

Undergraduate - School of Engineering

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Our Vision

The Vision of the School of Engineering is to become a preeminent engineering school providing transformational learning experiences that prepare engineering students for leadership, service, and success in life, profession, and society. It is our goal to be recognized for outstanding engineering research that positively advances the human condition, addresses critical needs of the world, and provides economic growth to our region, our nation, and our world. Finally, we are committed to being a nurturing, inclusive environment that promotes the development of all members of the School of Engineering family to their full potential while supporting and advancing the Catholic and Marianist mission of the University of Dayton.

Our Mission

The Mission of the School of Engineering is to educate complete professionals who have an integrated knowledge of the theory and practice of engineering together with an equally strong understanding of the arts and sciences that will prepare them for fulfilling careers of leadership, service, and life-long learning for the good of society.

Our Purpose

The School of Engineering has as its primary purpose the education of men and women toward a profound knowledge that engineering is more than a problem-solving discipline. While our curriculum and our research do not directly address issues of faith, we nonetheless affect in many ways the character and sensibilities of our students, not just as problem solvers but as individuals who respect the world that they shape for the good of others. Accordingly, our students receive an education that is rigorously directed toward advanced knowledge in engineering, while demonstrating at every turn the important relationships and interdependencies that exist between engineering and the rest of the disciplines across the full spectrum of human knowledge. We therefore educate students to be both intellectually astute and discerning in all their work and morally responsible in the face of the demands and rewards of our ever-changing world.

As an educational unit of a private university, the School of Engineering strongly emphasizes the advising of students so that they may achieve their educational objectives within the engineering program. First-year students are advised by an advising team. At the end of the second semester, each student is assigned a faculty advisor in his/her program. Academic advising begins before the students begin their formal course work and continues as they progress toward their objectives.

The broader responsibilities of the engineering profession demand that the professional education of an engineer include a significant component of humanities, ethics, and social science studies so that the student will become aware of the urgent problems of society and develop a deeper appreciation of the cultural achievements of humanity. Additionally, such studies provide the proper framework to ensure that scientific discoveries

and developments by engineers may result in the true advancement of the human race.

Academic Programs

The engineering program in each of the fields of chemical (p. 351), civil (p. 360), computer (p. 368), electrical (p. 366), and mechanical engineering (p. 391) is designed to lead to a bachelor's degree in a four-year period. While students pursue curricula they themselves have chosen according to their fields of interest, they all take certain core courses in mathematics, chemistry, physics, English, and engineering fundamentals. All of the programs permit additional specialization (as an overload) in minors in areas such as aerospace engineering (p. 393), bioengineering (p. 355), chemical processing (p. 356), composite materials engineering (p. 356), computer systems (p. 369), engineering management (p. 374), engineering mechanics (p. 361), environmental engineering (p. 362), materials engineering (p. 357), mechanical systems (p. 393), operations engineering (p. 374), polymer materials (p. 357), signals and systems (p. 369), structures (p. 362), transportation engineering (p. 362) and water resources engineering (p. 363) in the School of Engineering and in other areas such as languages, music, and political science in other units of the University. Concentrations in the School of Engineering include aerospace engineering (p. 392), electro-optics (p. 369), energy systems-chemical (p. 354), energy systems-mechanical (p. 392) and robotics (p. 369). Although emphasis is on fundamental theories, continued attention is paid to the solution of practical problems which the student will encounter in the practice of engineering.

The programs in chemical engineering, civil engineering, computer engineering, electrical engineering, and mechanical engineering are accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

The programs in electronic & computer, industrial, global manufacturing systems, and mechanical engineering technology are accredited by the Engineering Technology Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

Courses

EGR 100. Enrichment Workshop. 0 Hours

A workshop structured to provide collaborative learning of engineering calculus facilitated with upper-class engineering students. Required course both semesters for first-year students.

EGR 102. Seminar for Undergrad Engineering Students. 0 Hours

Introduction to engineering faculty, facilities, and curriculum; survey of career opportunities in engineering; orientation to the university. This course is part of the Integrated Engineering Core for all engineering students.

EGR 103. Engineering Innovation. 2 Hours

First year multi-disciplinary innovation projects primarily geared towards skill development in the areas of requirements analysis, creativity, conceptual design, design and problem-solving processes, prototyping, teamwork, and project communications. Application to the development of a new product or technology meeting societal needs. This course is part of the Integrated Engineering Core for all engineering students.

EGR 198. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

EGR 200. Professional Development Seminar. 0 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

EGR 201. Engineering Mechanics. 3 Hours

This course provides an introduction to mechanics as applied to engineering problems. Principles of force and moment balance, work, and energy conservation are applied to systems in static equilibrium. The similarity of balance laws applied to mechanical behavior to those used in thermodynamics and electric circuits is introduced. Students are introduced to the concepts of free-body diagrams and equivalent systems of forces, properties of areas and sections, analysis of simple structures, internal forces, stress, and material failure. Introduces a common problem-solving approach and processes to address and solve open ended problems and creative application of theory. Both analytical and computer solutions of engineering mechanics problems are emphasized. This course is part of the Integrated Engineering Core for all engineering students. Prerequisite(s): MTH 168; PHY 206.

