Mechanical Engineering

Professor D. Wallace; Associate Professors R. Friend and J. Mountain (Chair); Assistant Professor K. Supan; Lecturer M. Rolland; Visiting Assistant Professor B. Bradke.

The Mission of the Mechanical Engineering Department is to:

- Prepare students to excel in mechanical engineering and related fields.
- Provide modern, fundamental, practice-oriented education in the mechanical engineering field.
- Foster creativity and critical thinking in problem solving and motivate students to consider the societal consequences of their work.
- Enable students to be leaders in their profession, community, and the nation.

Graduates of the Mechanical Engineering program will:

- Apply engineering principles and modern tools to conceive, analyze and implement engineering solutions.
- Hold positions of progressive responsibility leading teams in a variety of mechanical engineering fields including: energy conversion and transfer, materials and manufacturing, and mechanical systems design.
- Work as professionals in industrial, military, government, and academic settings while maintaining a high awareness and responsibility regarding ethical, safety, environmental, social, economic, and global issues.
- Work effectively as a team member and lead multidisciplinary teams.
- Design components, systems or processes in the mechanical engineering field and effectively communicate those designs through verbal and written means.
- Have a positive outlook on the engineering profession and maintain an ongoing intellectual curiosity while actively engaged in continuing education throughout life.

Mechanical engineering, the broadest of the engineering professions, provides an opportunity for a wide range and variety of services, work, and interests. The mechanical engineer deals with the conversion of energy, the design of machines, the instrumentation and control of processes, and the control of machines and the environment. Conventional fields of interest are transportation (automobiles, aircraft, urban and mass transit); machines and systems for electrical power production from coal, oil, and gas; heating and air conditioning of buildings; and the complex machinery and methods of making steel, plastics, paper products, etc. Today the mechanical engineer is directly involved in new and challenging fields such as computer-aided design and manufacturing (CAD/CAM); artificial body organs and devices (bioengineering); nuclear power generation; applications of electronics to the control of machines and to laboratory instruments; aerospace (spacecraft and rockets); and the control of environmental pollution for automobiles and industry. The diversity of opportunities for the mechanical engineer and the extensive overlap of interests with the other engineering and scientific disciplines demand that the undergraduate education be broad rather than specialized and that it provide a thorough grounding in all of the engineering fundamentals. The curriculum is a carefully structured blend of theory and the practical aspects of engineering. Engineering applications are emphasized in the junior and senior years with three semesters of design. The diversity of the curriculum is also apparent in the senior projects courses where assignments range from the design, construction, and testing of a water quality measuring submarine to the investigation of robotics manufacturing techniques for the compact disc industry. Since three-fourths of the curriculum's technical content consists of a foundation of engineering theory, the graduate is uniquely prepared to attack the technical challenges of the future and solve the new engineering problems of society. The graduate is well prepared for direct employment in the engineering profession or for further formal education in graduate school.

The Mechanical Engineering curriculum is accredited by:

Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org
415 N. Charles Street
Baltimore, MD 21201
Telephone (410) 347-7700

B.S. in Mechanical Engineering - Curriculum Map

First Year			
Fall	**Credits**	**Spring**	**Credits**
CH 103 General Chemistry I	4	CH 104 General Chemistry II	4
EG 109 Introduction to Engineering I	3	EG 110 Introduction to Engineering II	3
MA 121 Calculus I	4	MA 122 Calculus II	4
EN 101 Composition and Literature I	3	EN 102 Composition and Literature II	3
		General Education Elective	3
	14		**17**

Second Year			
Fall	**Credits**	**Spring**	**Credits**
EE 204 Electrical Circuits I	3	EE 240 Electrical Concepts and Applications	3
EG 201 Engineering Mechanics (Statics, Dynamics)	3	EG 202 Engineering Mechanics (Statics,Dynamics)	3
ME 211 Mechanical Engineer Tools I	2	EG 206 Thermodynamics I	3
MA 223 Calculus III	4	MA 224 Differential Equations	4
PS 211 University Physics I	4	PS 212 University Physics II	4
	16		**17**
Third Year			
Fall	**Credits**	**Spring**	**Credits**
EG 203 Materials Science	3	EG 303 Fluid Mechanics	3
EG 301 Mechanics of Materials	3	ME 356 Manufacturing Processes	4
ME 307 Thermodynamics II	3	ME 368 Design of Machine Elements	3
ME 311 Mechanical Engineering Tools II	2	ME 370 Mechanical Systems Design	3
ME 363 Kinematic and Kinetic Sythesis	3	ME 382 Mechanical Engineering Laboratory II	1
ME 381 Mechanical Engineering Laboratory I	2	General Education Elective	3
	16		**17**
Fourth Year			
Fall	**Credits**	**Spring**	**Credits**
EE 321 Embedded Systems	4	ME 468 Mechanical Engineering Design II	3
ME 435 Mechanical Control Systems	3	EG 043 Conference	0
ME 465 Heat Transfer	3	ME Elective	3
ME 467 Mechanical Engineering Design I	3	Math/Science/Engineering Elective[1]	3
ME 487 Mechanical Engineering Laboratory III	2	General Education Elective	3
EG 044 Conference	0	General Education Elective	3
General Education Elective	3		
	18		**15**
Total Credits: 130			

An undergraduate student, who has completed all degree requirements except for attaining a 2.00 average, must take at least 50 percent of all subsequent course work in technical material (subject to approval by the Director of the David Crawford School of Engineering).

