of all activities that create

Graduate Course Descriptions

goods and services in a global aeronautic/aerospace environment. Special quantitative and qualitative emphasis is placed on the blending of the concepts of industrial engineering, cost accounting, reliability and availability, and general management in the context of core production and control decision activities, such as capacity planning, product design, layout of facilities, selecting of locations for facilities, quality assurance, fleet planning, scheduling, inventory management, and project management. Special emphasis is placed on the examination of recent trends in global competition, increased reliance of quality for competitive technology transfer into production systems, and the increased value added by worker involvement in problem solving and decision making.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 604

International Management and Aviation Policy 3 Credits

An advanced study of international management and aviation policy through the examination of major trends and issues challenging the aviation manager. Cross-cultural situations are evaluated from the perspective of interpersonal relationships in a diverse domestic and foreign environment, and in the context of evolving global trends. Strategic planning and negotiation are examined by defining the major tasks involved in organizing for international aviation, such as designing the organization and staffing. Managing workforce diversity is examined from culture-based and comparative perspectives, along with the function of control through the examination of effective control systems for overseas operations that ensure environmental interdependence through social responsibility and ethical behavior.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 607

Human Resource Development 3 Credits

This course emphasizes the integration of the individual into the organization by studying the current and fundamental issues in organization theory and organizational behavior as they relate to the individual. The effectiveness of the individual in the organization is examined in terms of personal traits

such as communicative abilities, leadership style and potential, and beliefs about organizational ethics and social responsibility.

Prerequisites: Successful completion of Business Foundation courses and/or permission of the graduate program chair.

BA 609

Airline Operations and Management

3 Credits

An integrated study of airline operations and functions. Domestic and international regulation of air carriers and the industry's changing structure due to alliances and globalization are addressed. Airline economics, airline marketing and pricing, computer reservation and revenue management systems, fleet planning and scheduling, aircraft maintenance, aircraft finance, labor relations, organizational structure, and strategic planning are studied.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 610

Airline Optimization and Simulation Systems

3 Credits

The airline industry provides an application-rich environment for the field of optimization and simulation systems. This course explores a variety of optimization models and simulation techniques commonly adopted by and integrated into airline decision making for the solution of multiple scheduling and planning problems. This course examines the technical aspects of modeling in network transportation systems, including issues involved in optimizing scheduling, fleet assignment, aircraft routing, crew pairing, gate assignment, and irregular operations. Discrete-event simulation models will be explored to determine their applications in the schedule-planning process. The course explores how airline companies handle their short, medium, and long-term schedule planning using these methodologies.

Prerequisite: Successful completion of BA 511.

BA 615

Investments

3 Credits

This course provides a survey of investments including security markets, investment vehicles, investment analysis, and portfolio management. Specific topics include the concept of risk and return, types

Graduate Course Descriptions

of financial instruments, security valuation, mechanics of trading, the survey of investment companies, asset allocation for individual and institutional investors, the concept of efficient markets, equity and bond portfolio management, and portfolio performance evaluation. The course is taught from the viewpoint of both an individual and institutional investor. The course uses case studies from the airline and aerospace industries, Web-based investment simulation, and current economic and capital market information to provide practical application of the course materials.

Prerequisite: Successful completion of BA 518.

BA 618

Advanced Corporate Finance

3 Credits

Airlines, airports, and manufacturers are complex, capital-intensive enterprises operating volatile, international markets. Consequently, participants in the industry rely on a variety of financial instruments to raise necessary capital and to manage financial risk arising from uncertain demand and supply markets. While building on the finance concepts developed in Managerial Finance, this course examines the complicated financial structures and advanced financial tools employed in the aviation industry. Concepts covered include project finance, financial derivatives (real options, interest rate swaps and hedges, forward contracts and futures), financial modeling using simulation and optimization techniques, and international financial management (foreign exchange exposure management, foreign investment and capital allocation, multinational cash and tax management). The course relies on current articles and cases to explore the application of advanced financial concepts to the aviation industry.

Prerequisite: Successful completion of BA 518.

BA 620

Organizational Theory

3 Credits

This course is an advanced study of the history, theory, and principles behind organizational design, and the role of structure in organizational effectiveness. Other topics include the impact of reengineering and organizational changes on employee and firm performance, and designing for a global and electronic environment.

Prerequisites: Satisfactory completion of the Business Foundation courses and/or permission of the graduate program chair.

BA 625

Airline Marketing

3 Credits

A study of the functions and basic concepts of marketing air transportation services. Discussion includes passenger and cargo markets, determinants of travel demand, growth factors, seasonality, and cargo traffic categories characteristics. Product and service elements, roles of advertising and travel agents, marketing unit structure, pricing and cost environment, and schedule planning are also among the topics examined.

Prerequisites: Demonstrated completion of Business Foundation courses and/or permission of the graduate program chair.

BA 630

Aviation/Aerospace Systems Analysis

3 Credits

This course is a study of systems theory and its relationship to aviation/aerospace systems management. The course covers a brief history of systems theory and the system life cycle concept, and explains the major activities in each phase of a system's life cycle. Also examined are specific topics related to system design and support, including reliability, maintainability, availability, customer support, product improvement, and the role of data collection and analysis. Related topics covered are cost effectiveness analysis and sensitivity analysis. The course examines applications and case studies specific to aviation/aerospace, including military applications and computer simulation models.

BA 632

Seminar in Aviation Labor Relations

3 Credits

A study of union movement, labor legislation, representation elections, the collective bargaining process, contract administration, and conflict resolution. The focus of the course will be on current issues in labor relations, and the evolution of private and public sector bargaining practices in the aviation industry. The impact on human resource management is analyzed.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

Graduate Course Descriptions

BA 635

Business Policy and Decision Making

3 Credits

A capstone course in the MBA/A program that expands on the skills, knowledge, and abilities the students have achieved in their core courses. Students will examine applications of long-term planning and management tools in aviation-related industries and will be able to formulate strategic vision and policies to achieve such a perspective. Concepts of strategic management, total quality management, continuous quality improvement, reengineering, customer-driven management, and other evolving management methodologies will be examined. Applications of the concepts will be applied to the domestic and international activities of airlines, airports, manufacturing, and government to sustain a long-term competitive advantage.

Prerequisites: Completion of all MBA/A core courses.

BA 645

Airport Operations and Management

3 Credits

A study of the management and operation of public-use airports. Specifically, traffic forecasting, sources of revenues and expenses, management of passenger and cargo terminal buildings, ground handling of passengers and baggage, ground access systems, and the U.S. Federal Aviation Administration Regulations dealing with airport operations. Current problems with environmental impact, land-use planning and control, airport capacity and delay, public relations, airport finance, airport privatization, liability, and economic impact will be covered.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 646

Air Cargo Logistics Management

3 Credits

This course provides an introduction to different topics related to the planning and operations of air cargo systems. These topics include identifying the main components of an air cargo system, the competition between air cargo and other surface-transportation modes, network and capacity planning, demand analysis and trends in the domestic and international markets, air cargo revenue man-

agement, cargo strategic alliances, revenue proration agreements, supply chain in air cargo management, shipper and forwarder interaction, ground/sorting operations, airport relations, e-commerce in air cargo management, marketing air cargo service, and air cargo security. The course also introduces students to several air cargo management and logistics computer software and applications. It also presents several study cases in air cargo management and market analysis.

BA 650

Airline/Airport Relations

3 Credits

A comprehensive examination and analysis of the symbiotic and often volatile relationship between airline management and airport management is provided. This course focuses on the varying perspectives toward issues that airline and airport management must address in order to effectively operate. The student will develop an understanding of current global issues impacting the relationship between airlines and airports. Airline scheduling, fleet management, finance agreements, contracts and negotiation, service agreements, marketing issues, passenger and baggage handling, ground transportation, labor relations, public/media relations, and strategic management are studied.

Prerequisite: Successful completion of either BA 645 or BA 609.

BA 651

Strategic Airport Planning

3 Credits

An advanced study of airport operations and management designed from a strategic management perspective. In the course, a number of management tools emphasizing computer software applications used in strategic airport planning will be introduced.

Prerequisite: Successful completion of either BA 645, BA 609, or BA 650.

BA 655

Aviation Law and Insurance

3 Credits

Examination of the governmental regulatory functions affecting statutory and administrative law pertaining to aviation. The national and international impact of these laws on aviation policies and operations are studied. The legal aspects of business contracts, negotiable instruments, and commercial code

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as they relate to aviation are analyzed. The course concludes with an overview of the principles of insurance and risk applied to aviation.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 690

Graduate Research Project

3 Credits

A written document on an aviation/aerospace topic that exposes the student to the technical aspects of writing. This course is included in the MBA/A curriculum to provide the student with the opportunity to pursue a project of special interest, but not to the level of a thesis. This is an elective course for those students who want the opportunity to research in-depth a topic in consultation with a project advisor.

Prerequisites: Successful completion of BA 522 and permission of the graduate program chair.

BA 696

Graduate Internship in Aviation Business Administration

1-3 Credits

Temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. They are academic/professional activities coordinated by the University between offering organizations and the graduate student. Prior approval of the graduate program coordinator is required.

BA 699

Special Topics in Business Administration

1-3 Credits

The election to perform a special, directed analysis and/or independent study in an area of particular interest. Candidates selecting this elective must prepare a detailed proposal for the desired project and present the proposal to the graduate program chair or department chair for faculty review. Proposals must be submitted at least four weeks prior to the start of the term in which the elective is being taken.

Prerequisites: Satisfactory completion of Business Foundation courses and/or permission of the graduate program chair.

BA 700

Thesis Research

6 Credits

A written document on an aviation/aerospace topic supervised throughout its preparation by the student's Thesis Committee, which demonstrates the student's mastery of the topic and is of satisfactory quality for publication.

Prerequisites: Successful completion of BA 522 and permission of the graduate program chair.

Computer Engineering

CEC 510

Digital Signal Processing

3 Credits

Fundamentals of discrete-time signal processing. Data acquisition, analog-to-digital and digital-to-analog conversions, sample rates, aliasing, and anti-aliasing filtering. Spectral analysis and system identification. Discrete-time filter design and implementations on digital signal processing microprocessors.

Prerequisite: Graduate standing or department chair permission required.

Electrical Engineering

EE 500

Digital Control Systems

3 Credits

A digital control system is a computer-based control system which is (the/a controlling) part of a larger system, such as a robot or UAV; it can make control decisions and communicate with various peripheral devices. Microcontrollers are single-chip computers, and this course deals with microcontroller-based control systems, also known as embedded systems. This course covers the following topics: (a) basic architecture of microcontrollers; (b) basic analog and digital input/output, including analog-to-digital converters and digital-to-analog converters; (c) advanced communications with other intelligent devices; (d) hardware design for embedded systems, including the applications of many different types of sensors and actuators as well as input and display devices; and (e) firmware programming for embedded systems using high-level programming languages. Various projects will be included in this class.

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Prerequisite: Graduate standing or department chair permission required.

EE 505

Advanced Mechatronics

3 Credits

This course includes an advanced study of the modeling and analysis of dynamic systems, system identification techniques, control sensors and actuators, analog and digital control electronics, interfacing sensors and actuators to a microcomputer/microcontroller, analog and digital controller design, and real-time programming for control.

Prerequisite: Graduate standing or department chair permission required.

EMBA - Business Administration

EMBA 540

Organizational Communication and Information Systems

3 Credits

The information age is vastly different from the industrial age, and information is rapidly being accepted as a key economic resource alongside traditional factors of industrial production. Course participants undertake an advanced study of information management trends and technologies and their strategic uses in aviation and aerospace industry settings. The case method is used to investigate rapidly emerging topics such as cyberspace and the Internet, as well as more traditional subjects such as the use of state-of-the-art hardware and software suites to find and sustain a competitive edge. Complete information systems, and the structures, dynamics, and linkages of global, information-based organizations, are afforded special attention.

EMBA 542

Accounting for Decision Making

3 Credits

This course examines the role of accounting in the information flow of the organization and emphasizes the needs and requirements of aviation and aerospace executives in their efforts to measure and control performance. The focus is on understanding how information is generated, assessed for reliability, and used for performance assessment and

resource allocation in an aviation/aerospace context. Participants cover the basic concepts, standards, and practices of financial reporting from the point of view of an executive user. The impact of managerial decisions on financial statements, as well as the impact of accounting policy on corporate strategy, are addressed. Topics include analysis of basic financial statements, valuation problems, cost analysis, activity-based costing, the use of budgets, and the design of management control systems. Specific aviation applications are emphasized throughout the course.

EMBA 544 and 545

Quantitative Analysis for Management Decision Making I & II

4 Credits

This course develops the theory and methods of business decision making, including intelligence, design, and choice, with special emphasis on aviation and aerospace applications. Participants will master the conceptual application of statistical methods and reasoning in the context of an aviation business environment. This course is designed to improve the industry managers' decision-making skills as they encounter uncertainty and competing decisions. Topics include statistical sampling and estimation, regression analysis and forecasting, decision theory, game theory, linear programming, and queuing theory.

EMBA 546

Production/Operations Management

3 Credits

Aviation industry trends point to the re-emerging importance of finding ways to add value in the technologies and techniques that transform basic resources into marketable products and services. This course is an advanced study of production and operations management as it relates to the planning, coordination, and execution of all activities that create goods and services in the global aviation/aerospace industry. A strategic perspective of operations is maintained throughout. Case analysis and group participation are used to investigate topics such as manufacturing, capacity planning, facility layout, location planning, services scheduling, inventory management, aircraft maintenance, and the quality imperative.

