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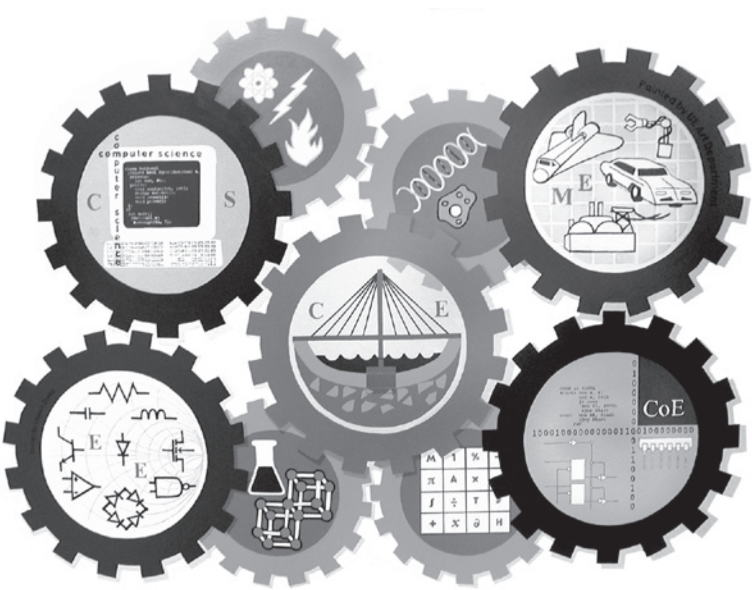

Mechanical Engineering
Guide Book

UNIVERSITY OF EVANSVILLE®
EST 1854

MECHANICAL ENGINEERING PROGRAM GUIDE BOOK 2018-19

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evansville.edu/majors/mechanicalengineering

The mechanical engineering program at the University of Evansville (UE) is accredited by the Engineering Accreditation Commission (EAC) of ABET Inc., www.abet.org, telephone 410-347-7700.

Revised 2018

MECHANICAL ENGINEERING AT THE UNIVERSITY OF EVANSVILLE

Mechanical engineering is one of the broadest fields of engineering, encompassing applications as diverse as automotive or aerospace vehicles, power generation, manufacturing processes, plastic and other petrochemical products, and even electronic hardware. These applications require a fundamental understanding of the static and dynamic relationships between forces, the nature of materials, principles of energy conservation and transformation, design and analysis of machines, the transmission of heat, and the flow of fluids. The mechanical engineering curriculum provides a rigorous treatment of fundamental principles in these subject areas and the necessary background in mathematics and the basic sciences to prepare students for these courses. Through elective choices, students may investigate special areas of mechanical engineering including internal combustion engines, turbomachinery, power plants, mechatronics, and advanced computational methods.

In addition to strong technical skills, today's engineers in the global marketplace must be adept at working with other people who have very different professional backgrounds and who may be from other countries with different cultures. The University of Evansville is helping engineers meet that challenge by providing students with a strong liberal arts background and providing an opportunity for an international experience at our Harlaxton College campus in England.

The mission of the mechanical engineering program is to provide a personalized educational experience for talented and motivated students who seek a Bachelor of Science in Mechanical Engineering degree. Our program objectives are:

Educational Objectives

1. Graduates shall be engaged in professional practice, continuing education, and/or other activities benefiting society.
2. Graduates shall have developed habits consistent with an attitude of professionalism, an awareness and appreciation for different cultures, and the understanding of engineering influence in a global context.

The mechanical engineering program is designed to provide our graduates with a firm grounding in basic science, engineering science, and engineering design that can serve as a basis for continued learning, either formally or informally. Our program strives to maintain a balance between a traditional approach to teaching engineering principles and incorporating current industrial practices. For example, computer-aided design and analysis, applications of automatic data acquisition, and concurrent engineering have all been incorporated into the curriculum. Faculty members aggressively seek funding from external sources to develop laboratories and courses that use state-of-the-art equipment.

The size of the program allows students to define individual experiences in undergraduate research or projects in student sections of professional societies. Student chapters of the American Society of Mechanical Engineers (ASME) and the Society of Automotive Engineers (SAE) are sponsored by the department to support and encourage the professional development of students. A national honorary society for mechanical engineering students, Pi Tau Sigma, is also represented. Students may also participate in university-wide chapters of the Society of Women Engineers (SWE) and the National Society of Black Engineers (NSBE).

A unique and exciting integrated design sequence is offered to all students. Students from all grade levels work together on practical real-life projects. Students apply design skills that they learn in their course work and throughout the integrated design sequence directly to meaningful projects. The goal is to teach both technical and non-technical skills through collaborative design-build-and-test projects.

The integrated design sequence consists of courses that offer specific skills that will be used in the team environment. The freshman course, Mechanical Engineering 197, provides skills in computer-aided modeling, sketching and product fabrication techniques. The sophomore course, Mechanical Engineering 297, provides instruction in basic computer-controlled machining techniques and further instruction in computer-aided modeling. The junior course, Mechanical Engineering 397, provides skills in instrumentation and automatic data acquisition for measurements. The senior course, Mechanical Engineering 497, provides skills in project management.

