B.S. in Mechanical Engineering

The Bachelor of Science in Mechanical Engineering prepares students for engineering careers in fields such as aerospace, robotics, energy, automotive, biomedical, and manufacturing.

The **Daytona Beach Campus** provides students with a strong foundation in mechanical systems with extensive hands-on experience in our engineering labs. Students pursuing a Mechanical Engineering degree must complete one of four different tracks: Biomedical Systems, Energy Systems, High-Performance Vehicles, and Robotics and Autonomous Systems. The Bachelor of Science in Mechanical Engineering is accredited by the Engineering Accreditation Commission (https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2025-2026/) of ABET (https://www.abet.org/), under the commission's General Criteria and Program Criteria for Mechanical and Similarly Named Engineering Programs.

The **Prescott Campus** provides a solid foundation in basic engineering that enables students to explore advances in mechanical engineering, ranging from the small world of nanotechnology and micro-electromechanical systems to the vastness of space systems. Students will focus on a wide variety of automated machines, design propulsion systems like jet engines and rocket motors, or develop new energy conversion and storage systems. Students pursuing a Mechanical Engineering degree must complete one of three different tracks: Robotics, Propulsion Systems, and Energy Systems. The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org/), under the commission's General Criteria and Program Criteria for Mechanical and Similarly Named Engineering Programs.

The **Worldwide Campus** provides students with a strong foundation in the design and analysis of mechanical systems, preparing students to tackle complex engineering challenges in aerospace, energy, robotics, and advanced manufacturing. Through flexible online coursework supported by experienced faculty, students will explore subjects like robotics, energy systems, and aerospace applications. The program emphasizes real-world problem-solving and practical design skills, providing students with the knowledge and hands-on experience necessary to excel in a variety of technical engineering careers. Students pursuing a Mechanical Engineering degree must complete the Robotics track.

Program-Level Student Learning Outcomes

Students will:

- Have an ability to communicate effectively with a range of audiences.
- Have an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives.
- Have an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- Have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Have an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Have an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Have an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Daytona Beach Program Requirements

General Education Requirements	42
Core Requirements	52
Area of Concentration	29
Electives	6
Total Credits	**129**

Program Details

The Bachelor of Science in Mechanical Engineering program requires successful completion of a minimum of 129 semester hours. The program may be completed in eight regular semesters, assuming appropriate background and full-time enrollment. Students pursuing this undergraduate degree must earn a minimum cumulative grade point average (CGPA) of 2.00 for all work completed at the University.

General Education Requirements

Communication		9
COMM 122	English Composition	
COMM 221	Technical Communication	
COMM 219	Speech	
or COMM 420 & COMM 430	Advanced Technical Communication I and Advanced Technical Communication II	
Humanities - Lower Level		3
Social Sciences - Lower Level		3
ECON 225	Engineering Economics	
Humanities/Social Sciences - Lower or Upper Level		3
Humanities/Social Sciences - Upper Level		3
Computer Science/Information Technology		3
ENGR 115	Introduction to Computing for Engineers	
Mathematics		8
MATH 241	Calculus and Analytical Geometry I	
MATH 242	Calculus and Analytical Geometry II	
Physical/Life Sciences		10
CHEM 110	General Chemistry I	
or CHEM 113	General Chemistry for Engineering	
PHYS 150 & PHYS 160 & CHEM 110L	Physics with Calculus I and Physics with Calculus II and General Chemistry I Laboratory	
or *		
MATH 335 & PHYS 161	Introduction to Linear and Abstract Algebra and Physics with Calculus I and II	
Total Credits		**42**

* Students may take MATH 335 or Math Elective.

Core Requirements

UNIV 101	College Success	1
MATH 243	Calculus and Analytical Geometry III	4
MATH 345	Differential Equations and Matrix Methods	4
ENGR 101	Introduction to Engineering	2
ENGR 120	Graphical Communications	3
or ENGR 201	Computer Aided Design of Mechanical Systems	
ESCI 201	Statics	3
ESCI 202	Solid Mechanics	3
ESCI 204	Dynamics	3
ESCI 208	Thermodynamics	3
MECH 200L	Machine Shop Laboratory	1

or MECH 208L	Manufacturing Laboratory	
MECH 309	Fluid Dynamics	3
or ESCI 206	Fluid Mechanics	
ESCI 320	Engineering Materials Science	2
ESCI 320L	Engineering Materials Science Laboratory	1
MECH 304	Introduction to Machine Design	3
MECH 400	Mechanical Vibrations	3
ESCI 403	Heat Transfer	3
ELEC 327	Electrical Engineering Fundamentals	3
or ELEC 335 & 335L	Electrical Engineering I and Electrical Engineering I Laboratory	
MECH 402 & 402L	Model-Based Control System Design and Model-Based Control System Design Laboratory	3
or AERO 430	Control System Analysis and Design	
PHYS 250	Physics with Calculus III	3
PHYS 250L	Physics with Calculus III Laboratory	1
Total Credits		**52**