EMBA 548

Global Economic Analysis for Executives

3 Credits

This course defines the importance of the global external economic constraints in which business decisions are made. Participants will develop an awareness of the broad implications of market mechanisms as the guiding force in the world economy. Participants will use quantitative tools and techniques to solve a variety of global economic problems faced by today's managers. The unique economic challenges facing aviation and aerospace executives will be emphasized. Topics to be examined include profit maximization and cost minimization, input and output pricing, price determination under different market structures, national economic measures, monetary and fiscal policy, interest rates, international economics, stabilization policies, and labor economics.

EMBA 550

Global Marketing Management

3 Credits

As global competition becomes the norm in the aviation and aerospace industry, it is increasingly important for firms to focus on building and maintaining successful customer relationships. This course examines how firms respond to internal and external forces that impact global marketplace behavior, meet increasing customer expectations, and manage competitive pressures. Strategic models and frameworks are examined for their usefulness in aiding the aviation or aerospace executive to meet the demands of the global customer. Topics to be covered include environmental scanning, market research, consumer and organizational markets, segmentation and database marketing using the computer reservation system, marketing communications, building a global image, and product positioning and pricing.

EMBA 552 and 553

Managerial Finance I & II

4 Credits

This course explores the principal challenges faced by corporate finance managers in their quest to maximize shareholder value. Participants develop an analytical framework using the fundamental building blocks of financial theory, including the concepts of risk, return, and the time value of money. Course content focuses on investment and financing decision making in areas such as capital budgeting, capital structure, dividend policy, and working capital

management. Additional topics include the costs and benefits of using financial instruments to manage risk, the impact of financial markets, financial institutions, and government policy on strategic decisions such as corporate restructuring, mergers and acquisitions, and joint ventures in the international marketplace. Specific industry-related topics, such as aircraft and airport financing, are also covered.

EMBA 554

Leadership and Entrepreneurship

3 Credits

Leadership and entrepreneurship require creating organizational direction, setting strategy, and developing new ventures. In the increasingly competitive global economy, aviation and aerospace managers must develop the necessary skills to lead organizational development and change and to motivate their employees to innovate. This course explores the interpersonal competencies necessary for effective leadership in situations requiring motivation of both individuals and teams. In addition, the course examines how these competencies enhance a positive environment for organizational change and entrepreneurship. Through case analysis and application, concepts such as managerial leadership, individual and team motivation, venture capital, global partnerships, innovation venture, formation of wealth among venture founders and investors, and the entrepreneurial act will be applied to aviation and aerospace industry problems.

EMBA 660

Applications of Organizational Behavior

3 Credits

The successful manager has subordinates who willingly put forth their best effort to accomplish organizational goals. Achieving this managerial success requires knowledge of individual and group behavior. Global competition in the aviation/aerospace industry demands that firms balance the demands of higher productivity and lower costs. This course is designed to provide executives with a thorough understanding of the application of organizational theories and concepts to issues facing the aviation and aerospace industry such as motivating and managing part-time, temporary, and contract employees. Selected readings, individual and group exercises, and case analysis will be used to investigate topics such as individual motivation, decision-making, group dynamics, and communication. A special section on human resource management will deal with

Graduate Course Descriptions

issues of personnel selection and placement, team design, performance appraisal, and labor relations.

EMBA 662

Personal Communication and Teamwork

3 Credits

As aviation and aerospace organizations continue to evolve, executives who want to lead their organization must understand and appreciate the role of effective personal communication. Teamwork is becoming increasingly important for global organizations as hierarchical management structures are replaced by cross-functional teams composed of multicultural employees selected from varying organizational departments. This course examines the role of communication in managing teams and its impact on team dynamics. How a manager/coach/team leader communicates with team members and the effect of that leader's communication on group participation and performance is investigated. Topics include interpersonal communication skills in a global organization, communication skills in a group setting, team building, group dynamics, and role incongruity.

EMBA 664

Global Market Forces and Ethical Responsibility

3 Credits

Aviation and aerospace executives face a new set of global market challenges at an ever-increasing pace. Managers must address many legal, ethical, technological, and competitive issues. These global forces must be dealt with, while at the same time recognizing the increased burden placed on organizations to conduct their activities in a legal and responsible manner. This course leads the participant in an examination of societal, government, and legal forces and their impact on the formulation of global strategy. Participants will analyze how to recognize and respond to these forces. Topics include governments and the law, demographic trends, telecommunications and the growth of satellite communications, the growth of the Internet as a global marketplace, and societal and ethical responsibility.

EMBA 668

Culture and the Diverse Workplace

3 Credits

Today's workforce is more diverse than in the past. In the increasingly global aviation/aerospace industry, this workforce spans continents and cultures. Managing this new workforce creates new problems

and new opportunities for organizations and the people who run them. This course examines the issues of national and organizational culture in the context of the modern workplace. Executives will investigate cultural differences that affect perception, motivation, performance, and team effectiveness in the global workplace. They will also develop an in-depth portrait of the organizational culture of selected firms. These portraits will be used to illustrate the role of organizational culture, as well as to demonstrate ways to maintain, strengthen, and change culture. Other topics include communicating in a diverse environment, the global transfer of organizational culture and practices, and conflict management and negotiation strategies.

EMBA 670

Technology and Innovation Management

3 Credits

Technology is a ubiquitous global force that must be understood to be managed well. This course examines strategic and tactical problems found in aviation/aerospace industry scenarios where innovation in products and processes is critical, and where the technical performance of products and services is a main criteria of success in time-constrained projects. The strategic view emphasizes evolutionary models of technological evolution and revolution, and addresses issues such as paradoxical management, technology transfer, intellectual property protection, and the productivity dilemma. The tactical view emphasizes contemporary tools and techniques for managing projects and addresses issues such as project selection, concept-to-commercialization product development, organizational forms and processes, monitoring and auditing, and project termination.

EMBA 672

Designing the High Performance Organization

3 Credits

This course is an advanced study of the theory and principles behind organizational design. An examination of real-world organizational structures will be used to illustrate the role of structure in effective internal and external communications, information gathering, service delivery, and financial and managerial control. Executives will investigate the impact of reengineering and organizational change on employee and firm performance. There will be an in-depth study of transformations in the constraints and opportunities facing firms in the aviation/aerospace industry that necessitate change, and the signs of dysfunctional structures. Other topics include

designing the global corporation, designing for innovation, and designing for a networked organization. There will be a special focus on the role of strategic alliances, including partner selection, desired outcomes, and alliance stability.

EMBA 674 and 675

Strategic Management I & II

4 Credits

This is an integrative course that promotes the development of a cross-functional management perspective. Participants focus on the analysis of the firm's external and internal environments to identify and create competitive advantage in a global context. Aviation and aerospace business case studies will be used to explore the issues of defining corporate objectives, evaluating opportunities and threats, and formulating strategies and tactics. The course content emphasizes the cultural, ethical, political, and regulatory facets of the global business environment, and highlights the need for leadership and organizational evolution in the successful management of strategic change. Topics include total quality management, continuous quality improvement, reengineering, and other evolving management methodologies.

EMBA 700

Executive Project

3 Credits

As the program's capstone activity, the executive project is designed to benefit both the participant and the sponsoring organization by giving the participant the opportunity to apply the knowledge and diagnostic competencies learned throughout the program to a specific business issue of the sponsor. Issues are selected by the sponsor and participant and approved by a faculty project advisor in module #3. Working from the perspective of a consultant, the participant thoroughly investigates the issue and proposes specific actions, using the analysis, planning, and management tools developed during each course. Continuous guidance and feedback are provided by the faculty project advisor and sponsor during the project. The completed project will require a comprehensive written report as well as a formal oral presentation.

EP - Engineering Physics

EP 501

Numerical Methods for Engineers and Scientists
3 Credits

Numerical methods for the solution of engineering physics problems; systems of linear equations, ordinary differential equations including one-dimensional initial value problems and boundary value problems; partial differential equations (PDEs) including elliptic, parabolic, and hyperbolic PDEs; finite difference method. Application to problems such as diffusion, transport, remote sensing, inversion, and plasma waves. Emphasis will be on computer implementation of numerical solutions.

EP 505

Advanced Spacecraft Dynamics and Control

3 Credits

Review of dynamic systems modeling, analysis, and control; orbital dynamics, orbital maneuvers, and control. Attitude sensors and sensing techniques are especially emphasized. Techniques for limb sensing, lunar and solar sensing, and ultra high accuracy stellar imaging techniques are explored. Passive attitude control techniques including spin, dual-spin, gravity-gradient, and magnetic stabilization. Active control using cold and hot gas jet thrusters, momentum wheels, reaction wheels, and control moment gyros. Robust optimal attitude control maneuvers of a complex spacecraft required for scientific instruments and the requirements of the measurements that they are performing, such as velocity vector alignment, limb scanning, and image stabilization, are emphasized.

EP 509

Advanced Space Physics

3 Credits

Plasma physics applied to the interplanetary medium and planetary magnetospheres: solar wind. Magnetohydrodynamics. Interaction between planetary magnetospheres and the solar wind. Auroral dynamics. Planetary atmospheres and ionospheres. Magnetosphere-ionosphere coupling. Energetic particle dynamics. Ring currents. The space radiation environment. Space weather. Satellite missions to Earth and other planets.

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EP 600

Experimental Methods in Space Science

3 Credits

Measurement techniques for ground-based, rocket, and satellite-borne experiments are explored. Advantages, disadvantages, and limitations are quantitatively developed. In situ atmospheric composition measurements, charged particle detection for plasma characterization, optical remote sensing, and imaging techniques are included.

EP 605

Spacecraft Power and Thermal Design

3 Credits

Spacecraft power and thermal energy management. Spacecraft power systems; sources of power; power subsystem function and design; energy storage devices; future concepts in spacecraft power systems. Review of the modes of heat transfer: conduction, radiation, and convection. Space environment, heating fluxes. Spacecraft thermal analysis. Thermal control hardware and design; active and passive thermal control. Emphasis on the design needs of instruments and their detector systems' power and thermal requirements.

EP 696

Graduate Internship in Engineering Physics

1-3 Credits

Temporary professional or industrial work appointments are made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. They are academic /professional activities coordinated by the University between offering organizations and the graduate student. Prior approval of the graduate program coordinator is required.

EP 699

Special Topics in Engineering Physics

1-3 Credits

Guided independent study of selected topics not offered in regularly scheduled classes. Arrangements and work requirements established by prior agreement of the instructor and students, subject to approval of the program committee and department chairman.

EP 700

Master of Science in Space Science Thesis

1-9 Credits

A master-level research project in Space Science/ Engineering Physics including an oral thesis defense and a written report satisfying all graduate school guidelines. The work is supervised by the student's advisor and thesis committee. The approval of the thesis committee is required to receive final thesis credit.

HFS - Human Factors and Systems

HFS 500

Systems Concepts, Theory, and Tools

3 Credits

The ability to think at a systems level will be developed. Formal systems principles; systems requirements analysis; knowledge acquisition techniques; information modeling; information management; decision support; systems evaluation.

HFS 505

Systems Engineering I

3 Credits

Practical application of design, build, and test processes applied to systems that incorporate hardware, software, and human components. Focus is on the integration of system components throughout the product life cycle. Lab is a required part of this course.

Prerequisite: HFS 500.

HFS 510

Research Design and Analysis I

3 Credits

Foundation and procedures of research techniques, tools, and methods. Course reviews the principal concepts of research design and evaluation. The application of experimental, case-study, survey, and nonexperimental techniques are explored. Identification, isolation, and treatment of dependent and independent variables is covered. Use of existing published research or data is used to highlight principles. Lab is a required part of this course.

Prerequisite: Completion of an undergraduate course in statistics. (This course is the same as MSA 665.)

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HFS 515

Ergonomics

3 Credits

This class will address the basic concepts of ergonomics and their application to the design of human-machine systems and products. Consideration of human physiological, biomechanical, and biological capabilities and limitations in design for human efficiency, safety, and comfort; anthropometry. Ergonomic issues related to the design of control and display systems, instrument panels, workplaces, seating, and tools will be addressed.

Prerequisites: HFS 500, and completion of an undergraduate course in human factors.

HFS 520

Team Resource Management

3 Credits

This course addresses the social-psychology underpinnings of what is commonly referred to as team resource management and cockpit resource management (CRM). The class will review and discuss the basic theoretical concepts from social psychology and relate them to the effective operation of aviation teams. It will identify and discuss the basic issues associated with the effective evaluation of CRM-type programs.

HFS 525

Human and Organizational Factors in Technological Systems

3 Credits

Theoretical paradigms in human computer interaction and their application to interface design; advanced interface technologies such as multimodal input/output, hypertext, and knowledge-based systems.

HFS 530

Systems Psychology

3 Credits

This course will be designed to provide the student with a very level view of human factors and ergonomics and how they fit into the overall system design and evaluation process. This class will address the human's role and effectiveness as a system constituent. It will take a very high level, systemic, and theoretical approach, rather than a detailed empirical one. It will provide an overview of the system science and the time-phased, iterative systems approach. It will also review the assumptions and limitations of the analytic tools used to

incorporate people into complex systems including systems test and evaluation tools.

HFS 590

Graduate Seminar

3 Credits

A study of current topics and advancements in human factors, aviation psychology, and related areas as determined by the instructor of the course. The course will have a different topic each time it is offered depending on the varied interests of the faculty, students, or availability of visiting professors.

