
Mechanical Engineering

Bachelor of Science

Mechanical Engineering became a degree offering in Fall 2007. When designing this degree program our faculty wanted to ensure that we created a Mechanical Engineering degree that embraced Embry-Riddle's mission and recognized expertise in aerospace. Aerospace platforms, whether atmosphere or space based, require skills from a team of engineers that include Aerospace, Electrical, Computer, and, of course, Mechanical Engineering. Given this, our ME degree stays within that focus of the aerospace platform with the two primary focus areas of robotics and propulsion.

The freshman year in the College of Engineering is common to all degree programs. The second year in Mechanical Engineering builds fundamental skills in math and physics while introducing students to Engineering Mechanics and the Thermal Sciences. The sophomore years in both Mechanical and Aerospace Engineering are the same, in reflection of the similarity of the two programs. During the junior year, Mechanical Engineering students in Embry-Riddle's program in Prescott will start taking courses in the focus areas of robotics or propulsion. The robotics focus will emphasize the design and analysis of autonomous vehicles that include uninhabited aerial vehicles (UAVs), autonomous space vehicles, and planetary rovers. The propulsion focus will emphasize the thermal sciences and design and analysis of turbomachinery. Jet aircraft engines are the primary area of depth but piston and rocket propulsion are also studied. During the senior year, students will gain additional depth in their focus areas and take

capstone courses in designing an aerospace platform.

Aerospace platforms are designed in teams and with that we provide interdisciplinary opportunities centered around our ME students. Senior ME students will have the opportunity to choose between four capstone sequences as a culminating event focused on teams, integration, and synthesis of four years of education. Mechanical, Aerospace, Electrical, and Computer engineers can choose capstones sequences that include:

- The robotics sequence centered on UAVs and rovers
- The astronautics sequence centered on spacecraft
- The aeronautics sequence centered on aircraft
- The propulsion sequence centered on jet aircraft engines.

The overall objective of the Mechanical Engineering program at Prescott is to produce graduates who will be successful practitioners of mechanical engineering. The program objectives to accomplish this goal are:

I. Math, Science, and Engineering Fundamentals

Alumni working in the engineering field will demonstrate skills in math, science, and engineering with an emphasis on solving problems using fundamental engineering principles, including engineering logic, traditional analytical methods, modern software, and experimental verification of analytical methods. Additionally and more specifically:

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1. Be competent in fundamental engineering areas that include statics, dynamics, solid mechanics, circuits, materials science, fluid mechanics, thermodynamics, machine design, and experimental techniques and instrumentation.
2. Use appropriate software that would enable analysis, simulation, and design of aerospace systems (for example, MATLAB, ANSYS, CATIA, etc.).

II. Social Context of Engineering Practice

Alumni working in the engineering field will demonstrate an understanding and philosophy that promotes engineering practice founded in technical integrity, ethics, social and environmental responsibility, and global awareness. Alumni will recognize the importance of preparing themselves for continued education and independent thought.

III. Design and Teamwork

Alumni working in the engineering field will demonstrate the ability to assimilate topics from multiple sources, design a system or process, communicate that design effectively though verbal and written means, and work effectively on a team. They will also be cognizant of engineering project management. Alumni will:

1. Have a broad understanding of the interrelations of the engineering disciplines and their impact on robotic and propulsion system designs.
2. Understand the importance of teamwork, the value of multiple experiences, and be able to communicate to a broad array of technical and non-technical audiences.
3. Bring design expertise to the work environment within a chosen subset of mechanical engineering disciplines.

IV. Discipline Specific Depth

Alumni working in the engineering field will demonstrate depth in their discipline and exposure in related areas. They will:

1. Have demonstrated depth in the analysis of robotic systems or turbomachinery.
2. Have depth in theoretical, computational, and experimental methods.

These objectives coupled with the common college outcomes are extensive and form the foundation of the program. We ask a lot from our students and faculty. The commitment a student makes in the program and consequently the skills they bring to the workforce are substantial and are required to be among the best in the industry.