Area of Concentration

Biomedical Systems

COIN 396	Co-Operative Education	3
or AFAS 402	National Security/Commissioning Preparation II	
or MILS 402	The Army Officer II	
or NSCI 402	Naval Leadership and Ethics	
or MECH 496	Engineering Practice and Entrepreneurship	
ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 307	Modeling and Simulation of Complex Engineering Problems	2
MECH 307L	Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 330	Fundamentals of Biomechanics	3
MECH 404	Advanced Machine Design	3
MECH 430	Biofluid Mechanics	3
MECH 431	Biosolid Mechanics	3
MECH 438	Biomedical Systems Preliminary Design	4
MECH 439	Biomedical Systems Detail Design	4
Total Credits		**29**

Energy Systems

COIN 396	Co-Operative Education	3
or AFAS 402	National Security/Commissioning Preparation II	
or MILS 402	The Army Officer II	
or NSCI 402	Naval Leadership and Ethics	
or MECH 496	Engineering Practice and Entrepreneurship	
ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 307	Modeling and Simulation of Complex Engineering Problems	2
MECH 307L	Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 404	Advanced Machine Design	3
MECH 440	Thermal Power Systems	3
MECH 443	Environment Control and HVAC Systems	3
MECH 445	Sustainable Design	3
MECH 448	Energy Systems Preliminary Design	4
or MECH 468	Propulsion System Preliminary Design	
MECH 449	Energy Systems Detail Design	4
or MECH 469	Propulsion System Detail Design	
Total Credits		**29**

High Performance Vehicles

COIN 396	Co-Operative Education	3
or AFAS 402	National Security/Commissioning Preparation II	
or MILS 402	The Army Officer II	
or NSCI 402	Naval Leadership and Ethics	
or MECH 496	Engineering Practice and Entrepreneurship	
ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 307	Modeling and Simulation of Complex Engineering Problems	2
MECH 307L	Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 350	Longitudinal and Vertical Vehicle Dynamics	3
MECH 404	Advanced Machine Design	3
MECH 450	Combined Vehicle Dynamics	3
MECH 451	Vehicle Aerodynamics	3
MECH 458	High Performance Vehicles Preliminary Design	4
MECH 459	High Performance Vehicles Detail Design	4
Total Credits		**29**

Robotics and Autonomous Systems

COIN 396	Co-Operative Education	3
or AFAS 402	National Security/Commissioning Preparation II	
or MILS 402	The Army Officer II	
or NSCI 402	Naval Leadership and Ethics	
or MECH 496	Engineering Practice and Entrepreneurship	
ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 307	Modeling and Simulation of Complex Engineering Problems	2
MECH 307L	Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 371	Robotic Technologies for Uncrewed Systems	3
MECH 372	Robotic Architecture	3
MECH 404	Advanced Machine Design	3
MECH 470	Mechatronics	3
MECH 478	Robotic Systems Preliminary Design	4
MECH 479	Robotic Systems Detail Design	4
Total Credits		**29**

Electives

Technical Electives *		6

* One technical elective must be a 300-500 level engineering course designated by the prefixes AERO, CESC, CIVE, CPSC, ELEC, ENGR, ENGP, MECH, PHYS, SFTW, or SYSE that is not listed in the student's degree requirements. Students may take one 300-500 level math course designated by the prefix MATH or DSCI.
The following courses cannot be used as technical electives: AERO 316, AERO 318, CIVE 304, CIVE 307/L, and ELEC 327L.
Students enrolled in combined program pathways should refer to the program catalog for alternative technical electives. ROTC students may use one upper-level ROTC elective as a technical elective.
Students who have completed more than 9 credit hours of internships may use up to 6 credit hours as a substitution for a technical elective.
Students in the Biomedical Systems Track may also select from the following courses as upper-level technical electives:

CHEM 310/CHEM 310L, HFCT 312, HFCT 440, BIOL 305/BIOL 305L, BIOL 306/BIOL 306L, BIOL 405/BIOL 405L, or BIOL 440

Suggested Plans of Study

Biomedical Systems

Year One

Requirements	Credits
COMM 122 - English Composition	3
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
ENGR 101 - Introduction to Engineering	2
ENGR 115 - Introduction to Computing for Engineers	3
MATH 241 - Calculus and Analytical Geometry I	4
UNIV 101 - College Success	1
Semester Hours	**17**

Requirements	Credits
COMM 219 - Speech	3
ENGR 120 - Graphical Communications	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 150 - Physics with Calculus I	3
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
COMM 221 - Technical Communication	3
ESCI 201 - Statics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 160 - Physics with Calculus II	3
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**16**

Requirements	Credits
ESCI 202 - Solid Mechanics	3
ESCI 204 - Dynamics	3
MATH 345 - Differential Equations and Matrix Methods	4
MECH 208L - Manufacturing Laboratory	1
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Semester Hours	**15**