Prerequisite: As announced by the instructor conducting the seminar.

HFS 600

Human Factors in Systems

3 Credits

Survey of human factors literature. Introduction to topics including human capabilities and human interfaces with human-machine systems, workload, anthropometrics, perception, workspace design, visual momentum. The course will study human limitations in the light of human engineering, human reliability, stress, and human physiology. The course will discuss human behavior as it relates to the aviator's adaptation to flight, air traffic, and maintenance environments.

HFS 605

Systems Engineering II

3 Credits

Studies on the value of prototyping in the application of design, build, and test processes. In-depth focus on the innovation of conceptual designs in short time-cycle engineering. Lab is a required part of this course.

Prerequisites: HFS 500 and HFS 505.

HFS 610

Research Design and Analysis II

3 Credits

This course is the advanced program in experimental design and analysis. The focus is the design, planning, and considerations involved in complex, multivariate experiments. Major areas of examination will include factorial designs, nested variables, linear models, multiple regression, measures of covariance, and Latin square designs. Considerations in selecting the appropriate experimental design is the focus of this course. Examination of appropriate statistical techniques is integrated with the theoretical and

Graduate Course Descriptions

practical concepts of experimental design. Lab is a required part of this course.

Prerequisite: HFS 510.

HFS 611

Work Physiology

3 Credits

This course will focus on the human as a biomechanical entity and evaluate the physiological loads and stresses of which we are capable. Topics include anthropometric applications, muscle and strength exertions, metabolism and work, the redesign of deteriorated and artificial body parts, and circadian rhythms in work design. The student will gain knowledge of the architecture, functioning, and biomechanics of bones, joints, muscles, tendons, and ligaments and the forces and torques that move the body at work or sports. The course will examine energy extraction from food and drink, and how human ability depends on the cooperation of the respiratory, circulatory, and metabolic systems. The effects of environmental conditions (lighting, noise, heat, cold, humidity, air movement) and shift work (day, evening, and night work; shift schedules) on task performance will be discussed in practical terms.

Prerequisite: HFS 600.

HFS 615

Sensation and Perception

3 Credits

This class will address advanced issues in human information processing with specific regard to the physical and psychological variables associated with sensory and perceptual phenomena. Attention will be paid to all the human sensors, with particular focus on perceptual issues related to system design, evaluation, and certification. While all the senses will be covered, special attention will be paid to the visual and auditory senses. Lab is a required part of this course.

Prerequisite: Completion of an undergraduate course in the area of sensation and perception. (This course is the same as MSA 660.)

HFS 620

Memory and Cognition

3 Credits

This course will examine the tremendous gains in memory and cognition research to obtain an understanding of how these theoretical and empirical

advances have been, or might be, applied to problems of human-machine interactions and system design. Topics include the total range of memory and cognitive processes and their potential application to systems design: sensation perception, pattern recognition, attention, language, memory, concept formation, thinking, decision making, problem solving, timesharing, reaction time, action, manual control, and the impact of automation. Lab is a required part of this course.

Prerequisite: Completion of an undergraduate course in the area of memory and cognition. (This course is the same as MSA 663.)

HFS 625

Applied Testing and Selection

3 Credits

Issues in selecting and testing applicants for a broad range of positions in aviation and related industries are the focus of this course. An examination of the methodologies used since World War I through the present is covered. The change in methodologies used and the level of sophistication of assessment techniques involved is examined across pilot, air traffic controller, maintenance, and aviation security screener personnel. A significant portion of this course is devoted to an understanding of the performance assessment techniques used to evaluate selection systems as well as the personnel selection instruments used. Problems in both criterion and assessment measurement are discussed in detail.

Prerequisites: HFS 510 and HFS 610.

HFS 630

Cognitive Systems

3 Credits

The course addresses applied cognitive science, which draws on the knowledge and techniques of cognitive psychology and related disciplines to provide the basis for principle-driven design. Specifically it addresses human cognitive behavior in complex worlds that exist without the artificial boundaries of the laboratory. It specifically addresses those domains where there are multiple agents (that is, cognitive systems) and that are problem-driven and tool-constrained. The course also addresses the impact of mismatches between the models of the designers, their software, and the users.

Prerequisites: HFS 600 and HFS 620.

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HFS 635

Human-Computer Interaction

3 Credits

This course stresses the importance of good interfaces and the relationship of user interface design to human-computer interaction. Other topics include interface quality and methods of evaluation interface design examples; dimensions of interface variability; dialogue genre; dialogue tools and techniques; user-centered design and task analysis; prototyping and the iterative design cycle; user interface implementation; prototyping tools and environments; I/O devices; basic computer graphics; color and sound. A lab is a required part of this course.

Prerequisite: Completion of an undergraduate course in human factors or human/computer interaction. (This course is the same as MSA 661.)

HFS 640

Aviation/Aerospace Psychology

3 Credits

This survey course covers the primary areas of work in the aviation psychology specialization. Topic areas may include the effects of alcohol on performance, aviation safety and accident investigation, cockpit and air traffic control automation, display and control issues and design, personnel selection, task analysis, workload assessment, training research and development, scale development methodologies, and crew resource management. The topic areas change from semester to semester depending on the focus of the current research environment. This course has a strong emphasis on methodological issues, problematic research concerns, and statistical issues. The majority of coursework involves extensive readings in the specialization from conference proceedings, journal articles, and training manuals. A critical analysis of research is the focal point for this course.

Prerequisite: Completion of an undergraduate course in the area of aviation/aerospace psychology.

HFS 645

Underpinnings of Human Factors and Ergonomics

3 Credits

Survey of historic human factors literature, particularly those papers considered classics. The class will review the key personalities, papers, theories, and research programs that provide the basis of current theory and best practice. The key historic papers addressing human capabilities, human-machine systems, workload, anthropometrics, perception, work-

space design, and visual momentum will be read and critically discussed. The course pays particular attention to the key research addressing aviation psychology, cockpit design, cognitive engineering, and human physiology.

HFS 650

Human Factors of Aviation/Aerospace Applications

3 Credits

This class will address the basic concepts of the application of human factors principles and theories to the effective design and operation of various aviation/aerospace applications. It will address these areas from a historical perspective and in relation to the future operational concepts of the applications. Issues to be addressed could include function allocation between human and machine, human computer interface, work environment (for example, stress circadian rhythms), person-to-person communications, performance measurement, and research and development needed.

Prerequisite: Completion of an undergraduate course in human factors.

HFS 660

Human Factors and Aircraft Safety and Airworthiness I

3 Credits

Aircraft safety and airworthiness will be considered as a coherent process running from the design of the aircraft to the monitoring of its condition in airline service. This class covers the technical aspects of certification along with the legal and economic implications. This class will specifically address the certification of an airliner, the safety of complex systems, and on-board software. This class is offered only at the Ecole Nationale de l'Aviation Civile.

Prerequisites: HFS 500, HFS 590, HFS 600.

HFS 665

Human Factors and Aircraft Safety and Airworthiness II

3 Credits

Aircraft safety and airworthiness will be considered as a coherent process running from the design of the aircraft to the monitoring of its condition in airline service. This class covers the technical aspects of certification along with the legal and economic implications. This class will specifically address the human factors of air transport safety and quality approval

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and concept. This class is offered only at the Ecole Nationale de l'Aviation Civile.

Prerequisites: HFS 500, HFS 590, HFS 600, HFS 660.

HFS 670

Human Factors and Aircraft Safety and Airworthiness III

3 Credits

Aircraft safety and airworthiness will be considered as a coherent process running from the design of the aircraft to the monitoring of its condition in airline service. This class covers the technical aspects of certification along with the legal and economic implications. This class will specifically address operational procedures, maintenance procedures, and continuing airworthiness. This class is offered only at the Ecole Nationale de l'Aviation Civile.

Prerequisites: HFS 500, HFS 590, HFS 600, HFS 660, HFS 665.

HFS 696

Graduate Internship in Human Factors and Systems

3 Credits

Supervised placement in an industrial, governmental, or consulting setting. The student completes a specific project under the supervision of an organizational sponsor and a faculty member.

Prerequisite: As announced by the instructor.

HFS 699

Special Topics in Human Factors and Systems

3 Credits

Completion of an area of study under the direct supervision of a faculty member. The course requirements and area of study are negotiated between the faculty member and the student with the approval of the department chair.

HFS 700

Thesis

1-6 Credits

The performance and a written description of a master-level research project. The topic of the thesis will be approved and supervised throughout its preparation by the student's major professor and thesis committee. This project will provide evidence of the student's ability to perform applied research at the graduate level.

Prerequisites: Completion of all core courses in the Human Factors Engineering track or the Systems Engineering track.

MA - Mathematics

MA 502

Boundary Value Problems

3 Credits

Basic techniques of solving boundary-value problems of partial differential equations by employing the methods of Fourier series orthogonal functions, operational calculus including Laplace transforms, other integral transforms, and Cauchy's residue calculus. Applications to heat transfer, fluid mechanics, elasticity, and mechanical vibrations. Computer applications.

Prerequisite: MA 441 or equivalent.

MA 504

Theory of the Potential

3 Credits

Potential theory and Green's function. Method of characteristics and solution of Cauchy's initial value problem for first and second order equations. Numerical methods. Application to fluid mechanics, electromagnetic fields, heat conduction, and other areas. Computer applications.

Prerequisite: MA 502.

MA 505

Statistics

3 Credits

Descriptive statistics and graphical depiction of data; confidence intervals and hypothesis testing for the mean, difference between two means, variance, ratio of two variances, proportion, and difference between two proportions; simple and multiple regression, including model development, inferences, residual analysis, outlier identification, and verification of assumptions; fundamental concepts of design of experiments; justification of linear models; construction and analysis of basic designs including one-way, block designs, and Latin squares; multiple comparisons.

Corequisite: MA 503 or MA 441.

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MA 506

Probability for Engineers

3 Credits

Foundations, combinations, conditional probability, expectations, and applications to discrete sample spaces. Random variable in one or more dimensions. Various continuum distributions. Characteristic functions. Applications to engineering problems. Computer applications.

Prerequisite: MA 441 or equivalent.

MA 510

Fundamentals of Optimization

3 Credits

Overview of several important general types of optimization problems; development of mathematical models; linear programming; the simplex method; introduction to sensitivity analysis, networks; applications involving Maple and Excel.

Prerequisite: MA 345.

MA 520

Mathematical Programming and Decision-Making

3 Credits

A continuation of MA 510. Development of mathematical modeling techniques with an emphasis on integer programming, nonlinear programming, and multiple-criteria decision-making techniques; case studies from aviation/aerospace involving mathematical programming and decision-making.

Prerequisite: MA 510.

MA 605

Statistical Quality Analysis

3 Credits

Fundamental concepts of statistical quality control, including Shewhart charts, cusum charts, EWMA charts, multivariate charts, tolerance limits, and capability analysis. Further development of concepts in statistical design of experiments including use of factorial designs, fractional factorial designs, and use of central composite designs. Several nonparametric statistical techniques, including sign test, signed-rank test, rank-sum test, Kruskal-Wallis test, runs test, and Kendall's Tau. Advanced regression topics, including the use of transformations, weighted least squares regression, and detection of influential points. Throughout the course, industrial applications will be emphasized, including the use of several case studies.

Prerequisite: MA 505.

MA 610

Multivariate Optimization

3 Credits

Multiple objective optimization with an emphasis on response surface methodologies and goal programming; inclusion of group decision-making techniques in model development; case studies from aviation/aerospace emphasizing multivariate model development, and determination of optimal solutions.

Prerequisites: MA 520 and MA 605.

MA 690

Graduate Research Project

3 Credits

An applied problem on an aviation/aerospace topic that requires the use of optimization and/or quality-improvement skills.

MA 699

Special Topics in Mathematics

1-3 Credits

Students may elect to perform a special, directed analysis and/or independent study in an aviation area of particular interest. A detailed proposal of the desired project must be developed and presented to the department chair or center director for faculty review and recommendation, three weeks prior to the end of registration for the term.

MA 700

Thesis

6 Credits

Written and defended documentation of a research project conducted under the supervision of a faculty committee. The research must be at the level of a published paper in an appropriate journal, as determined by the faculty committee.

MAAF - USAF Safety Education

MAAF 608

Aircraft Mishap Investigation

3 Credits

This course is an overview of aircraft mishap investigation and the management of a mishap investigation. The course will enable the student to

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understand and to apply aircraft mishap investigation techniques and procedures, including the collection, preservation, and analysis of mishap site data. The course will familiarize the student with aircraft structures, aircraft systems, records and performance, and their associated involvement in aircraft mishaps. The course will equip the student with knowledge of human factors, human performance, physiological, and psychological limitations that apply to mishap investigation. The course prepares the student to analyze evidence collected and to develop findings, causes, and recommendations required from an aircraft mishap. Use of a site laboratory will provide practical field experience. Equivalent to MSA 608.

MAAF 611

Aviation/Aerospace Mishap Prevention Management

3 Credits

This course is an overview of aviation/aerospace safety management and the application of safety management principles and techniques to the management of aviation/aerospace operations. Topics include hazard identification, risk analysis and management, flight safety programs, cabin safety, ground and maintenance safety, safety cultures in organizations, and emergency response programs. The course emphasizes accident prevention through systems engineering and safety management in all phases of a system's life-cycle. Equivalent to MSA 611.