Suggested Program of Study

FRESHMAN YEAR

Course	Title	Credits
CEC 220	Digital Circuit Design	3
CEC 222	Digital Circuit Laboratory	1
COM122	English Composition and Literature	3
COM219	Speech	3
EGR 101	Introduction to Engineering	2
EGR 115	Introduction to Computing for Engineers	3
HU/SS	Lower-Level Humanities -OR- Social Sciences*	3
HU 14X	Lower-Level Humanities*	3
MA 241	Calculus and Analytic Geometry I	4
MA 242	Calculus and Analytic Geometry II	4
PS 150	Physics I for Engineers	3
UNIV 101	College Success*	(1)+
Total Credits		32

* In excess of degree requirements.

SOPHOMORE YEAR

Course	Title	Credits
COM221	Technical Report Writing	3
EGR 200	Computer-Aided Conceptual Design of Aerospace Vehicles	3
ES 201	Statics	3
ES 202	Solid Mechanics	3
ES 204	Dynamics	3
ES 206	Fluid Mechanics	3
MA 243	Calculus and Analytical Geometry III	4

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MA	345	Differential Equations & Matrix Methods.....	4
PS	160	Physics II	3
PS	220	Physics III Laboratory	1
PS	250	Physics III for Engineers	3

Total Credits 33

JUNIOR YEAR

Course	Title		Credits
AE	408	Turbines and Rocket Engines	3
AE	430	Control System Analysis and Design	3
ME	430L	Control System Laboratory	1
ME	304	Introduction to Machine Design.....	3
ME	305	Machine Design Laboratory	1
ES	305	Thermodynamics	3
ES	320	Engineering Material Science	2
ES	321	Engineering Material Science Laboratory	1
EE	335	Electrical Engineering I	2
EE	336	Electrical Engineering I Laboratory.....	1
HU/SS		Lower-Level Elective	3
ME	302	Introduction to Robotics	3
ME	415	Modeling and Numerical Simulations of Energy and Environmental Systems...3	
PS	105	General Chemistry I.....	4

Total Credits 33

SENIOR YEAR

Course	Title		Credits
EE	Course**	for students taking EE Capstone.....	3
EC	225	Engineering Economics.....	3
ES	403	Heat Transfer.....	3
HU	330	Values and Ethics	3
MA	412	Probability and Statistics	3
ME	400	Vibration and Acoustics.....	3
ME	403	Thermal Power Systems	3
ME	406	Robotics II	
		-OR-	
ME	417	Advanced Propulsion	3
		Technical Elective	2
		Preliminary Design*	4/3
		Detail Design*	4/3

Total Credits 31

TOTAL DEGREE CREDITS 129

Technical Electives

- ME 410, 416, 426
- AE 301, 313, 404, 414, 416

Capstone Design Sequence, Preliminary and Detail Design

ME students have four possible sequences for their capstone sequence:

Astronautics

Students taking the Spacecraft capstone sequence are required to take:

Course	Title		Credits
AE	427	Spacecraft Preliminary Design	4
AE	445	Spacecraft Detail Design	4

Aeronautics

Students taking the Aircraft capstone sequence are required to take:

Course	Title		Credits
AE	420	Aircraft Preliminary Design	4
AE	421	Aircraft Detail Design	4

Propulsion

Students taking the Propulsion capstone sequence are required to take:

Course	Title		Credits
AE	435	Air-Breathing Propulsion Preliminary Design.....	4
AE	440	Air-Breathing Propulsion Detail Design..	4

Robotics

Students wishing to take a Robotics capstone sequence need to coordinate activities with the Electrical Engineering Department. In this sequence students take:

Course	Title		Credits
EE	420	Preliminary Design I	3
EE	421	Senior Capstone Project.....	3

**In addition, students choosing the Robotics sequence will take one additional CEC or EE 2 or 3 credit course as determined by the student and the EE chair.

General Education Electives

Embry-Riddle course in the general education categories of Humanities and Social Sciences may be chosen as specified below, assuming prerequisite requirements are met.

Humanities

HU: Lower-Level

Social Sciences

SS/PSY/RS: Lower-Level

Prior approval by the Mechanical Engineering program coordinator is required for any substitutions for general education electives. Language courses, other than the student's native language, substitute for Humanities.