Requirements	Credits
Professional Development Elective	3
Semester Hours	**3**

Total Credits

Total Hours for All Requirements: 34

Year Three

Requirements	Credits
ELEC 327 - Electrical Engineering Fundamentals	3
ESCI 208 - Thermodynamics	3
MECH 304 - Introduction to Machine Design	3
MECH 307 - Modeling and Simulation of Complex Engineering Problems	2
MECH 307L - Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 309 - Fluid Dynamics	3
Semester Hours	**15**

Requirements	Credits
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 330 - Fundamentals of Biomechanics	3
MECH 430 - Biofluid Mechanics	3
Semester Hours	**15**

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
MECH 400 - Mechanical Vibrations	3
MECH 402 - Model-Based Control System Design	2
MECH 402L - Model-Based Control System Design Laboratory	1
MECH 404 - Advanced Machine Design	3
MECH 431 - Biosolid Mechanics	3
MECH 438 - Biomedical Systems Preliminary Design	4
Semester Hours	**16**

Requirements	Credits
ECON 225 - Engineering Economics	3
MECH 439 - Biomedical Systems Detail Design	4
Humanities/Social Sciences - Upper Level	3
COE/COAS Technical Elective	3

COE/COAS Technical Elective	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 32

Energy Systems

Year One

Requirements	Credits
COMM 122 - English Composition	3
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
ENGR 101 - Introduction to Engineering	2
ENGR 115 - Introduction to Computing for Engineers	3
MATH 241 - Calculus and Analytical Geometry I	4
UNIV 101 - College Success	1
Semester Hours	**17**

Requirements	Credits
COMM 219 - Speech	3
ENGR 120 - Graphical Communications	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 150 - Physics with Calculus I	3
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
COMM 221 - Technical Communication	3
ESCI 201 - Statics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 160 - Physics with Calculus II	3
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**16**

Requirements	Credits
ESCI 202 - Solid Mechanics	3
ESCI 204 - Dynamics	3
MATH 345 - Differential Equations and Matrix Methods	4
MECH 208L - Manufacturing Laboratory	1
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Semester Hours	**15**

Requirements	Credits
Professional Development Elective	3
Semester Hours	**3**

Total Credits

Total Hours for All Requirements: 34

Year Three

Requirements	Credits
ELEC 327 - Electrical Engineering Fundamentals	3
ESCI 208 - Thermodynamics	3
MECH 304 - Introduction to Machine Design	3
MECH 307 - Modeling and Simulation of Complex Engineering Problems	2
MECH 307L - Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 309 - Fluid Dynamics	3
Semester Hours	**15**

Requirements	Credits
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 440 - Thermal Power Systems	3
MECH 443 - Environment Control and HVAC Systems	3
Semester Hours	**15**

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
MECH 400 - Mechanical Vibrations	3
MECH 404 - Advanced Machine Design	3
MECH 402 - Model-Based Control System Design	2
MECH 402L - Model-Based Control System Design Laboratory	1
MECH 445 - Sustainable Design	3
MECH 448 - Energy Systems Preliminary Design	4
Semester Hours	**16**

Requirements	Credits
ECON 225 - Engineering Economics	3
MECH 449 - Energy Systems Detail Design	4
Humanities/Social Sciences - Upper Level	3
COE/COAS Technical Elective	3

COE/COAS Technical Elective	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 32

High Performance Vehicles

Year One

Requirements	Credits
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
COMM 122 - English Composition	3
ENGR 101 - Introduction to Engineering	2
ENGR 115 - Introduction to Computing for Engineers	3
MATH 241 - Calculus and Analytical Geometry I	4
UNIV 101 - College Success	1
Semester Hours	**17**

Requirements	Credits
COMM 219 - Speech	3
ENGR 120 - Graphical Communications	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 150 - Physics with Calculus I	3
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
COMM 221 - Technical Communication	3
ESCI 201 - Statics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 160 - Physics with Calculus II	3
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**16**

Requirements	Credits
ESCI 202 - Solid Mechanics	3
ESCI 204 - Dynamics	3
MATH 345 - Differential Equations and Matrix Methods	4
MECH 208L - Manufacturing Laboratory	1
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Semester Hours	**15**

Requirements	Credits
Professional Development Elective	3
Semester Hours	**3**

Total Credits

Total Hours for All Requirements: 34

Year Three

Requirements	Credits
ELEC 327 - Electrical Engineering Fundamentals	3
ESCI 208 - Thermodynamics	3
MECH 304 - Introduction to Machine Design	3
MECH 307 - Modeling and Simulation of Complex Engineering Problems	2
MECH 307L - Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 309 - Fluid Dynamics	3
Semester Hours	**15**

Requirements	Credits
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 350 - Longitudinal and Vertical Vehicle Dynamics	3
MECH 451 - Vehicle Aerodynamics	3
Semester Hours	**15**