For the Mechanical Engineering Program, a fifth General Education Elective is required and is an additional course from any one of the four previously mentioned general education categories.

[1] The following courses are approved Math/Science/Engineering Electives: CE348, CH205, CH225, CH327, EE303, EE325, EE357, MA241, MA306, MA309, MA310, MA370, MA407, PS232, PS331, PS363, PS423, PS441, and any ME 400 level course not specifically listed as a degree requirement. Two different ME490 courses covering different topics can be used to satisfy the ME elective and the Math/Science/Engineering elective. Other 200 level (or higher) 3+ credit courses offered by College of Science and Mathematics or the David Crawford School of Engineering may be approved subject to completion of the course prerequisites and a positive recommendation from the student's academic advisor and the Mechanical Engineering department chair.

Courses

ME 211 Mechanical Engineer Tools I 2 Credits
An extension of EG 109 with a more in-depth treatment of 3-D solid model generation including extrusion, revolving, sweeping and lofting. Further development and modification of 3-D solid drawings. Laboratory: 3 hours. Prerequisite: EG 109.

ME 307 Thermodynamics II 3 Credits
Applications of thermodynamics to power and refrigeration cycles, combustion mechanisms, mixture and flow processes. Development of thermodynamic relationships and equations of state. Classroom 3 hours. Prerequisite: EG 206.

ME 311 Mechanical Engineering Tools II 2 Credits
An extension of ME 211 with additional application of computer based design and analysis methods. An emphasis will be placed on design for manufacturing and other tools appropriate to the mechanical engineering profession. Laboratory: 3 hours. Prerequisite: ME 211.

ME 356 Manufacturing Processes 4 Credits
A study of the principles of manufacturing processes. Metal removal, casting, joining and deformation processes are covered as well as introductions to numerically controlled machinery, computer-aided manufacturing, rapid prototyping, robotics, computer integrated manufacturing and modern manufacturing systems. Classroom 3 hours, laboratory 3 hours. Prerequisite: ME 311, EG 203.

ME 363 Kinematic and Kinetic Sythesis 3 Credits
A study of the principles of motion and the forces necessary to cause, and be created by motion. Applications to the design of typical machine elements such as gears, linkages and cams. Classroom 3 hours. Prerequisites: EG 202, MA 223.

ME 368 Design of Machine Elements 3 Credits
A study of the application of the theories of mechanics and stress analysis to the design of fundamental machine parts. Some of the topics covered are shafts, springs, screws, belts, gears, rivets, bearings and lubrication. Classroom 3 hours. Prerequisites: EG 301.

ME 370 Mechanical Systems Design 3 Credits
An introduction to the methodology of design including problem definition, generation and evaluation of alternatives, and design completion. Emphasis is placed on creativity, feasibility, and the effect of economic and societal factors on alternative selection. Goals are achieved through the use of case studies and small projects. Classroom 3 hours. Prerequisite: junior standing.

ME 381 Mechanical Engineering Laboratory I 2 Credits
A study of the fundamentals of mechanical and electronic instruments and their use in measurement systems to obtain data on temperature, pressure, displacement, acceleration, and other physical variables. Introduction to experimental methods and procedures, reduction of data to significant form, and the organization of experimental results in written reports. Lecture 1 hour, laboratory 3 hours. Prerequisite: EE 204.

ME 382 Mechanical Engineering Laboratory II 1 Credit
Application of instrumentation to observations of gas and liquid behavior, thermo-dynamic and mechanical aspects of machines and devices. Dynamic and transient considerations in instruments, physical systems, and experimental data. Laboratory 3 hours. Prerequisite: ME 381.

ME 435 Mechanical Control Systems 3 Credits
Synthesis and analysis of mechanical control systems with feedback. Use of linearization techniques and Laplace Transform methods of analysis. Techniques for determining system stability. Emphasis is placed on operational characteristics of components and their effect on system design. Computer simulation of system operation. Classroom 3 hours. Prerequisites: MA 224, EG 202.

ME 465 Heat Transfer 3 Credits
A study of the fundamentals of heat transfer by conduction, radiation, and convection. Steady and unsteady state conduction. Study will include boundary layer theory, internal and external convective flows, two-phase flow, and heat exchange design theory. Classroom 3 hours. Prerequisites: EG 206, EG 303, MA 224.

ME 467 Mechanical Engineering Design I 3 Credits
A capstone design project is taken up to the point of prototype construction, testing and hardware specification. The specific skills and knowledge needed by practicing engineers in the product realization process are emphasized and developed. Classroom 3 hours. Prerequisite: senior standing, ME 370.

ME 468 Mechanical Engineering Design II 3 Credits
Design completion of the capstone project initiated in ME 467 including hardware specification, instrumentation, laboratory testing, data reduction, and evaluation. Written design report required with oral presentation and defense. Prerequisite: ME 467.

ME 487 Mechanical Engineering Laboratory III 2 Credits
A continuation of the Mechanical Engineering laboratory sequence with experiments stressing the performance characteristics of heat power equipment and the application of theory learned in thermodynamics and fluid flow. Classroom 1 hour, laboratory 2 hours. Prerequisite: EG 303. Corequisite: ME 307.

ME 490 Advanced Topics 3,4 Credits
A course that provides specific work in an area of the instructor's special competence and indicated student interest. An extension of basic principles to applied areas such as HVAC, heat transfer, thermodynamics, stress analysis, environmental control, turbo-machinery, propulsion systems and aerodynamics. Classroom or seminar, 1-3 hours. Prerequisite: senior standing. Offered as occasion demands.