After students gain an understanding of fundamental concepts, design education is continued during the junior year through assigned design projects as a part of normal course work. The design projects are progressively more complex, culminating in the senior capstone design experience, Mechanical Engineering 495/497. There are many different types of projects including industry-sponsored projects; projects, such as the SAE Mini Baja and Formula SAE cars, that are entered into national and regional competitions; and undergraduate research projects. The engineering topics are divided approximately as two-thirds engineering science and one-third engineering design. The allocation between engineering science and design typically is carried throughout the selection of mechanical engineering technical electives as described below. This philosophy prepares our graduates to enter the professional practice of mechanical engineering or to further their education in graduate school.

You may have heard the phrase “It’s not what we do, it’s how we do it.” That is certainly true of the mechanical engineering program at UE. Our mechanical engineering curriculum is fairly typical of most colleges and universities. What makes our program different and, we believe, better are the following points.

- Students have the opportunity to study abroad at Harlaxton College in England and still complete their mechanical engineering degree in eight semesters.
- Our small size allows for close personal contact between students and professors and between other students.
- Our size and dedication to teaching give us great flexibility. We keep our courses up to date and use the latest techniques, such as team building, cooperative learning, and concurrent engineering.
- Our emphasis is on preparing students to be lifelong learners while preparing them to enter the practice of engineering upon graduation.
- A co-op program, featuring alternative terms of paid, full-time professional employment and school is available.
- The University’s size and diversity mean that engineering students can continually interact with students and faculty in other programs, allowing free intellectual and social interchange.

WHAT MECHANICAL ENGINEERS DO

Listed below are responses from several of our alumni about their job responsibilities.

Name: Jordan Haycock **Title:** General Engineer
Company: Missile Defense Agency
Job Responsibilities:

Assist in the development and production of a Divert Attitude Control System (DACS) that will help a ballistic missile defense system maneuver through space and intercept the target missile. Conduct simulated target and interceptor launches. Execute simulated flight tests.

Name: Jessie Bock Lofton, PhD **Title:** Assistant Professor Mechanical Engineering
Company: University of Evansville
Job Responsibilities:

Teach and mentor undergratduate mechanical engineering students at the University of Evansville. Specific attention to courses in the areas of heat transfer and thermo/fluids.

Name: Lori Bootz **Title:** Mechanical Engineer
Company: Alcoa
Job Responsibilities:
Lead the Global Rolling network for the plant and assist with mechanical, quality, and process issues as well as new technology. Serve as the supplier contact for roll shop equipment.

Name: Alex Mlsna **Title:** Design Engineer
Company: SMC Pneumatics (Indianapolis, Indiana)
Job Responsibilities:
Design new products based on customer specifications. Experimental testing of existing products and of new developmental prototypes. Also, provide technical support to sales and customer inquiries.

Name: Scott Farley **Title:** Design Engineer
Company: General Electric Aircraft Engines (Cincinnati, Ohio)
Job Responsibilities:
Design, analyze, and oversee manufacture of configuration hardware for all General Electric aircraft engine product lines. Configuration hardware includes such items as fuel manifolds, secondary air systems, and cable routings.

Name: Kurt Kimball **Title:** Mechanical Engineer
Company: IPEC-Planar (Phoenix, Arizona)
Job Responsibilities:
Responsible for the reliability, availability, and maintainability of our silicon wafer polishing machine. Includes research, design, and testing designs to improve the overall reliability of our product.

Name: John Weaver **Title:** Development Engineer
Company: Rolls Royce Company (Indianapolis, Indiana)
Job Responsibilities:
Perform detailed heat transfer and secondary flow analysis of gas turbine engine components. Further duties include: develop design software and analytical tools, coordinate analytical work with other technical/project engineers, and plan and evaluate results from engine tests.

Name: Les Owen **Title:** Manager, Technical and Regulatory
Company: BP Pipelines Inc. (Anchorage, Alaska)
Job Responsibilities:
Manage a technical group responsible for all technical and regulatory issues relating to BP's common carrier pipeline businesses in Alaska, including the Trans Alaska Pipeline System (TAPS), Endicott, Kaparuk, Milne Point, and three new systems under development. Requires interaction with government agencies, partners, and pipeline operators as well as diverse strategy development.

Name: Chor Weng Tan **Title:** Managing Director, Education
Company: American Society of Mechanical Engineers (New York, New York)
Job Responsibilities:
Direct the society's educational programs, including engineering education both at the undergraduate and graduate levels; pre-college math/science/engineering education; professional development; and continuing education of practicing engineers.

THE MECHANICAL ENGINEERING DEGREE PROGRAM

FIRST YEAR	
Fall	**Spring**
Calculus I	Calculus II
Principles of Chemistry	Calculus Physics I
Introduction to Mechanical Engineering	Integrated Design I
First-Year Seminar (FYS 112)	General Education Elective
Foreign Language or General Education Elective	Foreign Language or General Education Elective

The first year of the mechanical engineering program contains two semesters of calculus which cover differentiation and integration with applications of each. Calculus II contains a brief introduction to differential equations. There is one semester of chemistry which assumes that students have had a good high school chemistry course as a prerequisite. The first semester of Calculus Physics is taken in the spring of the freshman year; it covers mechanics, thermodynamics, and sound. First-Year Seminar 112 emphasizes writing and includes a range of global and interdisciplinary topics. Students will encounter challenging texts, perform critical analysis, and engage in expository writing.