EGR 202. Engineering Thermodynamics. 3 Hours

This course provides an introduction to engineering thermodynamics, emphasizing the vital importance of energy generation and efficiency from a multi-disciplinary perspective. State descriptions of pure substances and mixtures. Control volume analysis and conservation principles applied to systems with respect to mass, energy, and entropy with applications to power, refrigeration, chemically reacting and other energy conversion systems. Introduces a common problem-solving approach and processes to address real, open ended problems and creative application of theory. Both analytical and computer solutions of engineering thermodynamics problems are emphasized. This course is part of the Integrated Engineering Core for all engineering students. Prerequisite(s): MTH 168.

EGR 203. Electrical & Electronic Circuits. 3 Hours

This course provides an introduction to the discipline of Electrical and Computer Engineering. Covers principles of linear circuit analysis and problem solving techniques associated with circuits containing both passive and active components. Students are introduced to DC circuit analysis, AC circuit analysis, and transient circuit analysis. Applications of basic electronic devices including diodes, transistors, and operational amplifiers are studied. Both analytical and computer solutions of electrical and electronic circuit problems are emphasized. This course is part of the Integrated Engineering Core for all engineering students. Prerequisite(s): MTH 168.

EGR 298. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

EGR 299. Innovation Design & Entrepreneurship. 3 Hours

No description available.

EGR 311. Principles of Nanotechnology. 3 Hours

Nanoscale properties: optical, mechanical and thermal effects at the nanoscale, quantum confinement effects. Fabrication techniques: top down and bottom up techniques; nano-patterning, thin films. Nanometrology: scanning electron microscope, atomic force and microscope. Nanoelectronics: single electron devices, graphene and carbon nanotube electronics. Carbon nanotubes, quantum dots, nanophotonics.

EGR 320. Systems Design Scholars Seminar. 3 Hours

Interdisciplinary systems-design experience to emphasize the basic problem-solving approach and philosophy of engineering for students of varied backgrounds. By permission only.

EGR 323. Project Management. 3 Hours

No description available.

EGR 330. Engineering Design & Appropriate Technology. 0-3 Hours

An experiential course in appropriate technology and engineering design which spans the winter and summer semesters and includes language preparation, cultural immersion, selected readings, and discussions on appropriate technology and a six to sixteen week summer service-learning experience focused on technical or engineering related work in a developing country. Prerequisite(s): Junior or senior status; permission of instructor.

EGR 398. Multidisciplinary Research & Innovation Laboratory. 1-3 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

EGR 411. Advanced Nanotechnology. 3 Hours

Nanotechnology in information, energy, fabrication and metrology: data storage, nanoelectronics, 3-D transistors; nanomaterials in photovoltaics, fuel cells; thin films, optical and non-optical lithography, MEMS, nanofabrication processes; scanning electron microscopy.

EGR 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

EGR 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): EGR 493.

EGR 498. Honors Thesis. 3-6 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

EGR 499. Engineering Systems Design. 3 Hours

This course will provide students of varied backgrounds with an interdisciplinary systems-design experience of applying basic engineering problem-solving and process-oriented approaches to a set of case studies while examining those case studies through different philosophical perspectives on engineering itself.

Engineering Technology

The School of Engineering also offers a Bachelor of Science in Engineering Technology. The programs in which the degree is offered are:

- Electronic and Computer Engineering Technology
- Global Manufacturing Systems Engineering Technology
- Industrial Engineering Technology
- Mechanical engineering Technology

Students in Engineering Technology programs participate in an integrated education core in which they study specialized technical courses that emphasize rational thinking and the application of engineering and scientific principles to the practical solution of technological problems. Extensive laboratory experience aids the students in the design, analysis, and implementation of systems, as well as experiencing real-world application problems. The multidisciplinary curriculum culminates in a capstone design project. All programs offer a cooperative education program in which the student is allowed to alternate work and study semesters after the first year. Additionally, many students acquire experience through internships, summer work, or study abroad.

Graduates are critical thinkers who can apply established scientific and engineering knowledge to implement systems, and are prepared to take places in society as responsible, humane, complete professionals. They work effectively on multidisciplinary design teams building complex systems. Graduates are usually involved in the design, performance evaluation, service, and sales of products, equipment, and manufacturing systems or the management of these activities. Several years after graduation, they may find themselves in management positions.

The University of Dayton engineering technology programs prepare graduates who:

- are competent and productive in the practice of both the technical and communication aspects of their profession;
- demonstrate ethical and professional standards of conduct
- exhibit leadership qualities as appropriate for the practice of their profession;
- are involved in service activities that benefit their profession and their community; and
- are engaged in continuing professional development.