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
MECH 400 - Mechanical Vibrations	3
MECH 402 - Model-Based Control System Design	2
MECH 402L - Model-Based Control System Design Laboratory	1
MECH 404 - Advanced Machine Design	3
MECH 450 - Combined Vehicle Dynamics	3
MECH 458 - High Performance Vehicles Preliminary Design	4
Semester Hours	**16**

Requirements	Credits
ECON 225 - Engineering Economics	3
MECH 459 - High Performance Vehicles Detail Design	4
Humanities/Social Sciences - Upper Level	3
COE/COAS Technical Elective	3

COE/COAS Technical Elective	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 32

Robotics and Autonomous Systems

Year One

Requirements	Credits
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
COMM 122 - English Composition	3
ENGR 101 - Introduction to Engineering	2
ENGR 115 - Introduction to Computing for Engineers	3
MATH 241 - Calculus and Analytical Geometry I	4
UNIV 101 - College Success	1
Semester Hours	**17**

Requirements	Credits
COMM 219 - Speech	3
ENGR 120 - Graphical Communications	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 150 - Physics with Calculus I	3
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
COMM 221 - Technical Communication	3
ESCI 201 - Statics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 160 - Physics with Calculus II	3
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**16**

Requirements	Credits
ESCI 202 - Solid Mechanics	3
ESCI 204 - Dynamics	3
MATH 345 - Differential Equations and Matrix Methods	4
MECH 208L - Manufacturing Laboratory	1
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Semester Hours	**15**

Requirements	Credits
Professional Development Elective	3
Semester Hours	**3**

Total Credits

Total Hours for All Requirements: 34

Year Three

Requirements	Credits
ELEC 327 - Electrical Engineering Fundamentals	3
ESCI 208 - Thermodynamics	3
MECH 304 - Introduction to Machine Design	3
MECH 307 - Modeling and Simulation of Complex Engineering Problems	2
MECH 307L - Modeling and Simulation of Complex Engineering Problems Laboratory	1
MECH 309 - Fluid Dynamics	3
Semester Hours	**15**

Requirements	Credits
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 371 - Robotic Technologies for Uncrewed Systems	3
MECH 470 - Mechatronics	3
Semester Hours	**15**

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
MECH 372 - Robotic Architecture	3
MECH 400 - Mechanical Vibrations	3
MECH 402 - Model-Based Control System Design	2
MECH 402L - Model-Based Control System Design Laboratory	1
MECH 404 - Advanced Machine Design	3
MECH 478 - Robotic Systems Preliminary Design	4
Semester Hours	**16**

Requirements	Credits
ECON 225 - Engineering Economics	3
MECH 479 - Robotic Systems Detail Design	4
Humanities/Social Sciences - Upper Level	3
COE/COAS Technical Elective	3

COE/COAS Technical Elective	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 32

Prescott Program Requirements

General Education Requirements	42
Core Requirements	51
Area of Concentration	29
Electives	6
Total Credits	**128**

Program Details

The Bachelor of Science in Mechanical Engineering program requires successful completion of a minimum of 128 credit hours. The program may be completed in eight semesters, or four years, assuming appropriate background and full-time enrollment. A minimum cumulative grade point average of 2.00 is needed for all required AERO, ENGR, ESCI, and MECH courses, excluding technical electives. The program offers options in Energy Systems, Propulsion Systems, and Robotics, as well as multiple capstone design pathways. The courses necessary to earn this degree are listed below.

Students should be aware that many courses have prerequisites and/or corequisites. Students must earn a grade of C or better in all prerequisite courses for required AERO, COMM 221, ENGR, ENGP, ESCI, MECH, and SYSE courses. Students are responsible for ensuring that all prerequisite and degree requirements are met prior to enrollment in advanced coursework.

General Education Requirements

Embry-Riddle degree programs require students to complete a minimum of 36 hours of General Education coursework. For a full description of Embry-Riddle General Education guidelines, please see the General Education (https://catalog.erau.edu/general-education/) section of this catalog.

Students may choose other classes outside of their requirements, but doing so can result in the student having to complete more than the degree's 128 credit hours. This will result in additional ***time and cost*** to the student.

Communication		9
COMM 122	English Composition	
COMM 221	Technical Communication	
COMM 219	Speech	
or COMM 429 & COMM 430	Advanced Technical Communication I and Advanced Technical Communication II	
Humanities - Lower Level		3
Social Sciences - Lower Level		3
ECON 225	Engineering Economics	
Humanities/Social Sciences - Lower or Upper Level		3
Humanities/Social Sciences - Upper Level		3
Computer Science/Information Technology		3
ENGR 115	Introduction to Computing for Engineers	
Mathematics		8
MATH 241	Calculus and Analytical Geometry I	
MATH 242	Calculus and Analytical Geometry II	
Physical/Life Sciences		10
CHEM 110	General Chemistry I	
or CHEM 113	General Chemistry for Engineering	
PHYS 150 & PHYS 160 & CHEM 110L	Physics with Calculus I and Physics with Calculus II and General Chemistry I Laboratory	
or		
MATH 335	Introduction to Linear and Abstract Algebra	
or Math Elective		
PHYS 161	Physics with Calculus I and II	
Total Credits		**42**

Core Requirements

The following course of study outlines the quickest and most cost-efficient route for students to earn their B.S. in Mechanical Engineering. Students are encouraged to follow the course of study to ensure they complete all program required courses and their prerequisites within four years.

