

B.S. in Mechanical Engineering

Mechanical Engineering is a well-established engineering discipline that involves state-of-the-art 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 Mechanical Engineering program offers four areas of concentration (AOC), or tracks: Biomedical Systems, Energy Systems, High Performance Vehicles, and Robotics and Autonomous Systems (with an emphasis in Uncrewed and Autonomous Vehicle Systems). These tracks are integrated with a comprehensive range of Mechanical Engineering subjects, such as machine design, heat transfer, and vibrations. Mechanical Engineering students have exceptional experiential learning opportunities including internships, research projects, and numerous student competitions.

- The Biomedical Systems track prepares students for scientific discovery and technology innovation in the bioengineering and biomedical fields.

- The Energy Systems track prepares students to design, develop and evaluate energy-related projects to reduce cost and improve energy efficiency.

- The High Performance Vehicles track prepares students for employment in vehicle design and manufacturing, from competition vehicles to fuel-efficient and environmentally friendly vehicles. Subjects include aerodynamics, vehicle dynamics and design.

- The Robotics and Autonomous 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 mechatronics.

The Program Educational Objectives of the Mechanical Engineering program as offered at the Daytona Beach campus are that, in a few years of graduation, our graduates:

1. Are established as engineers in the aerospace, aviation, automotive, biomedical, energy, robotics, or related fields or engaged in advanced studies
2. Have demonstrated their ability to work effectively and responsibly as practical problem solvers, innovators and as members of diverse professional teams

The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The curriculum is designed to accomplish these objectives with a base of math, sciences, and engineering. 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.

Degree Requirements

The Bachelor of Science in Mechanical Engineering requires the successful completion of a minimum of 129 credit hours. A minimum cumulative grade point average of 2.0 is required for all work completed with the University.

Students will:

- Have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 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 communicate effectively with a range of audiences.

- 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 function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 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.

General Education Requirements

For a full description of Embry-Riddle General Education guidelines, please see the General Education section of this catalog. These minimum requirements are applicable to all degree programs.

Communication Theory & Skills (COM 122, COM 219, COM 221)	9
Lower-Level Humanities	3
Lower-Level Social Sciences (EC 225 required)	3
Lower or Upper-Level Humanities or Social Sciences	3
Upper-Level Humanities or Social Sciences	3
Computer Science (EGR 115)	3
Mathematics (MA 241 & MA 242)	8
Physical and Life Sciences - (PS 150, PS 160 & PS 253)	7
Total Credits	39

UNIV 101	College Success	1
Mathematics		
MA 243	Calculus and Analytical Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
Physical Science		
CHM 110	General Chemistry I	3
CHM 110L	General Chemistry I Laboratory	1
PS 250	Physics for Engineers III	3
Engineering Sciences Core		
EE 327	Electrical Engineering Fundamentals	3
EGR 101	Introduction to Engineering	2
EGR 120	Graphical Communications	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
ES 305	Thermodynamics	3
ES 309	Fluid Dynamics	3
ES 320	Engineering Materials Science	2
ES 321	Engineering Materials Science Laboratory	1
ES 403	Heat Transfer	3
Mechanical Engineering Core		
ME 208	Manufacturing Laboratory	1
ME 325	Modeling and Simulation of Complex Engineering Problems	2
ME 326	Modeling and Simulation of Complex Engineering Problems Lab	1
ME 304	Introduction to Machine Design	3
ME 313	Instrumentation and Data Acquisition	2
ME 314	Instrumentation and Data Acquisition Laboratory	1
ME 400	Mechanical Vibrations	3
ME 436	Advanced Machine Design	3
ME 438	Model-Based Control System Design	2

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ME 438L	Model-Based Control System Design Laboratory	1
	Professional Development Elective *	3
	Technical Electives **	6
Total Credits		73

* CEME 396 or AF 402/MSL 402/NSC 402 or ME 540 will satisfy this requirement.

** There are a number of 300-500 level courses from other departments that are equivalent to existing required courses in the BSME curriculum and therefore cannot be used as Technical Electives. Please consult with the BSME Program Coordinator or Academic Advisor before enrolling in any Technical Elective course to make sure it will apply to your BSME program of study.