The first semester of the freshman year also contains Introduction to Mechanical Engineering (Mechanical Engineering 101). This course meets three times a week and each student is enrolled in a section in which the student's academic advisor is the instructor. While students at this level do not have the necessary background to complete an advanced engineering design, they do have the mathematical ability to perform a "guided" engineering design. Students spend the semester designing and building a project in addition to learning teaming skills, presentation skills, and basic computer skills including computer graphics, word processing, and spreadsheets. The current project is a compressed air-powered launcher. Students are guided through the process of designing and constructing a properly sized air cylinder and elastic straps to launch a specified projectile for distance and accuracy. The semester concludes with a competition between the teams.

Mechanical engineering students take the first of four courses composing the integrated design sequence during the spring semester. Students work with upperclassmen to design, build, and test a mechanical engineering project.

SECOND YEAR	
Fall	**Spring**
Differential Equations	Calculus III
Calculus Physics II	Dynamics
Statics	Mechanics of Materials
Circuit Analysis	Integrated Design II
Materials Science	Circuits and Systems

During the first semester of the second year, mechanical engineering students take a course in differential equations. This course includes standard solution methods, difference equations, numerical techniques, and some nonlinear methods. This course is followed by Mathematics 323, which concludes the calculus sequence. This course covers advanced topics including vectors, multiple integrals, and line and surface integrals. The second semester of Calculus Physics is taken in the first semester of the sophomore year and covers electricity, magnetism, optics, and an introduction to nuclear physics.

Sophomore mechanical engineering students take Statics (rigid body mechanics) during the fall semester. In this course students learn to determine necessary forces and torques required to keep a component or component assemblies in equilibrium, assuming engineering components are manufactured from a perfectly rigid material.

Dynamics, taken during the spring semester, is a study of the forces necessary to move and accelerate rigid bodies. Dynamics introduces a variety of methods, including energy balances, to obtain solutions to these problems. During the second semester, students take Mechanics of Materials (Engineering 232) which begins a study of how materials deform under applied loads and torques and is the foundation course for designing reliable mechanical devices.

The second course in the integrated design sequence is taken during the spring semester of the sophomore year. Sophomore students work with freshman and junior mechanical engineering students to assist seniors to design, build, and test their senior projects. Students submit résumés and interview for positions on these teams in competition with other students.

At the end of the sophomore year students have completed many of the required courses that are fundamental to an understanding of engineering design and analysis. They have developed an approach for solving engineering problems and have a basic understanding of how engineering components behave.

THIRD YEAR	
Fall	**Spring**
Engineering Mathematics	Fluid Mechanics
Machine Design	Computer Aided Mechanical Design
Numerical Methods for Engineers	Thermo-Fluid Laboratory
Materials Laboratory	Integrated Design III
Thermodynamics	Manufacturing Methods
General Education Elective	General Education Elective

In the junior year, mechanical engineering students begin to concentrate in their major. They take required courses to continue to expand their basic understanding as well as courses to increase their breadth of understanding of mechanical engineering. The materials laboratory gives students hands-on experience with how materials fail. Laboratory experiments are performed to see how much force is required to produce failure in metal and plastic specimens. Computer aided mechanical design has students use modern software to analyze mechanical engineering design applications.

In the first semester of the junior year, students are required to take a course in numerical methods (Engineering 352). The course currently uses the MATLAB® numerical computing environment to teach students to apply computer solution techniques to a variety of mechanical engineering problems. The course includes an introduction to programming to accommodate students with no previous experience.

Thermodynamics is the initial course for the “energy stem” of mechanical engineering. Thermodynamics is a study of energy use and its transformation from one form to another, such as the combustion of fuel in an engine to produce work. Thermodynamic principles are expanded upon in the second semester Fluid Mechanics course.

During the spring semester, hands-on experience is gained in the Thermo-Fluid Laboratory where experimental set-ups are used to observe the behavior of various thermodynamic systems and fluid flow phenomena. The Engineering Mathematics introduces students to probability and statistics. In the spring semester, junior mechanical engineering students learn to design and construct instrumentation systems for measuring physical phenomena to participate in the integrated design sequence.

A year of foreign language may be taken in either the junior or senior year for students who have not established proficiency equivalent to one year of college level foreign language.

FOURTH YEAR	
Fall	**Spring**
Heat Transfer	ME Elective
System Modeling/Control	Professional Practice II
Professional Practice I	General Education Elective
ME Elective	Free Elective
Technical Elective	General Education Elective
General Education Elective	General Education Elective (if required)

There are four required mechanical engineering courses in the senior year, Heat Transfer and Systems Modeling and Control, and Professional Practice I and II. Most courses are electives that students take in their area of interest. In the first of the two required senior design courses, students work in teams on three projects. In the first project the instructor functions as the team leader. By the third project, students must perform completely independently of the instructor. In the second semester students choose their own teams and a semester-long project in which they design, build, and test a complete system. These projects have varied from Baja buggies to undergraduate research projects sponsored by industry. Underclassmen in the integrated design sequence compete for support positions on these senior teams. A senior usually serves as a team leader.

Students finish the last of their general education requirements and select electives in their area of specialization during both semesters of their senior year.