MATH 243	Calculus and Analytical Geometry III	4
MATH 345	Differential Equations and Matrix Methods	4
ENGR 101	Introduction to Engineering	2
ENGR 120	Graphical Communications	3
or ENGR 200	Computer Aided Design of Aerospace Systems	
or ENGR 201	Computer Aided Design of Mechanical Systems	
ESCI 201	Statics	3
ESCI 202	Solid Mechanics	3
ESCI 204	Dynamics	3
ESCI 208	Thermodynamics	3
MECH 200L	Machine Shop Laboratory	1
MECH 309	Fluid Dynamics	3
or ESCI 206	Fluid Mechanics	
ESCI 320	Engineering Materials Science	2
ESCI 320L	Engineering Materials Science Laboratory	1
MECH 304	Introduction to Machine Design	3
MECH 400	Mechanical Vibrations	3
ESCI 403	Heat Transfer	3
ELEC 327	Electrical Engineering Fundamentals	3
or ELEC 335 & 335L	Electrical Engineering I and Electrical Engineering I Laboratory	
MECH 402 & 402L	Model-Based Control System Design and Model-Based Control System Design Laboratory	3
or AERO 430	Control System Analysis and Design	
PHYS 250	Physics with Calculus III	3
PHYS 250L	Physics with Calculus III Laboratory	1
Total Credits		**51**

Area of Concentration

Energy Systems

ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 440	Thermal Power Systems	3
MECH 448	Energy Systems Preliminary Design	4
or MECH 468	Propulsion System Preliminary Design	
MECH 449	Energy Systems Detail Design	4
or MECH 469	Propulsion System Detail Design	
MECH 340	Alternative Energy I	3
MECH 405	Thermal-Fluid Science and Energy Measurement	1
MECH 405L	Thermal-Fluid Science and Energy Measurement Laboratory	1
MECH 304L	Machine Design Laboratory	1
ELEC 334	Electrical Engineering for Mechanical Engineers	3

Area of Concentration Electives:		**6**
MECH 442	Alternative Energy II	
or MECH 443	Environment Control and HVAC Systems	
COE courses with MECH, AERO, or ELEC Subject Code		
Total Credits		**29**

Robotics

MECH 470	Mechatronics	3
MECH 478	Robotic Systems Preliminary Design	4
MECH 479	Robotic Systems Detail Design	4
MECH 304L	Machine Design Laboratory	1
CESC 220	Digital Circuit Design	3
CESC 220L	Digital Circuit Design Laboratory	1
CPSC 125	Computer Science I	3
CPSC 125L	Computer Science I Laboratory	1
MECH 370	Introduction to Robotics	3
MECH 370L	Introduction to Robotics I Laboratory	1
MECH 470L	Mechatronics Laboratory	1
MECH 471	Robotics II	3
MECH 471L	Robotics II Laboratory	1
Total Credits		**29**

Propulsion Systems

MECH 304L	Machine Design Laboratory	1
ELEC 334	Electrical Engineering for Mechanical Engineers	3
ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 360	Airbreathing and Rocket Propulsion	3
MECH 440	Thermal Power Systems	3
MECH 405	Thermal-Fluid Science and Energy Measurement	1
MECH 405L	Thermal-Fluid Science and Energy Measurement Laboratory	1
MECH 448	Energy Systems Preliminary Design	4
or MECH 468	Propulsion System Preliminary Design	
MECH 449	Energy Systems Detail Design	4
or MECH 469	Propulsion System Detail Design	
Area of Concentration Electives:		**6**
AERO 302	Aerodynamics II	
AERO 414	Space Propulsion	
AERO 437	Advanced Space Propulsion	
ESCI 414	High Temperature Turbine Materials	
MECH 460	Advanced Propulsion	
MECH 461	Boost Rocket Propulsion	
MECH 461L	Boost Rocket Propulsion Laboratory	
Any 500 Level MECH course		
Total Credits		**29**

Electives

Technical Electives	6
One of the technical electives must be a 300-500 level engineering course designated by the prefixes AERO, CESC, CIVE, CPSC, ELEC, ENGR, ENGP, MECH, PHYS, SFTW, or SYSE that is not listed in the degree requirements. Students may take one 300-500 level math course designated by the prefix MATH.	
Total Credits	**6**