Mechanical Engineering

ME 500

Clean Energy Systems

3 Credits

This course will emphasize energy systems for both stationary and transportation applications. General energy requirements will be discussed for industrialized societies and the effects of waste energy and undesired byproducts. Clean energy process and minimizing the environmental effects. Examples of energy systems to be considered are fuel cells, wind energy, wave energy, geothermal energy, and solar energy.

Prerequisite: Graduate standing or department chair permission required.

ME 503

Unmanned and Autonomous Vehicle Systems

3 Credits

A systems-level overview of theory and practice of unmanned and autonomous vehicle systems, including hardware, software, and algorithm development. Topics include an overview of locomotion platforms (including land, air and marine platforms), actuators and motion control, sensors and perception (including GPS, inertial, magnetic, active ranging, computer vision, photo detectors, and encoders), planning and navigation (including reactive, deliberative, and hybrid approaches to autonomy), shortest path algorithms (including the Dykstra and A* algorithms). Case studies, readings from current literature, and guest lectures present best practice in the field.

Prerequisite: Graduate standing or department chair permission required.

ME 506

Design for Manufacturing and Assembly

3 Credits

Manufacturing processes and life cycle design for the aerospace industry. Tolerances and materials properties. Design for manufacturing and associated costs for various manufacturing processes (machining, casting, molding, stamping, forming, forging, and extrusion) with aviation-related case studies. Design for product assembly and total assembly cost with case studies. Selection of materials and processes using design for manufacturing guidelines, standards, and tolerance fittings. Simulations using computer graphics software. Design for manufacturing course project.

Prerequisite: Graduate standing or department chair permission required.

ME 508

Hydrogen and Hybrid Vehicle Systems

3 Credits

This course is an introduction to the principles of hybrid electrical vehicle propulsion systems for Mechanical and Electrical Engineering students. A major emphasis of the course will be to broaden the mechanical engineering student's knowledge of electrical engineering so that he/she can understand the fundamentals of electrical motors, electrical motor controls, and electrical energy storage systems. The course is also intended to strengthen the knowledge of electrical engineering students relative to automotive powertrain design. With this background, the integration of these hybrid electric components into

the hybrid electric vehicle powertrain system will be studied, including electric energy storage (batteries, flywheels, ultra-capacitors) and electrical energy production-fuel cells.

Prerequisite: Graduate standing or department chair permission required.

ME 510

Micro-Electrical Mechanical Systems

3 Credits

This course introduces modeling and design fundamentals for Micro-Electro-Mechanical Systems (MEMS). Basic principles covered include reviews of electrical and mechanical concepts, static-dynamic mechanical MEMS beams with emphasis on capacitor-based sensing and actuation, electromagnetic modeling of MEMS switches. Applications covered include pressure sensors, accelerometers, gas microsensors and microfluidic systems.

Prerequisite: Graduate standing or department chair permission required.

ME 696

Graduate Internship in Mechanical Engineering

3 Credits

This course involves temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. Internships are academic/professional activities coordinated by the University between participating organizations and a graduate student.

Prerequisite: Graduate standing or department chair permission required.

ME 700

Graduate Thesis

9 Credits

A master-level research project in Mechanical Engineering conducted under the supervision of the student's advisor and thesis committee. Submission of a final report, approved by the thesis committee, and an oral defense of the research work are required for thesis credits to be earned.

Prerequisite: Graduate standing or department chair permission required.

MSA - Aeronautical Science

MSA 508

Advanced Airport Modeling

3 Credits

A study of advanced airport and airspace planning to support day-to-day operations, resource allocation, and strategic analysis. Emphasis is put on the use of computer software to create working airport and airspace models to solve common airport and airspace operational problems. Airport and airspace background material and procedures will be covered in supplemental lectures. The Total Airport and Airspace Modeler (TAAM) software will be used as the primary planning and analysis tool. TAAM is the most advanced and comprehensive interactive software available for this type of analysis. Students are taught how to use the TAAM software on a UNIX-based SUN workstation. To accomplish this task, students will be divided into research teams for purposes of developing a simulation and conducting the group object portion of the course. Each team will be assigned a project of completing a realistic working simulation model of an actual airport, which they will then use to solve an operational problem.

Prerequisites: Demonstrated knowledge of flight rules and regulations and basic knowledge of the aviation industry, airports, and commercial aircraft used in the national air transportation system.

MSA 514

Computer-Based Instruction

3 Credits

This course addresses the design, development, and evaluation of instructional software as it applies to the aviation/aerospace industry. The course offers practice in the systematic design of computer-based instruction with emphasis in tutorials, drill and practice, and simulation. CBI lessons are developed using available authoring systems.

Prerequisite: Demonstrated knowledge of basic computer operations.

MSA 515

Aviation/Aerospace Simulation Systems

3 Credits

A comprehensive examination of simulation in modern aviation/aerospace that includes history, state-of-the-art, and current research and development. Discussion focuses on the extent and impact of simulator applications throughout the industry and the effects on training costs and safety. Topics include

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the flight crew being checked out, updated, evaluated, or retrained in aircraft and systems simulators to the simulation models used in management, flight operations, scheduling, or air traffic control.

MSA 516

Applications in Crew Resource Management

3 Credits

This course examines the common concepts of crew resource management (CRM) as developed by major air carriers and explores the theoretical basis of such training. Topics such as supervision of crewmembers, counseling, manner and style, accountability, and role management are studied. Each student has the opportunity to become knowledgeable in a specific area of CRM by assisting in the development of a CRM research document as part of the course. Additionally, each student uses simulators and computer-based instruction to supplement their academic instruction.

MSA 550

Aviation Education Foundations

3 Credits

This course assists in developing contexts and concepts in which educational problems and issues may be understood, particularly the role of aviation in education. Emphasis is placed on aviation education and its historical and philosophical foundations.

MSA 590

Graduate Seminar

1-3 Credits

A study of the most current advancements in a particular field of study as determined by the instructor of the course. The course has a different topic each term depending on the varied interests of the students, the graduate faculty, or the research requirements of the Aeronautical Science department.

Prerequisites: As announced by the instructor conducting the seminar.

MSA 601

Applications in Space: Commerce, Defense, and Exploration

3 Credits

The scientific, military, and commercial interests in international and domestic space programs are examined throughout the history of space flight. The needs of commercial space endeavors and the methods of expanding space technology into manufac-

turing are contrasted to the importance of scientific exploration and the requirements of military space operations. The justification, development, and costs of scientific exploration programs, defense-related projects, and commercial endeavors are used to study the evolution of space missions and the development of future programs.

Prerequisite: Demonstrated knowledge of spacecraft or satellite technology.

MSA 602

The Air Transportation System

3 Credits

A study of air transportation as part of a global, multimodal transportation system. The course reviews the evolution of the technological, social, environmental, and political aspects of this system since its inception at the beginning of the 20th century. The long-term and short-term effects of deregulation, energy shortages, governmental restraints, and national and international issues are examined. Passenger and cargo transportation as well as military and private aircraft modes are studied in relation to the ever-changing transportation requirements.

Prerequisites: Demonstrated knowledge of aviation rules and regulations and economics.

MSA 603

Aircraft and Spacecraft Development

3 Credits

This course is an overview of aircraft and spacecraft development. Included are vehicle mission, the requirements directed by economics, military and defense considerations, and research and developmental processes needed to meet vehicle requirements. Aviation and aerospace manufacturing organizations and techniques are addressed, including planning, scheduling, production, procurement, supply, and distribution systems. The course studies the aviation and aerospace maintenance systems from the built-in test equipment to the latest product-support activities.

Prerequisites: Demonstrated knowledge of college-level mathematics and economics.

MSA 604

Human Factors in the Aviation/Aerospace Industry

3 Credits

This course presents an overview of the importance of the human role in all aspects of the aviation and

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aerospace industries. It emphasizes the issues, problems, and solutions of unsafe acts, attitudes, errors, and deliberate actions attributed to human behavior and the roles supervisors and management personnel play in these actions. The course will study human limitations in the light of human engineering, human reliability, stress, medical standards, drug abuse, and human physiology. The course will discuss human behavior as it relates to the aviator's adaptation to the flight environment as well as the entire aviation/aerospace industry's role in meeting the aviator's unique needs.

Prerequisite: Demonstrated knowledge of behavioral science.

MSA 605

Research Methods and Statistics

3 Credits

A study of current aviation research methods that includes techniques of problem identification, hypothesis formulation, design and use of data-gathering instruments, and data analysis. Research reports that appear in professional publications are examined through the use of statistical terminology and computations. A formal research proposal will be developed and presented by each student as a basic course requirement.

Prerequisites: Demonstrated knowledge of college-level mathematics, including introductory statistics, and basic computer operations.

MSA 606

Aviation/Aerospace Communications/Control Systems

3 Credits

A detailed analysis of current and future developments and trends in the control of air traffic, including the evolution of current national policies and plans and their objectives. The most recent planned improvements for each major component of the ATC system are examined individually and as part of the system as a whole.

Prerequisites: Demonstrated knowledge of flight rules and regulations and basic navigation.

MSA 607

Advanced Aircraft/Spacecraft Systems

3 Credits

State-of-the-art aircraft/spacecraft systems and projections of research trends for future air vehicle requirements and applications are studied. Topics

include the development, capabilities, and limitations of current aircraft/spacecraft propulsion, electrical, environmental, control, hydraulic systems, and subsystems. The total aircraft design, and the interdependence of aircraft system design constraints are emphasized, as well as current problems and solutions.

Prerequisites: Demonstrated knowledge of college-level mathematics, aircraft systems, and components.

MSA 608

Aviation/Aerospace Accident Investigation and Safety Systems

3 Credits

A critical analysis of selected aircraft accidents and an evaluation of causal factors. Particular emphasis is placed on the study of human factors connected with flight and support crew activities in aviation operations. Identification and implementation of accident prevention measures are stressed as integral parts of the development of a complete safety program.

MSA 609

Aircraft Maintenance Management

3 Credits

A detailed analysis of commercial air carrier and general aviation aircraft maintenance that includes regulation, organization and structure, capabilities and limitations, maintenance levels, inspection and reporting requirements, and prevention and correction inspections. Case studies of typical and unique maintenance scenarios are used. A major course objective is to heighten awareness of the critical interface of maintenance with flight, supply, and training activities.

Prerequisite: Demonstrated knowledge of management principles.

MSA 610

Applied Aviation Safety Programs (3,0)

3 Credits

This course treats the U.S. proactive voluntary programs that are part of the FAA-NASA integrated safety research plan, as well as the voluntary aviation safety information sharing in the air carrier industry. ATC performance monitoring review complements that for FOQA and ASAP carrier data. Carrier practices that address discovered threats (AQP and LOSA) add to the synoptic review. Organizational safety includes the IEP and the VDRP. Confidentiality and protection of the data, as

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codified in Part 91 for ASRS and later in Part 193, are integral to the success of the programs. Practical significance of both quantitative and qualitative data analyses generated by all the programs pertains to hazard and risk identification. Student synopses and analyses also address the IOSA and the ICAO safety SARPs.

Prerequisite: MSA 605.

MSA 611

Aviation/Aerospace System Safety

3 Credits

This course emphasizes the specialized integration of safety skills and resources into all phases of a system's life-cycle. Accident prevention, beginning with systems engineering together with sound management, are combined in this course to enable students to fully comprehend their vital roles in preventing accidents. The total program, from basic design concepts through testing, maintenance/systems management, and operational employment, is fully examined and evaluated.

MSA 612

Aviation/Aerospace Industrial Safety Management

3 Credits

This course examines the modern work setting from an aviation and aerospace safety and health point of view. Examination of the history of industrial safety leads the student to an understanding of why and how aviation/aerospace industrial safety management evolved into an advanced discipline. The roles of, and interactions between, government, corporation, safety management, and the worker in the dynamic, economy-driven environments of aviation and aerospace are central themes.

MSA 613

Airport Operations Safety

3 Credits

A study of airport operations safety as applied to day-to-day operations. A review and analysis of all federal regulations applicable to operations and safety are conducted.

Prerequisites: Demonstrated knowledge of performance of airports and airline operations management or related field.

MSA 614

Advanced Aviation/Aerospace Curriculum Development

3 Credits

This course will investigate the traditional manner of curriculum development and then proceed to prepare an instructional framework for a variety of aviation and aerospace instructional programs.

MSA 615

Applied Aviation Research Methods (3,0)

3 Credits

This course addresses the study of phenomena within aviation utilizing quantitative, qualitative, and mixed methods designs. A review of descriptive and inferential statistics precedes the introduction of power analysis and a multivariate statistical procedure. Advancing tools available for (a) the research methods and procedures, (b) the analysis and interpretation of the vast quantities of data currently available within the industry, and (c) setting the results into practice are the foci of the course. Although the primary emphasis is on aviation research, the information and skills learned in this course will be applicable to most careers.

Prerequisites: MSA 605 and approval of the instructor.

MSA 616

Air Traffic Management Leadership and Critical Decision Making (3,0)

3 Credits

This course is designed to give students in the Air Traffic Management and other related specializations a practical and comprehensive understanding of leadership theories and practice as well as critical decision-making processes that can be applied in government, FAA, organizations, and the aviation/aerospace industry. The primary purpose is to examine practical leadership skills and applications about what aviation leaders including Air Traffic Management leaders do and how they do it in order to be more effective. Students will understand the complexity of effective leadership, the source of knowledge about leadership in aviation organizations, and the limitations of this knowledge. Through the use of case studies in Air Traffic Management, Aviation Logistics, Aviation Maintenance, and Aviation Production and Procurement, students will analyze leadership in aviation, study critical decision-making concepts, and apply learned concepts to resolve problems in the industry.