ADMISSION TO LOWER DIVISION

Students pursuing the Bachelor of Science in Mechanical Engineering (BSME) degree must be admitted to lower division by the mechanical engineering program faculty before they are permitted to participate in any 100- or 200-level mechanical engineering courses. Lower division acceptance into the mechanical engineering program requires that degree-seeking students meet the University's admission requirements and the mechanical engineering program's requirements. A limited number of students are accepted into the program as lower division status to ensure a high quality, personalized, educational experience. The mechanical engineering program's requirements focus on appropriate preparation such as prior course work, GPA, and minimum standardized test scores that are available on the ME website. Admission to full candidacy status in the mechanical engineering program is obtained through the successful upper division application process.

ADMISSION TO UPPER DIVISION

Students pursuing the Bachelor of Science in Mechanical Engineering (BSME) degree must be admitted to upper division by the mechanical engineering program faculty before they are permitted to participate in any 300- or 400-level mechanical engineering courses. Application for upper division admission is normally made during the semester preceding the one in which 300-level courses will be taken. The application process consists of submitting an application form for review by the mechanical engineering faculty. The deadline for submitting application materials is: spring semester, the Friday preceding the start of Spring Break; summer, the Wednesday preceding the start of fall classes; fall semester, the Friday preceding the start of Fall Break. The requirements for admission are:

- Students must have completed a minimum of 60 credit hours with a minimum GPA of 2.50, and received a letter grade of C- or better in each of the following courses:

Mathematics 221	Engineering 212
Mathematics 222	Engineering 213
Mathematics 323	Engineering 232
Mathematics 324	Mechanical Engineering 101/102
Chemistry 118	Mechanical Engineering 197
Physics 210	Mechanical Engineering 297

- Students must obtain a C- or better in First-Year Seminar 112. Transfer students must meet the University catalog requirements for writing proficiency.

Following the review period, conditional acceptance will be granted to students who have successfully completed the requirements or who will complete them by the end of the semester. Conditional acceptance allows students to preregister for 300-level mechanical engineering courses for the upcoming semester. Enrollment in 300-level and 400-level mechanical engineering courses requires fulfillment of all requirements.

Transfer students must also apply for admission to upper division. Transfer students may request a one semester probationary period in order to establish the requirements as listed above. The request must be made in writing and submitted to the program director no later than the first week of the semester.

AREAS OF SPECIALIZATION

Studies in mechanical engineering can be classified in three very broad areas: machine design, thermo-fluids, and biomedical. In this broad description the machine design area is generally thought of as "how big to make it so it does not fail." But the area also involves displacement and vibration analysis, manufacturing, sound, and advanced material behavior. The thermo-fluids area involves energy conversion and efficiency. But, again, in this broad definition it also includes fields of study in power plant design, turbomachinery, heat transfer, and internal combustion engines.

Machine Design Electives

Advanced Mechanics of Materials
Fracture Mechanics
Finite Elements
Mechanical Vibrations
Mechatronics

Thermo-Fluids Electives

Internal Combustion Engines
Advanced Thermodynamics
Principles of Turbomachinery
Computational Fluid Dynamics
Advanced Heat Transfer
Energy Systems
Heating, Ventilation, and Air Conditioning
Power Plant Engineering
Combustion

Biomedical Option Electives
Biomechanics
Organic Chemistry
Biology
Human Anatomy and Physiology I
Human Anatomy and Physiology II
Additional 300-level biology or chemistry courses

In addition to the above, students may elect to choose from specified electives in physics, mathematics, chemistry, civil, and electrical engineering.

UNDERGRADUATE RESEARCH

The University's UExplore Undergraduate Research Program is an opportunity for students to perform undergraduate research with faculty in a collegial relationship. Undergraduate research is an excellent way for students to acquire a distinctive experience for their résumé and a competitive edge when seeking employment or admission to graduate schools. Students may work on research topics of their own interest or work on faculty-defined projects. Students may also receive a $3,500 fellowship and board for summer research. Recent mechanical engineering projects include building a novel flaring device for hydrocarbon processing applications, understanding water-spray-driven air-flow-patterns for nuclear reactor containment, measuring the lift on model dragonfly wings in a wind tunnel, building a wheelchair simulator, and developing a new steam sensor.

THE CO-OP PROGRAM

Mechanical engineering majors are encouraged to participate in cooperative education (co-op program). In this program, a student completes the BSME degree requirements in five years but at the end of that time the student has a BSME plus three or four terms of industrial experience as a mechanical engineer.

The typical mechanical engineering co-op student goes to school the first two years just as a non co-op student does. At the end of the sophomore year the student goes to work and works through the summer. The student is back in school in the fall and out to work in the spring. Thereafter, the student alternates between work and school.

CO-OP CALENDAR			
Year	**Fall**	**Spring**	**Summer**
1	School 1	School 2	Work option
2	School 3	School 4	Work 1
3	School 5	Work 2	School/Work option
4	Work 3	School 6	Work 4
5	School 7	School 8	

Some students who are exceptionally well prepared to enter the work force may begin their co-op period in the summer after the freshman year. This is unusual and most students begin after the sophomore year. The summer after the junior year may be either school or work as needed. Many students work through this summer thereby completing a full calendar year on the job.

