MECHANICAL ENGINEERING

Requirements

Summary of Degree Requirements

The freshman year of the mechanical engineering program includes courses in mathematics and foundational sciences, as well as introductory courses in engineering and design. Foundational sciences include physics, biology, and chemistry. The sophomore year features courses in mathematics, foundational sciences, and the engineering sciences. The final two years of the program stress the design and analysis of systems, machines and their components, and the transfer and transformation of energy. In addition to the required mathematics, science, and engineering courses, the program includes required writing and communication courses and an array of technical electives and free electives, a math/science elective, and elective courses in the humanities, social sciences, and the arts (HSSA). The requirements for an undergraduate degree in mechanical engineering are summarized in the following table:

Code	Title	Hours
Required engineering (ME, ES, EM) courses		86
Required math courses		27
Required foundational science courses		16
Required HSSA writing and communication courses		8
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Technical electives		16
Free electives		8
Math/science elective		4
HSSA electives		28
Total Hours		**194**

Areas of Concentration

Students who complete recommended courses in an area of concentration may receive, upon request, a letter from the Department Head attesting to the fact that the student has completed the requirements in the selected area of concentration in the Mechanical Engineering Department. With proper planning, students should be able to take these course offerings without overload. Students may add special topics courses or new courses not yet listed in the catalog to the list of acceptable courses for a concentration with written permission from the mechanical engineering department head.

Automotive Area of Concentration

Automotive Engineering is a very broad field covering many topics including system modeling, combustion, electrification, autonomous driving, materials, and virtual design. To help prepare for a career in this field, the Automotive Concentration is offered. One required and four elective courses are necessary, allowing students to gain either breadth or depth according to their interests.

Code	Title	Hours
Required Course		
ME 359	Vehicle System Modeling	4
Elective Courses		
Select four of the following:		12
CSSE 461	Computer Vision	
CSSE 463	Image Recognition	
EM 402	Three-Dimensional Dynamics	
EM 403	Advanced Mechanics of Materials	
MA 416	Deep Learning	
ME 401	Foundations of Fluid Mechanics	
ME 306	Control Systems	
ME 408	Renewable Energy	
ME 410	Internal Combustion Engines	
ME 422	Finite Elements for Engineering Applications	
ME 423	Fatigue	
ME 424	Mechanics of Composites	
ME 427	Introduction to Computational Fluid Dynamics	
ME 450	Combustion	
ME 506	Advanced Control Systems	
ME 522	Advanced Finite Element Analysis	
ME 559	xEV Analysis and Design	
OE 450	Laser Systems & Applications	
PH 470	Special Topics in Physics	

Aerospace Engineering Area of Concentration

The aerospace industry provides job opportunities each year for many mechanical engineering graduates. The aerospace engineering area of concentration is intended to provide specialty courses which focus the application of basic mechanical engineering skills to aerospace systems.

The courses required to complete the concentration are as follows:

Code	Title	Hours
Required Course:		
ME 305	Introduction to Aerospace Engineering	4
Select four of the following elective courses:		16
ME 401	Foundations of Fluid Mechanics	
ME 405	Theoretical Aerodynamics	
ME 410	Internal Combustion Engines	
ME 411	Propulsion Systems	
ME 422	Finite Elements for Engineering Applications	
ME 426	Turbomachinery	
ME 427	Introduction to Computational Fluid Dynamics	
ME 461	Aircraft Design	
ME 506	Advanced Control Systems	
ME 510	Gas Dynamics	
ME 522	Advanced Finite Element Analysis	
EM 402	Three-Dimensional Dynamics	
EM 403	Advanced Mechanics of Materials	
MA 336	Boundary Value Problems	
MA 438	Advanced Engineering Mathematics	
PH 322	Celestial Mechanics	

CAD Area of Concentration

The CAD Concentration is intended to prepare students for careers with a focus in computer-aided design and analysis. The Concentration is divided into two sets of courses: Design and Analysis. The Design courses provide students with expertise in the use of modern Computer-Aided Design tools to model three-dimensional shapes and to communicate these designs graphically. The Analysis courses explore

the mathematics behind modern CAD tools, giving students a solid background in computer-aided kinematics and finite element analysis.

To earn the CAD Concentration, students must complete the following three Design classes:

Code	Title	Hours
Select one of the following:		2-8
EM 104	Graphical Communications	
ENGD 100	Design & Communication Studio	
BE 118	Design Thinking and Communication	
EM 304	Advanced CAD | Professional Certification	4
EM 305	Advanced CAD | Design Applications	4
Select three Analysis courses from the following:		12
ME 422	Finite Elements for Engineering Applications	
ME 522	Advanced Finite Element Analysis	
ME 304	Introduction to the Design of Mechanisms	
ME 404	Advanced Design of Mechanisms	
ME 380	Machine Component Design	

Dynamic Systems & Control Area of Concentration

Mechanical engineering graduates may work in industries, such as the automotive and aerospace industries, in which the understanding and control of a system's dynamic response is critical. The dynamic systems & control concentration provides students with experiences in modeling, analysis, and simulation of the dynamic behavior of systems with and without feedback control, as well as opportunities to explore data collection for vibratory systems and control algorithm implementation in a laboratory setting.

To complete the requirements of the area of concentration in Dynamics Systems & Control, students must complete five courses from this list:

Code	Title	Hours
EM 402	Three-Dimensional Dynamics	4
EM 306	Vibration Analysis	4
EM 502	Advanced Dynamics	4
EM 503	Advanced Vibration Analysis	4
ME 304	Introduction to the Design of Mechanisms	4
ME 404	Advanced Design of Mechanisms	4
ME 306	Control Systems	4
ME 441	Advanced Modeling and Simulation Techniques	4
ME 445	Robot Dynamics and Control	4
ME 506	Advanced Control Systems	4
PH 322	Celestial Mechanics	4

Thermal Fluid Area of Concentration

The Thermal Fluid concentration is designed to prepare students for careers with a focus on thermodynamics, fluid dynamics, and heat transfer. The concentration comprises two balanced areas of study: thermal fluid systems (with an emphasis on applications) and thermal fluid sciences (with an emphasis on fundamentals). They equip students with astrong foundation to analyze and design thermal fluid systems. Emerging global challenges such as climate change, sustainable energy, and water resources call for creative solutions within the constraints of fundamental physical principles. The Thermal Fluid concentration plays an active and crucial role in the broad discipline of mechanical engineering.

To complete the requirements of the area of concentration in Thermal Fluid, students must complete:

Code	Title	Hours
ME 401	Foundations of Fluid Mechanics	4
Select 4 more courses from the following two areas (with at least one course from each area):		16
Area 1: Thermal Fluid Systems		
ME 408	Renewable Energy	
ME 410	Internal Combustion Engines	
ME 411	Propulsion Systems	
ME 426	Turbomachinery	
Area 2: Thermal Fluid Sciences		
ME 405	Theoretical Aerodynamics	
ME 427	Introduction to Computational Fluid Dynamics	
ME 450	Combustion	
ME 510	Gas Dynamics	

The mechanical engineering program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org

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