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MSA 617

Air Traffic Management V (3,0)

3 Credits

This course expands on the skills, knowledge, and abilities the student has acquired in previous ATC classes. This course presents more demanding and complex traffic scenarios that require higher level performance and decision-making skills and prepares the student for initial training in any ATC specialization. Students will also gain an appreciation for the challenges of implementing large-scale changes in the National Airspace System. Upon successful completion of this course, students will demonstrate the knowledge and technical aptitude required for entry-level qualification as an air traffic control specialist. Students will demonstrate their ability to research, analyze, prepare, and present a paper in class that addresses a problem or question derived from the FAA's National Airspace System Capital Investment Plan. Problems will be analyzed through assignments and discussion.

Prerequisite: Air Traffic Management IV.

MSA 618

Air Traffic Management VI (3,0)

3 Credits

This course introduces students to the non-radar procedures and minima prescribed in FAAH 7110.65 and builds upon knowledge gained in prerequisite courses, all in a simulated environment. Training includes the vertical, lateral, and longitudinal separation of aircraft in the departure, en route, and arrival phases of flight. Phraseology, strip marking, instrument and visual approaches and the coordination procedures necessary to complete these functions are included in the simulated ATC scenarios. Students will demonstrate their ability to research, analyze, prepare, and present a paper in class that addresses a problem or question derived from the FAA's Next Generation Air Transportation System (NGATS).

Prerequisite: Air Traffic Management IV.

MSA 620

Air Carrier Operations

3 Credits

A study of air carrier flight operations systems from the viewpoints of the ground-based dispatcher, operations specialists, managers, and the cockpit flight crew. Topics include advanced flight planning, aircraft performance and loading considerations, impact of weather conditions, and routing priorities.

Prerequisites: Demonstrated knowledge of flight rules and regulations, basic meteorology, basic navigation, and basic aircraft performance.

MSA 622

Corporate Aviation Operations

3 Credits

The establishment and operations of a corporate flight department are examined along with the procedures and techniques generally accepted as standards by professional corporate flight operations. Included is a practical view of the corporate aviation mission of management mobility and use of the resources available to accomplish it.

MSA 627

Air Traffic Management in the NAS (3,0)

3 Credits

This course gives students an understanding of the political, economic, social, technical, and environmental importance of the air traffic control system in the National Airspace System. The course develops content knowledge in the following areas: the Federal Aviation Administration, its mission, organization, and operation; management and leadership concepts as they relate to a federal bureaucracy; safety management systems and culture; quality control; and air traffic facility management objectives and policies. Labor-management relations in the federal sector will also be covered, including statutes, regulations, and contracts; management rights and responsibilities; union and employee rights and responsibilities; grievances and unfair labor practices; the bargaining process; memoranda of understanding, facility directives, and past practices; participative management; supervisory notes; equal employment opportunities and model workforce issues; employee assistance programs; interpersonal skills; performance management and constructive discipline; employee ethics on and off the job; development from an organizational perspective; and technical training administration.

MSA 634

Aviation/Aerospace Psychology

3 Credits

A study of the complexities of human factors research in aviation, which draws extensively on such diverse areas as human physiology, basic learning theory, aviation safety, and pilot training. The course surveys the study of human behavior as it relates to the aviator's adaptation to the flight

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environment and attempts to design an occupant-friendly flight deck module.

MSA 636

Advanced Aviation/Aerospace Planning Systems

3 Credits

Planning and decision-making techniques and strategies used in the aviation industry are emphasized.

The types and sources of data needed for decisions about route development and expansion, fleet modernization, and new markets are examined. The methods of collecting, analyzing, and applying the data through computer applications, modeling, heuristic, value theory, and payoff tables are studied. The limitations and problems associated with strategic planning are discussed.

Prerequisites: Demonstrated knowledge of management principles and economics.

MSA 641

Production and Procurement Management in the Aviation/Aerospace Industry

3 Credits

The evolution of an air carrier aircraft from design concept to delivery is examined from the perspectives of the purchaser, manufacturer, component manufacturer, operator, and certifier/regulator. The study of the process begins with demand analysis and continues through purchase contracting, manufacturing, marketing, certification, predelivery activities, and introduction into service.

Prerequisites: Demonstrated knowledge of management principles and economics.

MSA 643

Management of Research and Development for the Aviation/Aerospace Industry

3 Credits

The types and sources of aviation/aerospace research and development are analyzed through study of the structure and interrelationship of the industry, educational institutions, and other organizations. Sources and methods of funding, specification determination, the relationship of research and development to procurement and production, and the regulatory factors affecting progress from the initial development to production of the aircraft and components are examined. Concepts of motivation and management as applied to research scientists and engineers will be studied as well as procedures

for promoting optimum creativity concurrently with efficient operations.

Prerequisites: Demonstrated knowledge of management principles and economics.

MSA 644

Integrated Logistics Support in Aviation/Aerospace

3 Credits

This course is a study of the elements of a modern integrated logistics system. The organizational structure, inventory management, principles of warehousing, traffic management, international logistics, and quality management principles as they apply to logistics are key elements. The impact of just-in-time systems and quality management principles on physical distribution and their relationship with integrated package and cargo carriers, advancements in intermodal transportation, and the deregulation of the transportation industry are probed. The characteristics of system design to meet requirements of reliability, maintainability, and supportability are examined. The economic feasibility of a logistics system, including a life-cycle cost analysis, is explored. The explosion of computer technology and its effect on electronic data interchange capability as they influence logistics policies and practices are explored. The use of computer software to solve logistics problems is introduced.

Prerequisites: Demonstrated knowledge of management principles and economics.

MSA 652

Continuing Education's Role in Aviation

3 Credits

Emphasis on assessing community needs relative to developing programs in continuing education for the adult learner, evaluation of existing programs, and the processes used in developing curricula for an adult continuing education program related to aviation.

MSA 654

Adult Teaching and Learning Techniques

3 Credits

The major instructional strategies used in education with particular emphasis on higher education and adult learning are the core of this course. Multiple approaches as they relate to academic disciplines and grade levels are studied. The unique "cockpit classroom" environment will be discussed and evaluated.

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MSA 660

Sensation and Perception

3 Credits

This course examines how the human senses transform stimulus patterns of physical energy into the neural codes that become our perceptions of the world. Topics include vision, audition, smell, taste, touch, balance; and phenomena common to all sensory modalities: feature enhancement, inhibition, adaptation, and stages of neural coding.

Prerequisite: Demonstrated knowledge of basic psychology or completion of an undergraduate course in psychology. (This course is the same as HFS 615.)

MSA 661

Human-Computer Interaction

3 Credits

This course discusses the importance of good interfaces and the relationship of user interface design to human-computer interaction (HCI). Topics include interface quality and methods of evaluation; interface design examples; dimensions of interface variability; dialogue genre; dialogue tools and techniques; user-centered design and task analysis; prototyping and the iterative design cycle; user interface implementation; prototyping tools and environments; I/O devices; basic computer graphics; and color and sound.

Prerequisite: Demonstrated knowledge of the use of computers, including programming familiarity with a high-level language.

MSA 663

Memory and Cognition

3 Credits

This course examines recent advances in memory and cognition research to obtain an understanding of how these theoretical and empirical advances have been, or might be, applied to problems of human-machine interactions and system design. Topics include the total range of memory and cognitive processes and their potential application to systems design such as sensation perception, pattern recognition, attention, language, memory, concept formation, thinking, decision making, problem solving, time sharing, reaction time, action, manual control, and the impact of automation.

Prerequisite: Demonstrated knowledge of basic psychology or completion of an undergraduate course in psychology. (This course is the same as HFS 620.)

MSA 665

Applied Experimental Design

3 Credits

The design, conduct, statistical analysis, and interpretation of common behavioral science research designs are covered in the context of aviation science topics. Students learn to differentiate research designs along dimensions of experimental/non-experimental approaches, questions of group differences, and questions of relationships between variables, adequacy of statistical power, statistical significance, and practical importance. Student projects include conducting statistical analyses and writing research results sections based on standard American Psychological Association format.

Prerequisite: MSA 605 or completion of an undergraduate experimental psychology course. (This course is the same as HFS 510.)

MSA 690

Graduate Research Project

3 Credits

A written document on an aviation/aerospace topic that exposes the student to the technical aspects of writing. This course is included in the MSA curriculum to provide the student with the opportunity to pursue a project of special interest, but not to the level of a thesis. This is a required course for those students who choose not to write a thesis.

Prerequisite: MSA 605.

MSA 696

Graduate Internship in Aeronautical Science

1-3 Credits

Temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. They are academic/professional activities coordinated by the University between offering organizations and a graduate student.

MSA 699

Special Topics in Aeronautical Science

1-3 Credits

Students may elect to perform a special, directed analysis and/or independent study in an area of particular interest. A detailed proposal of the desired

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project must be developed and presented to the center director or department chair for faculty review and recommendation at least three weeks prior to the end of registration for a term.

MSA 700

Thesis

6 Credits

A written document on an aviation/aerospace topic supervised throughout its preparation by the student's Thesis Committee, which demonstrates the student's mastery of the topic and is of satisfactory quality for publication.

Prerequisite: MSA 605.

MSF - Safety Science

MSF 500

Safety Science Foundations

1-6 Credits

Provided for students who may need to resolve deficiencies from undergraduate studies to be properly prepared for the advanced level courses. A review of algebra and trigonometry, basic calculus, statistics, physics, chemistry, and biological science as they relate to the safety profession. (Credit not applicable to any degree.)

1. Algebra and Trigonometry. A study of the basic laws of fractions, exponents, radicals, inequalities, quadratic equations, complex numbers, and the elements of trigonometry.
2. Basic Calculus. Differentiation and integration of algebraic functions; applications to velocity, accelerations, area, curve sketching, and computation of extreme values.
3. Statistics. Descriptive statistics; populations and samples; measures of central tendency and dispersion; elementary probability; binomial and normal distributions and their interrelationship; random variables; one- and two-sample hypothesis testing involving proportions and means for large and small samples; estimation and confidence intervals; Chi square distribution; correlation coefficient; least squares line.
4. Physics. Survey course in physics. Stress will be placed on basic concepts and principles of physics. Presentation will include selected topics in mechanics, heat, light, sound, electricity and magnetism, and modern physics.
5. Chemistry. Covers basic atomic theory, elements, compounds, and mixtures, calculation of weight

and weight volume relationships, basic descriptive chemistry. An overview of the current applications of chemistry and its future potential in human affairs. Applications to scientific decision-making in the business and industrial environment.

6. Biological Science. A survey course in general biological science, with emphasis on human biology. Includes basic cellular anatomy, biology, and biochemistry; viruses, bacteria, and protista; aerobic respiration and photosynthesis; mitosis and meiosis; genetics and inheritance, hereditary disorders in humans; and human tissues, organs, and organ systems.

MSF 530

Aircraft Accident Investigation

3 Credits

An examination of investigation as it pertains to aircraft accidents from the perspectives of the administrative, regulatory, and practical field investigation aspects. Emphasis will be on the evidence-gathering, preservation, and processing phases of accident investigation. An overview of organizations that conduct and participate in investigations, and an analysis of their roles in those investigations will be completed. Use of a laboratory will provide practical field experience. Research into investigative concepts and techniques will be an integral part of the course.

MSF 580

Industrial Hygiene and Environmental Protection

3 Credits

A study of the role and responsibilities of an industrial hygienist employed in technical industries. The course reviews the application of methods for the identification, evaluation, and control of industrial hygiene and environmental hazards encountered in the aviation and other workplaces. Specific hazards to be addressed include noise, vibration, ionizing and nonionizing radiation, thermal conditions, pressure, chemicals, airborne contaminants, and biological substances. Engineering and nonengineering controls as well as regulatory requirements will also be covered.

MSF 601

Ergonomics

3 Credits

This course studies the most common source of musculoskeletal injuries in the American workplace. These injuries, commonly labeled as overexertion or repetitive stress, are found in various forms in all workplaces. The course begins with a study of

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work physiology and its implications for workplace design and workplace safety. It covers biomechanics and its implications for workplace design, low back pain, and other overexertion injuries. It covers the various cumulative trauma disorders, including the importance of risk factors such as force, frequency, and posture. Setting up and managing an ergonomics program are discussed.

MSF 602

Human Factors

3 Credits

This course studies the role of human factors in workplace and work task design with emphasis on complex technical industries including aviation/aerospace. This study of human factors includes traditional material such as anthropometry, control/display design, visual and auditory acuity and their importance in work design, circadian rhythms and their implications for work design and shift work, psychomotor skills, and learning and memory. It also includes the human role as it relates to unsafe acts, attitudes, errors, and deliberate actions. Finally, the course studies the interface between human factors in workplace design and human error.

Prerequisites: Demonstrated knowledge of behavioral science, college-level mathematics, including introductory statistics, and basic computer operations.

MSF 603

Occupational Safety

3 Credits

This course provides a broad overview of occupational safety. It begins with an exploration of the history of the subject, moves through the OSH Act, workers' compensation, safety program development and management, and finally addresses a series of specific hazards. These hazards include machine guarding, material handling equipment, fall protection, fire protection, building design, and lighting. The application of safety and health management principles to the management of complex technical industries including aviation/aerospace are covered using scenario evaluations to determine OSHA compliance, accident/injury data evaluation and analysis, and OSHA log completion.