To enter the co-op program students should enroll in the co-op orientation course (EXED 090). This is a non-credit course which should be taken during the fall of the sophomore year. This course covers such topics as résumé writing, interviewing, and what is expected on the job. During the spring of the sophomore year the typical co-op student interviews with prospective employers. The Center for Career Development takes care of contacting employers and arranging interviews for students. Actual placement in a co-op position is dependent on the outcome of the interview process.

Co-op students in mechanical engineering have a wide range of employers to choose from. Employers are located in the immediate Evansville area, in the surrounding region of Indiana, Kentucky, and Illinois, and at various places throughout the country. If a student wants to work for a company with which we do not have a co-op relationship, the Center for Career Development will contact that company and attempt to establish a program. The requirement to qualify as a legitimate co-op employer is that the company has to provide a mechanical engineering opportunity for a prospective engineer that is relevant to the student's education and chosen profession. Some of the companies who hire UE mechanical engineering co-op and internship students are listed here:

Accuride
Alcoa
Boeing
Bowen Engineering
Duke Power
Electronics Research Inc.
Fiat Chrysler
GE Aircraft Engines
George Koch Sons
General Electric
Kimball International
LexMark
NSWC Crane
Patriot Engineering
Professional Consultants Inc.
Sumitomo Electric Wiring Systems
Toyota
Vectren Energy Delivery

The real value of the co-op program is the experience that it provides. A co-op job can be a financial benefit, but the net income from one term at work does not typically cover the cost of one term in education. The co-op program gives employers an opportunity to look at a student as a prospective employee without making a commitment to long term employment. Likewise, the co-op program gives the student a chance to look at a company and gain some experience before entering the work force as a working professional.

Co-op students normally get a higher salary offer upon graduation than non co-op students. In many cases the co-op employer provides a long-term employment opportunity for the co-op student upon graduation. About 25 percent of mechanical engineering students participate in the co-op program.

HARLAXTON COLLEGE OPTION

The University of Evansville's Harlaxton College is located just outside of Grantham, England, in the rolling English countryside. Harlaxton is about a one hour ride by train from London. Engineering students who choose to spend a semester studying at Harlaxton have easy access to England's culture, history, and entertainment.

Harlaxton College is housed in a large Victorian manor where about 200 students and faculty live and hold classes. The manor house has a number of historic state rooms where classes are held. A soccer field, sports hall, student lounges, bistro, and tennis courts are also available on the grounds.

Engineering students who wish to study one semester in England are encouraged to do so during the first semester of their sophomore year. At Harlaxton, engineering students typically take calculus, British studies, and general education classes. Harlaxton College is on the semester system and all courses earn credit at UE in the same way they would if they were taken in Evansville. Since the engineering program requires a number of general education classes, all classes taken at Harlaxton can count as required courses toward the mechanical engineering degree. Tuition at Harlaxton is the same as tuition at the Evansville campus and all scholarships and loans may be applied to Harlaxton costs.

Students at Harlaxton are encouraged to travel on weekends. The college arranges eight to 10 weekend field trips to locations such as Nottingham, London, Scotland, and Wales. During some semesters, less frequent but longer trips are arranged to Ireland and the continent.

Harlaxton College has its own resident British faculty as well as visiting faculty from the University of Evansville and other selected campuses in the United States. Likewise, students at Harlaxton come from the Evansville campus and various other campuses around the United States.

Harlaxton College Costs
While the tuition at Harlaxton College is the same as on the Evansville campus and all scholarships apply to Harlaxton, there are additional costs associated with travel. The typical airplane round trip is $1,500 and the typical student at Harlaxton College will spend an additional $3,000-$4,000 on weekend trips, souvenirs, and other miscellaneous expenses.

HONORS PROGRAM – MECHANICAL ENGINEERING

The Honors Program is open to selected mechanical engineering majors on entrance to the University. Admittance to the Honors Program is determined by the University Honors Committee on the basis of standardized test scores, an essay, and other student work completed in high school. The Honors Program provides participants with the opportunity to interact with other Honors Program students both socially and academically. Special honors courses and other academic events are available for honors students both in general education and in the major. Honors students have special library privileges and are able to register early.

1. Honors students must have a grade point average of 3.5 or better at the time of graduation.
2. To complete the program, honors students must acquire a total of at least 21 points in the Honors Program made up of the following:

   Course Work (required; 15 points)
   Honors Courses (generally three points each). Honors courses offered on a regular basis include First-Year Seminar 112, various courses that fulfill the general education requirements, and honors courses in other departments which are not part of the general education requirements.

   Honors Colloquia (generally one point each). Honors colloquia are offered on a variety of topics and include small group discussion of a book, a research topic, or a topic of current interest.

   Major Courses (generally three points each). These are courses within the major which are given a section designation of H.

Honors Project and Research (required; three points)
Senior Honors Project. In mechanical engineering this requirement is satisfied by the Mechanical Engineering 495/497 senior project sequence. This is a year-long sequence in which mechanical engineering students write a proposal, complete a design and construct a project. The honors project in mechanical engineering is more challenging and has a significant design and/or research component.

Study Abroad (optional; points vary)
Study at Harlaxton College during the fall or spring semester earns two points. Completion of a Harlaxton summer semester earns one point. Students studying abroad in other locations can obtain points based on the length of stay and honors learning experience.