Biomedical Systems Track Courses*

ME 320	Fundamentals of Biomechanics	3
ME 442	Biofluid Mechanics	3
ME 460	Biosolid Mechanics	3
ME 448	Preliminary Design in Biomedical Systems	4
ME 458	Senior Design in Biomedical Systems	4
Total Credits		17

* Students may also select from the following courses as upper level technical electives: CHM 310/CHM 310L, HF 312, HF 326, HF 440, BIO 305/BIO 305L, BIO 306/BIO 306L, BIO 405/405L, or BIO 440

Energy Systems Track Courses

ME 316	Thermodynamics II	3
ME 443	Heating, Ventilation, and Air-Conditioning	3
ME 445	Sustainable Design	3
ME 414	Preliminary Design for Energy Systems	4
ME 434	Senior Design for Energy Systems	4
Total Credits		17

High Performance Vehicles Track Courses

ME 303	Longitudinal and Vertical Vehicle Dynamics	3
ME 409	Vehicle Aerodynamics	3
ME 439	Combined Vehicle Dynamics	3
ME 413	Preliminary Design for High Performance Vehicles with Laboratory	4
ME 433	Senior Design for High Performance Vehicles with Laboratory	4
Total Credits		17

Robotics and Autonomous Systems Track Courses

ME 311	Robotics Technologies for Unmanned Systems	3
ME 402	Robotic Arms	3
ME 404	Mechatronics	3
ME 407	Preliminary Design for Robotic Systems with Laboratory	4
ME 437	Senior Design for Robotic Systems with Laboratory	4
Total Credits		17

Total Degree Credits 129

Suggested Plan 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.

See the Common Year One outline in the Engineering Fundamentals Program Introduction.

Year One

	See the Common Year One outline in the College of Engineering introduction.	Credits 33
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Credits Subtotal 33.0

Year Two

COM 221	Technical Report Writing	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
ME 208	Manufacturing Laboratory	1
MA 243	Calculus and Analytical Geometry III	4
MA 345	Differential Equations and Matrix Methods	4
PS 160	Physics for Engineers II	3
PS 250	Physics for Engineers III	3
PS 253	Physics Laboratory for Engineers	1
	Humanities or Social Science Lower Level Elective	3

Credits Subtotal 31.0

Year Three

EE 327	Electrical Engineering Fundamentals	3
ES 305	Thermodynamics	3
ES 309	Fluid Dynamics	3
ES 320	Engineering Materials Science	2
ES 321	Engineering Materials Science Laboratory	1
ES 403	Heat Transfer	3
ME 304	Introduction to Machine Design	3
ME 313	Instrumentation and Data Acquisition	2
ME 314	Instrumentation and Data Acquisition Laboratory	1
ME 325	Modeling and Simulation of Complex Engineering Problems	2
ME 326	Modeling and Simulation of Complex Engineering Problems Lab	1
	Professional Development Requirement *	3
	Track Course	3
	Track Course	3

Credits Subtotal 33.0

Year Four

EC 225	Engineering Economics	3
ME 436	Advanced Machine Design	3
ME 400	Mechanical Vibrations	3
ME 438	Model-Based Control System Design	2
ME 438L	Model-Based Control System Design Laboratory	1
	Upper-Level Humanities or Social Science Elective	3
	Technical Elective AE/CEC/CIV/CS/EE/EGR/EP/MA 4XX/ME/SE/SYS or Track specific electives **	6
	Track Course	3
	Preliminary Design Course (ME 413 or ME 407 or ME 414 or ME 448)	4

Senior Design Course (ME 433 or ME 437 or ME 434 or ME 458)	4
Credits Subtotal	32.0
Credits Total:	129.0

* CEME 396 or AF 402 / MSL 402 / NSC 402 or ME 540 will satisfy this requirement.

** AF/NSC/MSL UL may fulfill 3 credits of technical electives. There are a number of 300-500 level courses from other departments that are equivalent to existing required courses in BSME curriculum and therefore cannot be used as Technical Electives. Please consult with the BSME Program Coordinator or Academic Advisor before enrolling in any Technical Elective course to make sure it will apply to your BSME program of study.