Suggested Plans of Study

Energy Systems Option

Year One

Requirements	Credits
COMM 122 - English Composition	3
CHEM 113 - General Chemistry for Engineering	3
ENGR 101 - Introduction to Engineering	2
ENGR 201 - Computer Aided Design of Mechanical Systems	3
MATH 241 - Calculus and Analytical Geometry I	4
MECH 200L - Machine Shop Laboratory	1
Semester Hours	**16**

Requirements	Credits
COMM 221 - Technical Communication	3
ECON 225 - Engineering Economics	3
ENGR 115 - Introduction to Computing for Engineers	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 161 - Physics with Calculus I and II	4
Semester Hours	**17**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
ESCI 201 - Statics	3
ESCI 208 - Thermodynamics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**17**

Requirements	Credits
ELEC 335 - Electrical Engineering I	2
ELEC 335L - Electrical Engineering I Laboratory	1
ESCI 202 - Solid Mechanics	3
ESCI 206 - Fluid Mechanics	3
MATH 345 - Differential Equations and Matrix Methods	4
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Three

Requirements	Credits
ELEC 334 - Electrical Engineering for Mechanical Engineers	3
ESCI 204 - Dynamics	3
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 440 - Thermal Power Systems	3
Semester Hours	**15**

Requirements	Credits
AERO 430 - Control System Analysis and Design	3
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
MECH 340 - Alternative Energy I	3
MECH 405 - Thermal-Fluid Science and Energy Measurement	1
MECH 405L - Thermal-Fluid Science and Energy Measurement Laboratory	1
Area of Concentration	3
Math/Science Elective	3
Semester Hours	**17**

Total Credits

Total Hours for All Requirements: 32

Year Four

Requirements	Credits
COMM 420 - Advanced Technical Communication I and COMM 430 - Advanced Technical Communication II	3
MECH 304 - Introduction to Machine Design	3
MECH 304L - Machine Design Laboratory	1
MECH 448 - Energy Systems Preliminary Design	4
Area of Concentration	3
Technical Elective	3
Semester Hours	**17**

Requirements	Credits
MECH 400 - Mechanical Vibrations	3
MECH 449 - Energy Systems Detail Design	4
Humanities/Social Sciences - Upper Level	3
Technical Elective	3
Semester Hours	**13**

Total Credits

Total Hours for All Requirements: 30

Robotics Option

Year One

Requirements	Credits
CHEM 113 - General Chemistry for Engineering	3
COMM 122 - English Composition	3
ENGR 101 - Introduction to Engineering	2
ENGR 201 - Computer Aided Design of Mechanical Systems	3
MATH 241 - Calculus and Analytical Geometry I	4
Semester Hours	**15**

Requirements	Credits
COMM 221 - Technical Communication	3
CESC 220 - Digital Circuit Design	3
CESC 220L - Digital Circuit Design Laboratory	1
MATH 242 - Calculus and Analytical Geometry II	4
MECH 200L - Machine Shop Laboratory	1
PHYS 161 - Physics with Calculus I and II	4
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 31

Year Two

Requirements	Credits
ENGR 115 - Introduction to Computing for Engineers	3
ESCI 201 - Statics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**17**

Requirements	Credits
CPSC 125 - Computer Science I	3
CPSC 125L - Computer Science I Laboratory	1
ELEC 335 - Electrical Engineering I	2
ELEC 335L - Electrical Engineering I Laboratory	1
ESCI 204 - Dynamics	3
MATH 335 - Introduction to Linear and Abstract Algebra	3
MATH 345 - Differential Equations and Matrix Methods	4
Semester Hours	**17**

Total Credits

Total Hours for All Requirements: 34

Year Three

Requirements	Credits
ESCI 202 - Solid Mechanics	3
ESCI 208 - Thermodynamics	3
MECH 370 - Introduction to Robotics	3
MECH 370L - Introduction to Robotics I Laboratory	1
MECH 470 - Mechatronics	3
MECH 470L - Mechatronics Laboratory	1
Humanities - Lower Level	3
Semester Hours	**17**

Requirements	Credits
AERO 430 - Control System Analysis and Design	3
ESCI 206 - Fluid Mechanics	3
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
MECH 471 - Robotics II	3
MECH 471L - Robotics II Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Four

Requirements	Credits
COMM 420 - Advanced Technical Communication I and COMM 430 - Advanced Technical Communication II	3
ESCI 403 - Heat Transfer	3
MECH 304 - Introduction to Machine Design	3
MECH 304L - Machine Design Laboratory	1
MECH 478 - Robotic Systems Preliminary Design	4
Technical Elective	3
Semester Hours	**17**

Requirements	Credits
ECON 225 - Engineering Economics	3
MECH 400 - Mechanical Vibrations	3
MECH 479 - Robotic Systems Detail Design	4
Technical Elective	3
Semester Hours	**13**

Total Credits

Total Hours for All Requirements: 30

Propulsion Systems

Year One

Requirements	Credits
CHEM 113 - General Chemistry for Engineering	3
COMM 122 - English Composition	3
ENGR 101 - Introduction to Engineering	2
ENGR 201 - Computer Aided Design of Mechanical Systems	3
MATH 241 - Calculus and Analytical Geometry I	4
MECH 200L - Machine Shop Laboratory	1
Semester Hours	**16**