STUDENT ORGANIZATIONS

American Society of Heating, Refrigerating, and Air-Conditioning Engineers
The American Society of Heating, Refrigerating, and Air-Conditioning Engineers was founded in 1894 and is a global society advancing human well-being through sustainable technology built for the environment. The mission of ASHRAE is to advance the arts and sciences of heating, ventilation, air conditioning, and refrigeration to serve humanity and promote a sustainable world. Student members have opportunities to learn from and interact with the local professional section of ASHRAE. This organization is open to all disciplines and encourages students to explore green energy and focus on creating and implementing sustainable and efficient designs.

American Society of Mechanical Engineers
The American Society of Mechanical Engineers was founded in 1880 as an educational and technical society. Today it is the largest and most prestigious mechanical engineering society in the world with over 115,000 members. As a member of the student section of ASME at the University of Evansville, mechanical engineering students have the opportunity to participate in a wide variety of activities and services of this national organization. Upon graduation student members are eligible to upgrade their membership status to associate member and gain additional benefits.

The local student organization participates in a variety of social and technical activities.

- Local section meetings
- Industrial tours
- Attend and participate in regional and national ASME meetings
- Network with guest speakers from business and industry

- Gain leadership skills as an officer in the local section
- Scholarship opportunities for upperclassmen

Society of Automotive Engineers

The Society of Automotive Engineers was founded in 1905. SAE is a nonprofit educational and scientific organization dedicated to advancing mobility technology to better serve humanity. Nearly 70,000 engineers and scientists, who are SAE members, develop technical information on all forms of self-propelled vehicles including automobiles, trucks and buses, off-highway equipment, aircraft, aerospace vehicles, marine, rail, and transit systems.

Mechanical engineering students at UE have been involved in the Baja SAE competition. The goal of Baja SAE is for students to design, build, and test a small ATV racer that uses a 10 horsepower Briggs and Stratton engine. Students design and build a chassis of their choice, but the engine cannot be modified. The competition consists of two parts: static and dynamic. The static events focus on how well the vehicle was engineered. The goal of the dynamic events is to determine which vehicle performs best on various off-road courses.

Baja SAE is an annual competition sponsored by SAE for engineering students. Approximately 100 engineering schools across North America, South America, and Asia compete in this activity.

The University of Evansville is one of two schools in Indiana that participates in the international SAE formula car competition. This senior-led project designs and builds a formula-style race care with an engine greater than 610cc and competes against 130 other schools from around the world. The vehicle is judged on static inspection and engineering design, solo performance through timed road courses, and high-performance track endurance.

ΠΤΣ Pi Tau Sigma

Pi Tau Sigma is the national honorary fraternity for mechanical engineers. The fraternity was founded at the University of Illinois in 1915. The University of Evansville Phi Rho chapter was founded in 1986.

The primary purpose of Pi Tau Sigma is to recognize those mechanical engineering students whose academic achievements, character, and attitude place them at the head of their class. Membership in Pi Tau Sigma is by invitation based on election by the active members of the chapter. To be eligible for consideration, a junior must rank in the upper 25 percent of the class and a senior must rank in the upper 35 percent of the class. Initiation into the UE chapter, with a one-time payment of national dues, makes one a lifetime member of Pi Tau Sigma.

Pi Tau Sigma activities emphasize scholarship and service. Members have served as tutors and often serve as guides and laboratory assistants for special events such as Engineering Open House. Pi Tau Sigma often co-sponsors activities such as tours and speakers with ASME.

Society of Women Engineers
The Society of Women Engineers is a national organization with student sections on each engineering campus. The section is an interdisciplinary organization with membership cutting across all the engineering disciplines and is also open to men who are interested in the mission and activities of the group.

The mission of SWE is to encourage women to achieve full potential in careers as engineers and leaders, to expand the image of the engineering profession as a positive force in improving the quality of life, and to demonstrate the value of diversity.

DEGREE REQUIREMENTS – BSME

The Bachelor of Science in Mechanical Engineering requires at least 127 hours of course work distributed as follows:

Enduring Foundations General Education *(43 hours)*
including Chemistry 118; Mathematics 221; Mechanical Engineering 495; Physics 210; and the foreign language proficiency requirement. For additional departmental general education requirements, please consult the department.

Lower division required courses *(41 hours)*
Mathematics 222, 323, 324; Physics 211; Engineering 212, 213, 230, 232; Electrical Engineering 210, 215; Mechanical Engineering 101/102, 197, 297.

Upper level required courses *(37 hours)*
Engineering 352, 366, 390; Mechanical Engineering 318, 330*, 344, 345, 360*, 362, 368, 397, 452, 495†, 497.

Electives *(12 hours)*
One of Mechanical Engineering 424, 432, 434, 446, 448, 453; one of Mechanical Engineering 462, 463, 466, 468, 470, 472, 473, 476; three hours technical elective from Mechanical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Engineering, Mathematics, Physics, Biology, Chemistry, or Interdisciplinary 380 (with STEM focus); three hours free elective.

*Meets Writing Across the Curriculum requirement (Overlay E).
†Meets Enduring Foundations capstone requirement (Overlay 11).

Note: Mathematics 202 or lower, Physics 1xx, Chemistry 10x, software courses and English language courses may not be applied to the 12 hour requirement.

The engineering topics are divided approximately as two-thirds engineering science and one-third engineering design. The allocation between engineering science and design typically is carried throughout the selection of mechanical engineering technical electives. This philosophy prepares our graduates to enter the professional practice of engineering or to further their education in graduate school.