MSF 604

Quantitative Methods in Occupational Safety and Health

3 Credits

This course is a survey of quantitative methods pertinent to occupational safety and health. Topics include descriptive statistics, probability distributions, the idea of statistical significance, the distinction between parametric and nonparametric statistics, confidence intervals and hypothesis testing, correlation, regression, analysis of variance (ANOVA), and epidemiology. A formal research proposal may be developed and presented by each student as a basic course requirement.

Prerequisites: Demonstrated knowledge of college-level mathematics, including introductory statistics, and basic computer operations.

MSF 605

Industrial Hygiene Measurement

3 Credits

This course provides students with the knowledge and skills necessary to conduct basic industrial hygiene surveys. Hands-on laboratory experience is provided for the students, starting with equipment calibration and ending with completing a field-sampling project. Particulate sampling for both total and respirable, gravimetric analysis, gas/vapor sampling with tubes and impingers, dosimeters, use of direct reading instruments and detector tubes, are all covered. The fundamentals of sample analysis are presented. Case studies are presented to emphasize the strategies used to select sampling locations, times, and individuals.

MSF 606

Control Methods in Occupational Safety and Health

3 Credits

This course studies the methods commonly used by OSH professionals to control aviation and industrial workplace exposures to health and safety hazards. The most commonly used control for industrial health hazards is industrial ventilation, so this control method is studied in detail, with students learning to complete basic ventilation system designs and to evaluate moderately complex designs. Students may also learn to use ventilation system testing equipment to verify a system is working as designed and to troubleshoot a system that is not working properly. The proper use of and the potential failure modes associated with personal protective equip-

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ment are evaluated. In addition, measurement and control methods for noise and vibration are examined through a series of lectures and class projects.

MSF 607

Epidemiology
3 Credits

Epidemiology is the basic science underlying all public health programs, whether implemented privately in industry or publicly by government organizations. This course will deal with the distribution and causes of diseases (including all forms of illness, injury, and accidents) in specified populations. This will be applied to the control of health problems through the understanding of the causes of those problems.

MSF 608

Toxicology
3 Credits

Toxicology is the study of the adverse effects of chemicals on living organisms. Its relevance to OSH is that most occupational diseases are the result of workplace exposures to chemicals. Our job as OSH professionals is to prevent the adverse effects of these exposures, and to do this we must understand the toxic effects and their mechanisms. This introduction to toxicology will provide students with the basic knowledge needed to interpret the toxicological aspects of the OSH literature, including OSHA/NIOSH/EPA reports; to discuss toxicological issues with toxicologists and understand them; and to provide elementary explanations of toxicological issues to the people they serve.

MSF 609

System Safety
3 Credits

An in-depth review of system safety management principles and system safety engineering techniques are combined in this course to enable students to fully comprehend their vital roles in preventing accidents. This course emphasizes the specialized integration of system safety analytical techniques and risk management into all phases of a system's life-cycle using a system safety program that is tailored to an organization's mission. System safety's relationship with other disciplines such as reliability, maintainability, human factors, and product liability will be examined in the context of government, military, and general industry.

Prerequisite: Demonstrated knowledge of college-level mathematics, including introductory statistics.

MSF 610

Industrial Security
3 Credits

This course will intensively focus on the various aspects of business intelligence and industrial security as they apply to complex and technical industries. Of prime concern are risks, threats, and countermeasures. Topics include intelligence theory and intelligence operations; foreign and domestic organized crime; industrial espionage; riots and disasters; terrorism; sabotage; hijacking; internal security; cybercrime; legal and ethical issues; de facto and regulatory roles of local, regional, and national governments, international agencies, and nongovernmental organizations; social and cultural factors; strategic planning and investment vulnerabilities; physical, operations, communications, and personnel securities.

MSF 615

Aerospace Occupational Safety and Health Program Management
3 Credits

Addresses the application of management principles and techniques to the management of aviation safety and health programs. Topics include planning, organizing, budgeting, resourcing, training, operating, and evaluating management processes as they relate to aviation safety and health programs. Regulatory requirements and other standards along with the measurement and evaluation of safety performance and loss control accountability are included throughout the course.

MSF 630

Aircraft Accident Analysis
3 Credits

A critical analysis of selected aircraft accidents that involves extensive field work, teaming, a thorough investigation, detailed examination, group-process discussions, and decision making. Each team of student investigators will produce a professional report that includes the facts, the scenario, and an analysis of all potential factors, findings, and recommendations. Identification of accident prevention measures as a product of the analysis process is stressed. Identification and analysis of available and future loss-prevention technologies will be completed.

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MSF 635

Advanced Aircraft Survivability Analysis and Design

3 Credits

Entails a detailed analysis of the aircraft accident environment with particular emphasis on survivability factors. Explores factors and forces that cause injury and examines the injury-role played by impact forces and occupiable space compromises. Examines crashworthiness and delethalization technologies and concepts with a focus on the best ways to protect occupants during a crash. Selected aircraft accidents will be used as case studies. An in-depth review of basic kinematics and development of injury-related information will be completed.

MSF 645

Aircraft Fire Survivability Analysis and Design

3 Credits

Involves a detailed examination of basic fire science and the relationship of fire to aircraft accident survival. Examines current fire crashworthiness factors including fire development and propagation, injury and fatality mechanisms related to fire, and current evacuation systems in use. The focus will be on the configurational, procedural, environmental, and biobehavioral factors that influence survival in a fire situation. Case studies of accidents involving both in-flight and crash-related fires will be used. Identification and analysis of available and future fire-protection technologies will be completed.

MSF 655

Airline and Operations Safety Management

3 Credits

This course addresses the application of safety management principles and techniques to the management of airline operations and safety. Topics include hazard identification, accident/incident investigation, flight safety, cabin safety, ground safety, and emergency response programs. Regulatory requirements and airline standards as well as accident prevention strategies are included throughout the course.

Prerequisite: MSF 615.

MSF 675

Aviation Maintenance Safety

3 Credits

A study of the aviation maintenance safety practices, procedures, and policies in use throughout the

aviation industry. Includes the role of maintenance safety in relation to the overall safety management program in the organization. Case studies of maintenance-related accident prevention and loss control scenarios. The influence and role of the regulatory and compliance agencies in aviation maintenance safety.

MSF 680

Integrated Safety Operations - Capstone

3 Credits

Study of management theory, integrated arrangements, common constraints, developmental level, essential guidelines, staff liaison, project improvement, effectiveness audits, and collaboration needed to ensure success of the safety function. May include a written document on a safety topic, which exposes the student to the technical aspects of writing. This course is included in the MSSS curriculum to provide the student with the opportunity to study how the various domains of the safety and health occupation are integrated into a single program.

MSF 685

Aviation Security

3 Credits

This course will intensively focus on the various aspects of business intelligence and industrial security as they apply to aviation and to aviation safety. Of prime concern are risks, threats, and countermeasures. Topics include intelligence theory and intelligence operations; foreign and domestic organized crime; industrial espionage; riots and disasters; terrorism; sabotage; hijacking; internal security; cybercrime; legal and ethical issues; de facto and regulatory roles of local, regional, and national governments, international agencies, and nongovernmental organizations; social and cultural factors; strategic planning and investment vulnerabilities; and physical, operations, communications, and personnel securities. Readings, lectures, discussions, and case studies will be supplemented by team exercises resulting in security plans addressing risks, threats, countermeasures, and evaluative mechanisms.

MSF 686

Emergency Preparedness and Preplanning

3 Credits

This course is designed to increase the student's knowledge of emergency response procedures, safety and health hazards, and enforcement issues for industry. Topics include a thorough discussion

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of scope, application, definitions, and other related standards; elements of an emergency response plan; training requirements; the incident command system; medical surveillance; and postemergency response. Major elements involved in disasters and emergencies, preparedness planning, systems use, and attention to essential human services, with emphasis on community action and the development of successful, cost-effective strategies for implementing emergency and mitigation plans.

MSF 690

Graduate Research Project

3 Credits

A written document on a safety topic, which exposes the student to the technical aspects of writing. This course is included in the MSSS curriculum to provide students with the opportunity to pursue a project of special interest, but not to the level of a thesis. This is a required course for those students who choose not to write a thesis.

Prerequisite: MSF 604.

MSF 696

Graduate Internship in Safety Science

1-3 Credits

Temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. They are academic/professional activities coordinated by the University between offering organizations and a graduate student.

MSF 699

Special Topics in Safety Science

1-3 Credits

Students may elect to perform a special, directed analysis and/or independent study in an area of particular interest. A detailed proposal of the desired project must be developed and presented to the center director or department chair for faculty review and recommendation at least three weeks prior to the end of registration for a term.

MSF 700

Thesis

3 Credits

A written document on a safety topic supervised throughout its preparation by the student's thesis committee, which demonstrates the student's mastery of the topic and is of satisfactory quality for publication.

Prerequisite: MSF 604.

SE - Software Engineering

SE 500

Software Engineering Discipline

3 Credits

This course introduces students to the concepts and methods for disciplined software engineering processes. Students learn about and practice individual planning, tracking, analyzing, and managing of their time and defects, to fit the needs of small-scale program development. Students also study and use a team project process. The course provides a framework for the application and analysis of managed software engineering practices. Also discussed are the latest common and practical processes used in industry. Students will work individually and as a team to complete the course assignments.

Prerequisite: Practical knowledge of a modern programming language such as Ada, C, C++, or Java.

SE 505

Model-Based Verification of Software

3 Credits

This course is concerned with engineering practices that use formalized models as a basis for analyzing software artifacts. The course covers the key software engineering skills required, surveys a variety of techniques for model building and analysis, and includes sample problems and real-world systems for discussion and analysis. Applications of the techniques in the requirements, design, and coding phases of software development are investigated.

Corequisite: SE 500 or consent of instructor.

SE 510

Software Project Management

3 Credits

This course addresses management considerations in software systems development. It provides advanced

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material in software planning mechanisms for monitoring and controlling projects, and leadership and team building.

Corequisite: SE 500 or consent of instructor.

SE 520

Formal Methods for Software Engineering

3 Credits

A study of mathematical logic and proof techniques, discrete structures, and other mathematical topics that are used in software engineering; the use of formal methods in software specification; and an overview of the use of formal methods throughout the software life-cycle.

Prerequisite: Course in discrete mathematics or consent of instructor.

SE 530

Software Requirements Engineering

3 Credits

This course is concerned with the development, definition, and management of requirements for a software system or product. Topics include the software requirements process, requirements elicitation, requirements analysis, requirements specification, requirements verification and validation, requirements management, and requirements standards and tools. Students will participate in individual and group exercises related to software requirements engineering tasks.

Corequisite: SE 500.

SE 535

User Interface Design and Evaluation

3 Credits

This course provides an introduction to designing, implementing, and evaluating human-computer interfaces of various types. The theoretical foundation for designing interfaces is complemented by practical classroom exercises and the design and development of a prototype in a team-based setting using previously learned software engineering principles. Students will become acquainted with the literature related to user interface design and with the design of experiments for evaluating user interfaces.

SE 545

Specification and Design of Real-Time Systems

3 Credits

This course addresses basic concepts and methods used in software specification and design of real-

time systems. The characteristics of real-time systems and the role of software design in software development are explored. The course reviews software design methods specifically suited for real-time systems. Selected methods are analyzed and case studies are used to illustrate the design process. The course material may require research in real-time aspects of software design, laboratory experiments with software development tools and real-time development environment, and producing appropriate reports.

Prerequisite: SE 500.

SE 550

Current Trends in Software Engineering

3 Credits

Current techniques, methods, procedures, and paradigms of software engineering are studied. Students perform literature searches, collect data from software development experiments, and prepare written and oral reports on current software engineering practices.

Prerequisite: SE 500.

SE 555

Object-Oriented Software Construction

3 Credits

This course addresses the basic concepts of object-oriented software development. It provides an integrated view of subjects related to the different phases of software development using object-oriented techniques. The course covers object-oriented analysis and design (OOA/OOD), object-oriented programming (OOP), and object-oriented testing (OOT) techniques. Also covered in the course are object-oriented metrics and case studies in object-oriented software development.

Prerequisites: SE 500, proficiency in use of modern OO programming languages such as Ada, C++, or Java).

SE 565

Concurrent and Distributed Systems

3 Credits

The objective of this course is to teach principles of software development for concurrent and distributed systems. Specification, design, implementation, and performance evaluation techniques for concurrent and distributed applications will be presented and complemented by examples and practical exercises. The various paradigms used for concurrent and distributed systems, including high performance

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clusters, along with the implementation issues for each will be discussed. A survey of languages suitable for implementing concurrent solutions will also be covered.

Prerequisite: SE 500 or consent of instructor.

SE 575

Software Safety

3 Credits

The objective of this course is to teach principles of software development for safety and mission critical systems. Safety-related specification, design, and implementation techniques are described and illustrated by examples and practical exercises. Principles and practices of safe software development, including a survey of programming language and operating system level issues for implementing safety related software are discussed. The course discusses the safety requirements, hazard and risk analyses, fault tolerance, basics of software reliability, and issues of verification, validation, and certification. Various safety standards and guidelines across application domain and selected tools supporting safety assurance of software products are introduced. The course material may require research in development of safe systems, laboratory experiments with tools, and producing appropriate reports.

Prerequisite: SE 500 or consent of instructor.