Requirements	Credits
COMM 221 - Technical Communication	3
ECON 225 - Engineering Economics	3
ENGR 115 - Introduction to Computing for Engineers	3
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 161 - Physics with Calculus I and II	4
Semester Hours	**17**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
ESCI 201 - Statics	3
ESCI 208 - Thermodynamics	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 250 - Physics with Calculus III	3
PHYS 250L - Physics with Calculus III Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	**17**

Requirements	Credits
ELEC 335 - Electrical Engineering I	2
ELEC 335L - Electrical Engineering I Laboratory	1
ESCI 202 - Solid Mechanics	3
ESCI 206 - Fluid Mechanics	3
MATH 345 - Differential Equations and Matrix Methods	4
Humanities - Lower Level	3
Semester Hours	**16**

Total Credits

Total Hours for All Requirements: 33

Year Three

Requirements	Credits
ELEC 334 - Electrical Engineering for Mechanical Engineers	3
ESCI 204 - Dynamics	3
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
ESCI 403 - Heat Transfer	3
MECH 360 - Airbreathing and Rocket Propulsion	3
Semester Hours	**15**

Requirements	Credits
AERO 430 - Control System Analysis and Design	3
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
MECH 405 - Thermal-Fluid Science and Energy Measurement	1
MECH 405L - Thermal-Fluid Science and Energy Measurement Laboratory	1
MECH 440 - Thermal Power Systems	3
Area of Concentration	3
Math/Science Elective	3
Semester Hours	**17**

Total Credits

Total Hours for All Requirements: 32

Year Four

Requirements	Credits
COMM 420 - Advanced Technical Communication I and COMM 430 - Advanced Technical Communication II	3
MECH 304 - Introduction to Machine Design	3
MECH 304L - Machine Design Laboratory	1
MECH 468 - Propulsion System Preliminary Design	4
Area of Concentration	3
Technical Elective	3
Semester Hours	**17**

Requirements	Credits
MECH 400 - Mechanical Vibrations	3
MECH 449 - Energy Systems Detail Design	4
Humanities/Social Sciences - Upper Level	3
Technical Elective	3
Semester Hours	**13**

Total Credits

Total Hours for All Requirements: 30

Worldwide Program Requirements

General Education Requirements	42
Core Requirements	53
Area of Concentration	29
Electives	6
Total Credits	**130**

Program Details

The Bachelor of Science in Mechanical Engineering requires successful completion of a minimum of 130 credit hours. Students enrolled in the Worldwide Undergraduate Online program may complete the degree in 20 terms, or approximately four years, assuming full-time enrollment and continuous progress. Students pursuing this undergraduate degree must earn a minimum cumulative grade point average (CGPA) of 2.00 for all work completed at the University. The courses required to earn this degree are listed below.

Students should be aware that many courses have prerequisites and/or corequisites. Students are responsible for ensuring that all prerequisite and degree requirements are satisfied prior to enrollment in advanced coursework. The suggested plan of study is provided as a guide. A student's actual plan of study may vary based on term of admission, course availability, transfer credit, and other academic considerations. Students should consult with their academic advisor to develop an individualized plan of study.

The curriculum includes a Robotics track that integrates advanced coursework in robotics, mechatronics, control systems, and mechanical engineering design. Students should work closely with their academic advisor to ensure prerequisite requirements are met and courses are completed in the recommended sequence to support successful completion of the Robotics track and the engineering curriculum.

General Education Requirements

Communication		9
COMM 122	English Composition	
COMM 221	Technical Communication	
COMM 219	Speech	
Humanities - Lower Level		3
Social Sciences - Lower Level		3
ECON 225	Engineering Economics	
Humanities/Social Sciences - Lower or Upper Level		3
Humanities/Social Sciences - Upper Level		3
HUMN 330	Values and Ethics	
Computer Science/Information Technology		3
ENGR 115	Introduction to Computing for Engineers	
Mathematics		8
MATH 241	Calculus and Analytical Geometry I	
MATH 242	Calculus and Analytical Geometry II	
Physical/Life Sciences		10
CHEM 110	General Chemistry I	
CHEM 110L	General Chemistry I Laboratory	
PHYS 150	Physics with Calculus I	
PHYS 160	Physics with Calculus II	
Total Credits		**42**

Core Requirements

MATH 243	Calculus and Analytical Geometry III	4
MATH 345	Differential Equations and Matrix Methods	4
ENGR 101W	Introduction to Engineering	3
ENGR 120	Graphical Communications	3
ESCI 201	Statics	3
ESCI 202	Solid Mechanics	3