Bachelor of Science in Mechanical Engineering

FALL			SPRING		
FRESHMAN					
CHEM 118	Principles of Chemistry	4	MATH 222	Calculus II	4
ME 101	Introduction to Mechanical Engineering	3	ME 197	Integrated Design I	2
FYS 112	First-Year Seminar	3	PHYS 210	Calculus Physics I	4
MATH 221	Calculus I	4		General Education	3
	Foreign Language 111* or General Education	3		Foreign Language 112* or General Education	3
		17			16
SOPHOMORE					
EE 210	Circuits	3	EE 215	Circuits and Systems	3
ENGR 212	Statics	3	ENGR 232	Mechanics of Materials	3
EXED 090	Building Your Professional Image	0	MATH 323	Calculus III	4
MATH 324	Differential Equations	3	ENGR 213	Dynamics	3
PHYS 211	Calculus Physics II	4	ME 297	Integrated Design II	2
ENGR 230	Materials Science	3		Health and Wellness	1
		16			16
JUNIOR					
ENGR 390	Applied Engineering Mathematics	3	ENGR 366	Fluid Mechanics	3
ENGR 352	Numerical Methods for Engineers	3	ME 318	Manufacturing Methods	3
ME 330	Materials Laboratory	2	ME 345	Computer Aided Mechanical Design	3
ME 344	Design of Machine Elements	3	ME 360	Thermo/Fluid Dynamics Lab	2
ME 362	Thermodynamics	4	ME 397	Integrated Design III	3
	General Education	3		General Education	3
		18			17
SENIOR					
ME 368	Heat Transfer	3	ME 497	Professional Practice II	3
ME 452	System Modeling and Control	3	ME 4xx	Elective	3
ME 495	Professional Practice I	3		Free Elective	3
ME 4xx	Elective	3		General Education	3
	General Education†	3		General Education**	3
	Technical Elective	3			12/15
		15/18			

*Note: Only if necessary to meet University foreign language requirement.
†Note: Only if necessary to meet University general education requirement.

Harlaxton College Option Plan of Study

FALL			SPRING		
FRESHMAN					
CHEM 118	Principles of Chemistry	4	ENGR 212	Statics	3
ME 101	Introduction to Mechanical Engineering	3	MATH 222	Calculus II	4
FYS 112	First-Year Seminar	3	ME 197	Integrated Design I	2
MATH 221	Calculus I	4	PHYS 210	Calculus Physics I	4
	Foreign Language 111* or General Education	3		Foreign Language 112* or General Education	3
		17			16
SOPHOMORE					
ID H282/283	The British Experience	6	ENGR 213	Dynamics	3
MATH 324	Differential Equations	3	ENGR 232	Mechanics of Materials	3
	General Education	3	EXED 090	Building Your Professional Image	0
	General Education	3	MATH 323	Calculus III	4
		15	ENGR 390	Applied Engineering Mathematics	3
			ME 297	Integrated Design II	2
				General Education	3
					18
JUNIOR					
EE 210	Circuits	3	EE 215	Circuits and Systems	3
ENGR 230	Material Science	3	ENGR 366	Fluid Mechanics	3
ME 330	Materials Laboratory	2	ME 318	Manufacturing Methods	3
ME 344	Design of Machine Elements	3	ME 345	Computer Aided Mechancial Design	3
ME 362	Thermodynamics	4	ME 360	Thermo/Fluid Dynamics Lab	2
ENGR 352	Numerical Methods for Engineers	3	ME 397	Integrated Design III	3
		18			17
SENIOR					
ME 368	Heat Transfer	3	ME 497	Professional Practice II	3
ME 452	System Modeling and Control	3	ME 4xx	Elective	3
ME 495	Professional Practice I	3		General Education	3
ME 4xx	Elective	3		General Education	3
PHYS 211	Calculus Physics II	4		Technical Elective	3
	Health and Wellness	1		Free Elective	3
		17			18

*Note: Only if necessary to meet University foreign language requirement.

Engineering Management Minor

A minor in engineering management is offered by the College of Engineering and Computer Science in cooperation with the Schroeder Family School of Business Administration. For mechanical engineering students, the engineering management minor can be earned by taking the following courses.

Engineering Management Minor *(18 hours)*

ECON 101	Principles of Macroeconomics (General Education Elective)
or	
ECON 102	Principles of Microeconomics
ENGR 390	Applied Engineering Mathematics (Required)
ENGR 409	Engineering Economy and Decision Making (Technical Elective)
COMM 380	Intercultural Communication (General Education Elective)
or	
ID 150	The American Corporation (General Education)
MGT 331	International Business Strategy (Free Elective)
or	
MGT 377	Organizational Behavior
MGT 310	Production/Operations Management (Additional Course)
or	
CE 324	Construction Management

With careful curriculum planning, mechanical engineering students can earn an engineering management minor by taking two additional courses. The note in parenthesis following each course shows where the course might fit into the BSME curriculum plan.

Mathematics Minor

A minor in mathematics is offered by the College of Arts and Sciences. Mechanical engineering students can earn a mathematics minor by taking the following courses.