SE 580

Software Process Definition and Modeling

3 Credits

This course provides students with the fundamental knowledge for software process definition and modeling. Software process content includes a framework for process definition and modeling, process evaluation, enactment of processes, process tailoring, and description of the process properties. Course projects include analysis of existing process and design and modeling of new processes.

Prerequisite: SE 500 or consent of the instructor.

SE 585

Metrics and Statistical Methods for Software Engineering

3 Credits

This course is concerned with the topics of software measurement, statistical tools and methods, and applied experimental design in software engineering. Students will be introduced to the principles and concepts relevant to measurement in software

engineering, including the representational theory of measurement, collection, analysis, and validation of data. Also studied are frameworks such as Goal-Question-Metric and Quality Function Deployment paradigms for guiding measurement efforts. Also explored are the concepts of experimental design, analysis of experiments, model building, ethics, and presentation of experiments.

Prerequisite: SE 500 or consent of instructor.

SE 590

Graduate Seminar

3 Credits

This course is a study of the current advancements in a particular field of software engineering, as determined by the instructor of the course. The course will focus on a different topic each term, depending on the varied interests of students, the graduate faculty, and the existing departmental research requirements.

SE 610

Software Systems Architecture and Design

3 Credits

This course is concerned with the principles and concepts of engineering of large software systems and programs. Software architecture is an abstraction of system details that helps in managing the inherent complexity of software systems development. Software architecture provides opportunities for early evaluation of user needs, analysis of requirements and design, and prediction of system properties. Architectural styles, views, notations, and description languages provide systematic frameworks for engineering decisions and design practices. The focus of the course is on advanced topics related to software architecture practices, technologies, and artifacts. Students participate in individual or group projects related to developing architectural representations of software systems.

Prerequisite: SE 530.

SE 625

Software Quality Engineering and Assurance

3 Credits

This course describes the overall approach to specifying software quality, achieving quality, and mapping a quality specification into a set of engineering activities. This course provides a framework for understanding the application of software verification and validation (V&V) processes and techniques throughout the software development life cycle. The

course covers the economics of software quality and provides a guide to organizing a project to achieve quality both in terms of the software product and the software process.

Prerequisite: SE 530 or consent of instructor.

SE 655

Performance Analysis of Real-Time Systems

3 Credits

The objective of this course is to teach principles of performance analysis of computer systems, with a focus on real-time applications. Performance modeling and analysis techniques are described and illustrated by examples and practical exercises using elements of mathematical statistics. Principles and practices of software development to achieve required or optimal performance, including design analysis and assessment of the implementation in terms of works case execution time and schedulability, will be addressed. An actual project in instrumentation of software for performance evaluation is an essential element of this course.

Prerequisites: SE 500 or consent of instructor, plus knowledge of basic statistics.

SE 660

Formal Methods for Concurrent and Real-Time Systems

3 Credits

The course includes study of the formal specification of reactive systems, temporal logic, and current research in the specification of concurrent and real-time systems. There is also discussion of verifying software designs based on formal specifications.

Prerequisite: SE 520 or consent of instructor.

SE 690

Graduate Research Project

3 Credits

This course provides the student with an opportunity to pursue a topic area of special interest. The graduate research project is an individual investigation or software development effort culminating in a formal written report, requisite artifacts, and an oral presentation to the faculty. The focus is on an advanced topic in software engineering that may be theoretical or practical.

Prerequisite: Consent of instructor.

SE 696

Graduate Internship in Software Engineering

1-3 Credits

This course involves temporary professional or industrial work appointments made available to students enrolled in graduate programs at the University. An internship provides graduate students with an opportunity to extend their academic endeavors through the application of the theories and philosophies studied in the classroom to specific professional activities common to the workplace. Internships are academic/professional activities coordinated by the University between participating organizations and a graduate student.

SE 697

Software Engineering Practicum

3 Credits

The practicum is a capstone course that builds on the other core MSE courses. It consists of a faculty-mentored team software development project that extends from concept to delivery. All phases of the development life-cycle are included: requirements, architecture, detailed design, implementation, and verification and validation. Disciplined software engineering practices are used (for example, PSP, TSP, project management). Deliverables for the course are a validated functioning system, a comprehensive set of development artifacts, a final report, and a formal presentation.

Prerequisites: SE 510, SE 555, and SE 610, or permission of instructor.

SE 699

Special Topics in Software Engineering

1-3 Credits

Students may elect to perform a special, directed analysis and/or independent study in an area of particular interest. The student should submit to the department chair and graduate committee a detailed proposal of the desired project and identify a faculty sponsor.

Systems Engineering

SYS 500

Systems Engineering

3 Credits

This fast-paced course provides an overview of systems engineering in the development of multidisci-

Graduate Course Descriptions

plined systems. Topics address definition of systems, roles and qualities of system engineers, principles of systems thinking, and management of the total system life cycle (from birth to death). The basic framework spans user need and concept development, through development and deployment, and ultimately to phase-out and disposal. Emphasis is on the total "system view" including system requirements and their traceability, reliability, maintainability, system support, interfaces, cost, schedule, optimization, and trades as they affect total system performance, fulfillment of user needs, and impact to the operational environment. The course also addresses ancillary concerns including characteristics of contract types, and legal and ethical considerations.

Prerequisites: Matrix/vector algebra, differential and integral calculus, introductory probability and statistics.

TM - Technical Management

TM 501

Computer Skills for a Technical Environment

3 Credits

Introductory graduate-level skills in computers are developed through application to current business-related problems. Computer techniques are used to solve problems and enhance technical communications. Computer techniques will be covered as an efficient method to achieve higher-level analytical and communicative skills. Emphasis is placed on supporting and enhancing technical communications with computer technology. Computer presentation graphics will be explored as a tool to develop and augment high-impact presentations. Successful completion is necessary in order to proceed in the MSTM program.

TM 502

Communication Skills in a Technical Environment

3 Credits

Introductory graduate-level skills in business communications are explained through the development of solutions applied to a series of interconnected management science problems. Students learn to communicate results in a clear and understandable fashion. Emphasis is placed on communicat-

ing conclusions in concise and persuasive writing and speaking. Written assignments will involve reports, business letters, memoranda, and resumes. Successful completion is necessary in order to proceed in the MSTM program.

TM 503

Quantitative Methods and Statistics

3 Credits

The integration of graduate-level skills in quantitative management methods through the development of solutions applied to a series of interconnected management science problems. Computer techniques are also used to solve problems and to communicate the results in a clear and understandable fashion. Emphasis is placed on understanding analytical methodologies, interpreting quantitative results, and communicating conclusions. Descriptive and inferential statistical applications will be explored. Successful completion is necessary in order to proceed in the MSTM program.

TM 605

Organizational Theory in a Technical Environment

3 Credits

Effectively using the organization to build a technical management team. Leadership versus management; conflict between functional management; matrix versus hierarchical organizations; organizational alternatives; human response in the organization; influence and authority in the technical setting; participation; sensitivity to cultural and minority differences; managing technical change and innovation in a large organization; communication in a technical organization; organization culture and tradition; government perspective; industry perspective.

TM 610

Managing Effective Technical Work Teams

3 Credits

This course encompasses the study of managing work teams in the technical environment. Specific topics include two-way communications and feedback; participative management techniques pertaining to motivation; small-group processes and group decision support systems; attraction and retention of quality personnel; skills in writing employee evalua-

Graduate Course Descriptions

tions, responsibility, authority, accountability; conflict resolution; initiative; creativity; horizontal and vertical communication; personality/temperament; logic versus heuristic/detail versus holistic; management strategies; motivation, recognition, and reward.

TM 616

Production Operations Management

3 Credits

An in-depth analysis of production/operations concepts, methods, and techniques from a systems perspective.

TM 621

Regulations, Ethics, and the Legal System

3 Credits

Understanding the complex regulatory and legal setting surrounding management. The Federal Acquisition Regulations and how they affect all projects' legal responsibility and accountability, ethical considerations in and external to the organization, the international environment and how it may affect projects.

TM 625

Marketing in the Technical Environment

3 Credits

Effective use of communications to describe and/or market projects, programs, or products to a hostile or friendly audience. Understanding products and the marketplace; collecting data to accurately reflect the situation; the use of accurate, clear, and meaningful presentations; highlighting the positive; reporting the negative; internal versus external presentations; dealing with the media; video and computer techniques; analyzing your audience; communications level; public relations. Students will be required to develop a marketing plan and, working as a team, conduct a marketing research project based on the needs of their organization.

TM 630

Technical Management Information Systems

3 Credits

This course provides an end-user orientation to management information systems with both managerial and technical components. The course will develop managerial skills in using information systems to conduct daily operations, to plan business strategies, and to solve business problems. A systems approach to planning, scheduling, and controlling will provide the student with effective decision-making resources.

In addition, the course will provide hands-on experience with laptop computer exercises in computerized MIS to develop the information management proficiency required by the corporate environment. The emphasis of this course is on data resource management; electronic commerce; enterprise collaboration systems; telecommunications (Internet, intranet, extranet, and client/server systems); decision support systems (DSS); executive support systems (ESS); and security, control, and ethical issues.

TM 635

Financial and Managerial Accounting and Control for Technical Managers

3 Credits

Financial control procedures for a systems approach to program management are presented. Cost elements in manufacturing, research and development, and logistic and support services are explored. Included will be the introduction of fixed and variable costs; computing and using overhead; process and job order costing methods; preparation of income statements in the contribution format; ratio analysis; profit planning and its relationship to cost; using spreadsheets for budget and overhead analysis; pricing, capital budgeting, and investment decisions.

TM 641

Project Management: Concepts and Practices

3 Credits

This course encompasses the study of project management, paying particular attention to the nine knowledge areas: scope, time, cost, risk, quality, procurement, human resources, communication, and integration, as they relate to the process areas of initiation, planning, execution, control, and closure of projects. Examples and student-initiated projects and project simulations are used to emphasize the integrated relationships. Project management software is used throughout the course, particularly to demonstrate the usefulness of automated calculations, record keeping, and reporting as related to planning and controlling projects. Throughout, the merger of technical skills, general management skills, and project management skills for the successful project is emphasized. Where applicable, the information delivered in this course is compliant with ISO 9,000, 10,000 series standards, and the Project Management Institute generated Project Management Body of Knowledge.

Graduate Course Descriptions

TM 646

Operations Research and Management Science
3 Credits

Quantitative methods for program management. Forecasting and probability distributions; decisions theory and decision-making under conditions of risk and uncertainty; marginal analysis; linear programming applications including problems of minimization and maximization, transportation and warehousing, assignment and scheduling and ingredient blending; queuing theory and waiting lines; network models such as minimum spanning tree, maximal flow, and shortest route techniques; simulation and modeling; regression analysis; and time series analysis.

TM 651

Quality Management and Quality Control
3 Credits

Instilling quality concepts in a project. Continuous improvement; quality management; designing for and cost of quality; organizing for QM; alternative approaches to quality; understanding the corporate culture; developing the quality plan; implementing QM; introducing the concept; work meetings and project teams; informing; motivating; recording; using technology; key approaches and when to use them; reward and recognition; and follow up, evaluation, and feedback.

TM 660

Project Development Techniques
2 Credits

A study of current scientific research methods that includes techniques of problem identification, hypothesis formulation, literature search strategies of libraries and online databases, design and use of data-gathering instruments, formulation of a research model and plan, and appropriate statistical data analysis. The TMRP Guidelines format and American Psychological Association (APA) style will be introduced and followed. A formal Technical Management Research Project proposal will be developed and presented by each student as a basic course requirement.

Prerequisite: TM 646.

TM 660 L

Technical Management Research Project
1 Credit

A written document on a technical management topic that exposes the graduate student to the technical aspects of writing. This course is included in the MSTM curriculum to provide the graduate student with the opportunity to pursue a project of special interest, but not to the level of a thesis.

Prerequisite: TM 660.