ESCI 204	Dynamics	3
ESCI 208	Thermodynamics	3
MECH 201L	Computer-Aided Manufacturing Laboratory	1
ESCI 206	Fluid Mechanics	3
ESCI 320	Engineering Materials Science	2
ESCI 320L	Engineering Materials Science Laboratory	1
MECH 304	Introduction to Machine Design	3
MECH 400	Mechanical Vibrations	3
ESCI 403	Heat Transfer	3
ELEC 327	Electrical Engineering Fundamentals	3
AERO 430	Control System Analysis and Design	3
PHYS 250	Physics with Calculus III	3
PHYS 250W	Physics with Calculus III Laboratory	2
Total Credits		**53**

Area of Concentration

ROBOTICS

MECH 470	Mechatronics	3
MECH 478	Robotic Systems Preliminary Design	4
MECH 479	Robotic Systems Detail Design	4
MECH 304L	Machine Design Laboratory	1
CESC 220	Digital Circuit Design	3
CESC 220L	Digital Circuit Design Laboratory	1
CPSC 125	Computer Science I	3
CPSC 125L	Computer Science I Laboratory	1
MECH 370	Introduction to Robotics	3
MECH 370L	Introduction to Robotics I Laboratory	1
MECH 470L	Mechatronics Laboratory	1
MECH 471	Robotics II	3
MECH 471L	Robotics II Laboratory	1
Total Credits		**29**

Electives

ESCI 324	Measurements and Instrumentation	2
ESCI 324L	Measurements and Instrumentation Laboratory	1
MECH 404	Advanced Machine Design	3
Total Credits		**6**

Suggested Plan of Study

Year One

Requirements	Credits
COMM 122 - English Composition	3
ENGR 101W - Introduction to Engineering	3
Semester Hours	**6**

Requirements	Credits
MATH 241 - Calculus and Analytical Geometry I	4
ENGR 115 - Introduction to Computing for Engineers	3
Humanities - Lower Level	3
Semester Hours	**10**

Requirements	Credits
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 150 - Physics with Calculus I	3
Semester Hours	**7**

Requirements	Credits
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
ECON 225 - Engineering Economics	3
ENGR 120 - Graphical Communications	3
Semester Hours	**10**

Total Credits

Total Hours for All Requirements: 33

Year Two

Requirements	Credits
COMM 221 - Technical Communication	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 160 - Physics with Calculus II	3
Semester Hours	**10**

Requirements	Credits
ESCI 201 - Statics	3
MATH 345 - Differential Equations and Matrix Methods	4
MECH 201L - Computer-Aided Manufacturing Laboratory	1
Semester Hours	**8**

Requirements	Credits
COMM 219 - Speech	3
ESCI 202 - Solid Mechanics	3
ESCI 204 - Dynamics	3
Semester Hours	**9**

Requirements	Credits
ESCI 206 - Fluid Mechanics	3
PHYS 250 - Physics with Calculus III	3
PHYS 250W - Physics with Calculus III Laboratory	2
Semester Hours	**8**

Total Credits

Total Hours for All Requirements: 35

Year Three

Requirements	Credits
ELEC 327 - Electrical Engineering Fundamentals	3
ESCI 208 - Thermodynamics	3
ESCI 320 - Engineering Materials Science	2
ESCI 320L - Engineering Materials Science Laboratory	1
Semester Hours	**9**

Requirements	Credits
ESCI 403 - Heat Transfer	3
CESC 220 - Digital Circuit Design	3

CESC 220L - Digital Circuit Design Laboratory	1
Semester Hours	**7**

Requirements	Credits
ESCI 324 - Measurements and Instrumentation	2
ESCI 324L - Measurements and Instrumentation Laboratory	1
MECH 370 - Introduction to Robotics	3
MECH 370L - Introduction to Robotics I Laboratory	1
Semester Hours	**7**

Requirements	Credits
CPSC 125 - Computer Science I	3
CPSC 125L - Computer Science I Laboratory	1
MECH 304 - Introduction to Machine Design	3
MECH 304L - Machine Design Laboratory	1
Semester Hours	**8**

Total Credits

Total Hours for All Requirements: 31

Year Four

Requirements	Credits
MECH 470 - Mechatronics	3
MECH 470L - Mechatronics Laboratory	1
MECH 471 - Robotics II	3
MECH 471L - Robotics II Laboratory	1
Semester Hours	**8**

Requirements	Credits
AERO 430 - Control System Analysis and Design	3
MECH 400 - Mechanical Vibrations	3
MECH 404 - Advanced Machine Design	3
Semester Hours	**9**

Requirements	Credits
HUMN 330 - Values and Ethics	3
MECH 478 - Robotic Systems Preliminary Design	4
Semester Hours	**7**

Requirements	Credits
MECH 479 - Robotic Systems Detail Design	4
Humanities/Social Science - Lower or Upper Level	3
Semester Hours	**7**

Total Credits

Total Hours for All Requirements: 31

Estimated Cost of Attendance

Estimated Cost of Attendance: California Student Information (https://catalog.erau.edu/student-life/student-affairs/california-student/)