Mathematics Minor *(20 hours)*

ENGR 390	Applied Engineering Mathematics (Required)
MATH 221	Calculus I (Required)
MATH 222	Calculus II (Required)
MATH 323	Calculus III (Required)
MATH 324	Differential Equations (Required)
MATH 3xx	300- or 400-level Course in Mathematics or Physics 305 (Additional Course)

With careful curriculum planning, mechanical engineering students can earn a mathematics minor with no extra courses. Upper level math courses require faculty approval. The note in parenthesis following each course shows where the course might fit into the BSME curriculum plan.

Chemistry Minor

A minor in chemistry is offered by the College of Arts and Sciences. Mechanical engineering students can earn a chemistry minor by taking the following courses.

Chemistry Minor *(20 hours)*

CHEM 118 Principles of Chemistry (Required)
CHEM 240 Organic Chemistry I (PHYS 211 Substitute)
CHEM 280 Inorganic Chemistry I (Technical Elective)
CHEM 360 Quantitative Analysis (Free Elective)

One additional course from:
CHEM 341 Organic Chemistry II (Additional Course)
or
CHEM 351 Physical Chemistry I (Additional Course)
or
CHEM 370 Biochemistry I and CHEM 371 Biochemistry Lab I (Additional Course)

With careful curriculum planning, mechanical engineering students can earn a chemistry minor with one or two additional courses. The note in parenthesis following each course shows where the course might fit into the BSME curriculum plan.

Energy Engineering Certificate

A certificate in energy engineering is available to students in the mechanical engineering program. Students may earn the certificate by completing the following requirements.

Energy Engineering Certificate *(12 hours or equivalent)*

EE 430 Energy Conversion Systems (Free Elective)

Any three of the following:

CE 374 Environmental Engineering (Technical Elective)
EE 330 Introduction to Power Systems (Additional Course)
ME 463 Principles of Turbomachinery (ME 4xx ThermoScience or Tech Elective)
ME 470 Combustion (ME 4xx ThermoScience or Tech Elective)
ME 472 Energy Systems (ME 4xx ThermoScience or Tech Elective)
ME 476 Power Plant Engineering (ME 4xx ThermoScience or Tech Elective)

CE 497 or EE 497 or ME 497
(with an approved energy-focused project)
or
COOP 91 - 95 or EXED 71 - 73
(with an approved energy-focused employer)

With careful curriculum planning including an approved energy-focused project or co-op, mechanical engineering students can earn an energy engineering certificate with no extra classes. The note in parenthesis following each course shows where the course might fit into the BSME curriculum plan.

Biomedical Option

A biomedical option is available to students in the mechanical engineering program.

Biomedical Option *(21 hours)*

EXSS 112	Human Anatomy and Physiology I (Free elective)
EXSS 113	Human Anatomy and Physiology II (Instead of ME 318)
ME 424	Engineering Biomechanics (Preferred) or EXSS 356 Biomechanics (ME 4xx elective)
CHEM 240	Organic Chemistry 1 (ME 4xx elective)
BIOL 107	General Biology (Instead of PHYS211)
ME 497	(with approved biomedical focused project) or ME 497 plus an approved biomedical focused project (at least on credit) or Internship/Co-op in a Biomedical or Heath-related setting (at least 10 weeks) plus ME 497

One of the following *(Technical Elective)*

ME 428 Special Topics in Biomedical Engineering
BIOL 305 Microbial Ecology
BIOL 322 Biological Physics
CHEM 370 Biochemistry

With careful curriculum planning, mechanical engineering students can complete the biomedical option with no additional classes. The note in parenthesis following each course shows where the course might fit into the BSME curriculum plan.

MECHANICAL ENGINEERING COURSES

Visit our website at www.evansville.edu/majors/mechanical engineering/courses.cfm for course descriptions.

ME 101/102	Introduction to Mechanical Engineering
ME 197	Integrated Design I
ME 297	Integrated Design II
ME 318	Manufacturing Methods
ME 330	Materials Laboratory
ME 344	Design of Machine Elements
ME 345	Computer Aided Mechanical Design
ME 360	Thermo/Fluid Dynamics Laboratory
ME 362	Thermodynamics
ME 368	Heat Transfer
ME 397	Integrated Design III
ME 424	Engineering Biomechanics
ME 428	Special Topics in Biomedical Engineering
ME 432	Advanced Mechanics of Materials
ME 434	Fracture Mechanics
ME 446	Finite Elements
ME 448	Mechanical Vibrations
ME 452	System Modeling and Control
ME 453	Mechatronics
ME 462	Advanced Thermodynamics
ME 463	Principles of Turbomachinery
ME 465	Internal Combustion Engines
ME 466	Computational Fluid Dynamics
ME 468	Advanced Heat Transfer
ME 470	Combustion
ME 472	Energy Systems
ME 473	Heating, Ventilating, and Air Conditioning
ME 476	Power Plant Engineering
ME 495	Professional Practice I
ME 497	Professional Practice II
ME 498	Independent Study in Mechanical Engineering
ME 499	Special Topics in Mechanical Engineering

ENGR 212	Statics
ENGR 213	Dynamics
ENGR 230	Materials Science
ENGR 232	Mechanics of Materials
ENGR 352	Numerical Methods for Engineers
ENGR 366	Fluid Mechanics
ENGR 390	Applied Engineering Mathematics
ENGR 409	Engineering Economy and Decision Making

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