WORLDWIDE

Contact/Information Sources

Worldwide students should contact their campus or Advising Enrollment and Recruitment Office (AERO), or any of the offices listed below for more information and guidance:

General Information:

Telephone: (386) 226-6910

-OR-

(800) 522-6787

Email: ecinfo@erau.edu

Student Services

Enrollment Management Office

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Admissions

(866) 509-0743

Email: wwem@erau.edu

Financial Aid

(866) 567-7202

-OR- (800) 943-6279

Email: wwfinaid@erau.edu

Registrar

(866) 393-9046

Email: ecregist@erau.edu

Portfolio Assessment

(877) 362-7970

Fax: (386) 226-6984

Student Affairs Department

Disability Support Services

Student Affairs/Student and

Technology Services

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Telephone: (386) 226-6944

Student Financial Services

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Career Services

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Telephone: (386) 226-6054

Email: eccareer@erau.edu

Veterans Affairs

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Telephone: (386) 226-6350

Professional Education Programs

Worldwide

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Telephone: (386) 323-8669

Fax: (386) 323-8692

Toll Free: 1-866-574-9125

Worldwide Online Advising Enrollment and Recruitment Office (AERO)

Embry-Riddle Aeronautical University

600 S. Clyde Morris Blvd.

Daytona Beach, FL 32114-3900

Telephone: (800) 359-3728

Worldwide: (386) 226-6397

Fax: (386) 226-7627

Worldwide

Embry-Riddle Aeronautical University Worldwide Campus Listing by State / Country

ALABAMA

FORT RUCKER	Fort Rucker	(334) 598-6232
<i>Teaching Sites:</i>		
Mobile, AL (out of Keesler, MS)		(251) 441-6737
REDSTONE ARSENAL	Huntsville	(256) 876-9763

ALASKA

ANCHORAGE	Elmendorf AFB	(907) 753-9367
FAIRBANKS	Fort Wainwright	(907) 356-7773
<i>Teaching Site:</i>		
Eielson AFB		(907) 377-2977

ARIZONA

LUKE	Glendale	(623) 935-4000
<i>Classroom Locations:</i>		
Glendale Municipal Airport		
Lockheed-Martin Goodyear (MSTM ONLY)		
PHOENIX/CHANDLER	Chandler	(480) 279-1149
SKY HARBOR	Phoenix	(602) 275-5578
TUCSON	Davis Monthan-AFB	(520) 747-5540

ARKANSAS

LITTLE ROCK	Little Rock AFB	(501) 983-9300
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CALIFORNIA

BEALE	Beale	(530) 788-0900
<i>Classroom Location:</i>		
McClellan AFB		
NORTH ISLAND	Coronado	(619) 435-6673
EDWARDS	Edwards AFB	(661) 258-1264
LOS ANGELES (Metro Center)	Los Angeles	(562) 627-5870
INLAND EMPIRE	March AFB	(951) 653-4074
LEMOORE	NAS Lemoore	(559) 998-6026
OAKLAND	Oakland	(510) 636-2424
CAMP PENDLETON	Oceanside	(760) 385-4423
PALMDALE	Palmdale	(661) 947-4025
VENTURA	Ventura	(805) 271-9691
CHINA LAKE	Ridgecrest	(760) 939-4557
SAN DIEGO	San Diego	(858) 576-4375
TRAVIS	Travis AFB	(707) 437-5464
VANDENBERG	Vandenberg AFB	(805) 734-4076
<i>Classroom Location:</i>		
Victorville		(760) 530-0875

COLORADO

COLORADO SPRINGS Fort Carson (719) 576-6858

FLORIDA

FORT WALTON BEACH Eglin AFB (850) 678-3137
FT. LAUDERDALE Ft. Lauderdale (954) 497-3774

Classroom Locations:

Hurlburt Field

(850) 581-2106

JACKSONVILLE

Jacksonville

(904) 645-0333

Teaching Site:

N.S. Mayport

(904) 249-6700

TAMPA

MacDill AFB

(813) 828-3772

Teaching Site:

Miami

(305) 871-3855

NAS JACKSONVILLE

(904) 779-0246

PENSACOLA

Pensacola

(850) 458-1098

Teaching Site:

NAS Whiting Field

(850) 623-7438

ORLANDO (Metro)

Orlando

(407) 352-7575

SPACE COAST

Patrick AFB

(321) 783-5020

Teaching Site:

St. Petersburg College

(727) 394-6218

Tallahassee

(850) 201-8330

TYNDALL

Tyndall AFB

(850) 283-4557

GEORGIA

NAS ATLANTA

(770) 426-9990

DELTA AIR LINES

(404) 714-3248

COLUMBUS

Columbus

(706) 568-5485

MOODY

Moody AFB

(229) 244-9400

ROBINS

Robins AFB

(478) 926-1727

SAVANNAH

Savannah

(912) 355-0644

HAWAII

HONOLULU

Honolulu

(808) 422-0835

AIRPORT TRAINING CENTER

Honolulu Training Center

(808) 838-1435

SCHOFIELD BARRACKS

Schofield Barracks

(808) 624-2334

IDAHO

MOUNTAIN HOME

Mountain Home AFB

(208) 832-2222

INDIANA

INDIANAPOLIS

Indianapolis

(317) 487-6281

NORTH CAROLINA

ELIZABETH CITY	Elizabeth City	(252) 331-2225
FAYETTEVILLE	Fayetteville	(910) 323-2126
GREENSBORO		(336) 605-3030
SEYMOUR JOHNSON	Seymour Johnson AFB	(919) 734-9211

NORTH DAKOTA

GRAND FORKS	Grand Forks AFB	(701) 594-5324
MINOT	Minot AFB	(701) 727-9007

OHIO

CINCINNATI	Cincinnati	(513) 733-3728
DAYTON AREA	Fairborn	(937) 878-3728
<i>Teaching Site:</i> Wright-Patterson		(937) 254-3728

OKLAHOMA

ALTUS	Altus AFB	(580) 481-5991
OKLAHOMA CITY	Oklahoma City	(405) 739-0397
VANCE	Vance AFB	(580) 213-7320

OREGON

PORTLAND	Portland	(503) 288-8690
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SOUTH CAROLINA

CHARLESTON	Charleston AFB	(843) 767-8912
GREENVILLE	Greenville	(864) 233-5288
MCAS BEAUFORT		(843) 228-7585
MCENTIRE ANGB		(803) 783-5025
SHAW	Shaw AFB	(803) 666-7401

TENNESSEE

MEMPHIS	Memphis Airport	(901) 507-9969
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TEXAS

CORPUS CHRISTI	Corpus Christi	(361) 937-4951
DYESS	Dyess AFB	(325) 692-2007
FORT WORTH	Dallas/Fort Worth	(817) 737-8180
HOUSTON	Houston	(281) 244-9456
SAN ANTONIO	Randolph AFB	(210) 659-0801
SHEPPARD	Sheppard AFB	(940) 851-6458

Worldwide

UTAH

NORTHERN UTAH	Hill AFB	(801) 777-0952
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VIRGINIA

FORT EUSTIS	Fort Eustis	(757) 887-0980
LANGLEY	Langley AFB	(757) 764-2662
NORFOLK	NS Norfolk	(757) 440-5078

Teaching Site:

Oceana		(757) 437-8061
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WASHINGTON

EVERETT	Everett	(425) 514-0220
SPOKANE	Fairfield AFB	(509) 244-3832
TACOMA	McChord AFB	(253) 589-1728
WHIDBEY ISLAND	Oak Harbor	(360) 279-0959
SEATTLE	Renton	(425) 226-2484

WYOMING

CHEYENNE	F.E. Warren AFB	(307) 634-9693
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INTERNATIONAL

Embry-Riddle Aeronautical University
Worldwide

International Regional Office

CMR 429
APO AE 09054-0429
DSN: 483-7811
Civilian: 011-49-631-303-2781
FAX: 011-49-631-303-27810
Email: europe.rdo@erau.edu
Website: www.erau.edu/eu/

Embry-Riddle Aeronautical University
Worldwide

International Regional Office

Europaallee 6
D-67657 Kaiserslautern
Germany
Civilian: 011-49-631-303-27811

Worldwide Locations (International - U.S. Military)
KUWAIT

DEPLOYED LOCATIONS	Kuwait	011-49-631-303-27816
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GERMANY

BERLIN	Berlin	011-49-0305-3063549
KATTERBACH	Katterbach	011-49-9802-832379
RAMSTEIN AB	Ramstein	011-49-6371-47-5755
SPANGDAHLEM	Spangdahlem	011-49-6565-7297
GEILENKIRCHEN		011-49-2451-63-2246

TURKEY

INCIRLIK		011-90-322-316-1098
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ITALY

AVIANO	Aviano	011-39-0434-66-0631
SIGONELLA	Sigonella	011-39-095-56-4550
NAPLES		011-39-081-568-4364

SPAIN

ROTA	Rota	011-34-956-822984
LAJES FIELD	Portugal	011-351-295-57-3375

Worldwide Administration

DOVE, JOAN M.

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B.A., Duke University;

M.G.A., University of Maryland, University College

DiFABIO, MARK A.

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B.S., Robert Morris University

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Assistant Chancellor

B.B.A. and M.B.A., Stetson University

LOWRY III, EMMERT M.

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VASQUEZ, REBECCA

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A.S., Kieser College

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B.Sc., Heriot-Watt University;

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A.A., and B.A., Park College; M.A., Webster University; M.A.S.,

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B.A., William and Mary College; M.S., Capella University;

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RODGERS, LAURETTE

Assistant Vice Chancellor of Academic Support and Military Affairs

B.S., University of Maryland, University College; M.S., Austin

Peay State University

FACULTY AND ADMINISTRATION

Officials of the University

JOHNSON, JOHN P.

President; Professor, College of Arts and Sciences.
B.A. and M.S., Florida State University; Ph.D., Kent State University.

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CARRELL, DANIEL L.

Chancellor (Interim), Prescott Campus. B.A., California State University; B.A., Northwestern State University; M.A.S., Embry-Riddle Aeronautical University; C-H.

Legend

Letter designations for aviation qualifications are as follows:

A – Airplane	ME – Multi-Engine	DWE – Designated Written Examiner
C – Commercial Pilot	SE – Single-Engine	HTA – Heavier Than Air
G – Glider	A&P – Airframe and Powerplant Maintenance Technician	IGI – Instrument Ground Instructor
H – Helicopter	AGI – Advanced Ground Instructor	LTA – Lighter Than Air
I – Instrument	ATP – Airline Transport Pilot	SME – Single- and Multi-Engine
L – Land	BGI – Basic Ground Instructor	FCC – Federal Communication Commission
P – Private Pilot	CFI – Certified Flight Instructor	FE – Flight Engineer
S – Seaplane	CTO – Control Tower Operations	AC – Advanced Graduate Credit
AD – Aircraft Dispatcher	DME – Designated Mechanic Examiner	
IA – Inspection Authorization		

Faculty and Administration

Academic Administration

DAYTONA BEACH

AYERS, FRANCIS H., JR.

Associate Professor of Aeronautical Science and Chair, Flight Department, College of Aviation. B.A., Virginia Polytechnic Institute and State University; M.S., Embry-Riddle Aeronautical University; Ed.D., Nova Southeastern University.

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CLARK, BRETT M., MAJOR, U.S. ARMY

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Professor and Chair, Department of Aerospace Engineering, College of Engineering. B.S., Iran University of Science and Technology; M.S., University of Arkansas; Ph.D., Old Dominion University.

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Professor of Mathematics, Interim Dean of the College of Arts and Sciences. B.A. and M.S., University of North Dakota; M.S. and Ph.D., Florida State University.

GRANT, CHRISTOPHER D.

Professor of Civil Engineering; Associate Dean and Chair, Freshman Engineering Department, College of Engineering. B.S. and M.E., University of Louisville; Ph.D., Georgia Institute of Technology; Registered Professional Engineer.

HAMPTON, STEVE

Professor of Aeronautical Science and Associate Dean for Research, College of Aviation. B.S. and M.B.A./A., Embry-Riddle Aeronautical University; Ed.D., Nova University; C-ASMELIA; CFI-ASME-LA; AGI; A&P.

HELFRICK, ALBERT

Professor of Electrical Engineering and Chair, Department of Electrical and Systems Engineering, College of Engineering. B.S., Upsala College; M.S., New Jersey Institute of Technology; Registered Professional Engineer; FCC Radio telephone Operators License, Radar Endorsement.

HICKEY, MICHAEL P.

Professor of Physics; Associate Dean, College of Arts and Sciences. B.Sc. and Ph.D., Latrobe University.

HOWELL, CASS D.

Associate Professor and Chair, Department of Aeronautical Science, College of Engineering. B.S., Troy State University; M.S., University of Northern Colorado; Ed.D., University of Southern California; C-ASMELIA; CFI-ASE.

KAIN, GEOFFREY

Professor of Humanities and Communications; Director of the Honors Program, College of Arts and Sciences. B.A. and M.A., Rosary College; Ph.D., Idaho State University.

MIRMIRANI, MAJ DEAN

Professor of Mechanical Engineering; Dean of the College of Engineering. B.S., Tehran Polytechnic, Iran; M.S. and Ph.D., University of California, Berkeley.

MOORE, ALAN R., CAPTAIN, U.S. NAVY

Professor of Naval Science and Chair, Navy ROTC, College of Arts and Sciences. B.S., University of Kansas; M.A., Naval War College.

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Professor of Physics and Chair, Department of Physical Sciences, College of Arts and Sciences. B.S., Florida State University; M.S., College of William and Mary; Ph.D., University of Michigan.

PETREE, DANIEL L.

Professor of Management; Dean of the College of Business. B.S.B.A. and M.B.A., Rockhurst College; Ph.D., University of Kansas School of Business.

REESE, JOEL SCOTT, COLONEL, U.S. AIR FORCE

Professor of Aerospace Studies, Air Force ROTC, College of Arts and Sciences. B.A. Louisiana State University; M.S., Embry-Riddle Aeronautical University; Command Pilot.

REINHOLTZ, CHARLES

Professor of Mechanical Engineering; Chair, Mechanical, Civil and Engineering Sciences Department. B.S., M.S. and Ph.D., University of Florida.

RHOADES, DAWNA L.

Professor of Strategy; Associate Dean, Research and Graduate Studies, College of Business. B.A., University of Alabama, Huntsville; M.P.A., University of Washington; Ph.D., University of Houston.

Faculty and Administration

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SAJJADI, SHAHRDAD

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TOWHIDNEJAD, MASSOOD

Professor of Computer and Software Engineering; Chair, Department of Computer and Software Engineering, College of Engineering. B.S.E., M.S. and Ph.D., University of Central Florida.

WILLIAMS, MICHAEL J.

Professor of Management and Chair, Department of Economics, Finance, Accounting, Risk Management, and Information Systems, College of Business. B.S. and M.A.M., Embry-Riddle Aeronautical University; Ph.D., Nova Southeastern University; A&P; DME.

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