TRANSFER STUDENTS

The engineering technology programs welcome transfer students from associate degree programs in engineering technology who wish to pursue the Bachelor of Science in Engineering Technology. Graduates

of two-year associate degree programs in engineering technology should normally expect to undertake at least two additional years of work for the bachelor's degree.

MINORS IN ENGINEERING TECHNOLOGY

Students majoring in any engineering technology program may earn a minor in another engineering technology program by completing 12 approved semester hours of work in the second discipline. Courses already required in the student's program may not be counted in the minor. The director of the program in which the minor is to be earned is responsible for approving the list of courses for the minor.

The minors available to engineering technology students are:

- Automotive Systems
- Electronic and Computer Engineering Technology
- Global Manufacturing Systems Engineering Technology
- Industrial Automation and Applied Robotic Systems
- Industrial Engineering Technology
- Integrated Arts & Technology
- Mechanical Engineering Technology
- Quality Assurance
- Sustainable Manufacturing

A minor in Engineering Technology is also offered for students enrolled in majors in the College of Arts and Sciences, the School of Business Administration, and the School of Education and Health Sciences.

ACCREDITATION

The programs in electronic & computer, global manufacturing systems, industrial, and mechanical engineering technology are accredited by the Engineering Technology Accreditation Commission of ABET 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: (410) 347-7700.

ENGINEERING TECHNOLOGY FIRST-YEAR REQUIREMENTS

Students selecting any of the four engineering technology majors should take the courses prescribed under the Sample Plan of Study. Undeclared engineering technology students should follow the first-year schedule below.

Total first-year requirements:

CHM 123 & 123L	General Chemistry and General Chemistry Laboratory	4
EGR 103	Engineering Innovation	2
ENG 100 & ENG 200 or ENG 200H	Writing Seminar I and Writing Seminar II or Writing Seminar II	6
HST 103	The West & the World	3
MCT 110L	Technical Drawing & CAD Laboratory	2
MTH 137 & MTH 138	Calculus I with Review and Calculus I with Review	8
PHL 103	Introduction to Philosophy	3
REL 103	Introduction to Religious & Theological Studies	3
SET 100	Engineering Technology First Year Seminar	0
SET 101	Enrichment Workshop	0

SET 153L	Technical Computation Laboratory	1
Total Hours		32

Minors in Engineering

The student majoring in chemical, civil, computer, electrical, or mechanical engineering may choose a minor area of technical study. The minors program in the School of Engineering provides an opportunity to specialize in a particular technical sub-area while still pursuing a major program of study in one of the traditional and well recognized engineering disciplines. The minors program was designed in response to the needs of industry and government and to the educational needs and career objectives of students. Election of the minor is optional; it may require additional courses for completion.

The minor is defined as at least 12 semester hours of work. It can be composed of any number of 1- to 4-semester-hour courses selected from the approved list of minor areas of study.

The minors available to engineering students are:

- Aerospace Engineering (p. 390)
- Automotive Systems (p. 374)
- Bioengineering (p. 351)
- Chemical Processing (p. 351)
- Composite Materials Engineering (p. 351)
- Computer Systems (p. 365)
- Electrical and Computer Engineering Technology (p. 374)
- Energy Production Engineering (p. 351)
- Engineering Management (p. 374)
- Engineering Mechanics (p. 360)
- Engineering Technology (p. 374)
- Environmental Engineering (p. 360)
- Global Manufacturing Systems Engineering Technology (p. 374)
- Industrial Automation and Applied Robotic Systems (p. 374)
- Industrial Engineering Technology (p. 374)
- Integrated Arts and Technology (p. 374)
- Materials Engineering (p. 351)
- Mechanical Engineering Technology (p. 374)
- Mechanical Systems (p. 390)
- Operations Engineering (p. 374)
- Polymer Materials (p. 351)
- Quality Assurance (p. 374)
- Signals and Systems (p. 365)
- Structures (p. 360)
- Sustainable Manufacturing (p. 374)
- Transportation Engineering (p. 360)
- Water Resources Engineering (p. 360)

A 12 semester hour concentration in electro-optics is available to electrical and computer engineering undergraduates. A 16 semester hour concentration in aerospace engineering is also available to mechanical engineering students. Additional minors from outside the School of Engineering are available in many subject areas.

Students, in consultation with their faculty advisors, normally select the minor or concentration in the second semester of their sophomore year. The minor or concentration is designated on the student's transcript.

Degree Requirements

A student enrolls in the curriculum prescribed for the academic year in which he or she is registered as a first-year student at the University of Dayton or elsewhere. If for any reason it is necessary or desirable to change to a subsequently established curriculum, the student must meet all of the requirements of the new curriculum.

The degrees Bachelor of Chemical, Civil, Electrical, or Mechanical Engineering, Bachelor of Science in Computer Engineering, and Bachelor of Science in Engineering Technology are conferred at commencement if the general requirements enumerated here (p. 43) have been fulfilled as well as those listed below:

1. All bachelor's degrees granted by the University of Dayton require a cumulative grade point average of at least 2.0.
2. The cumulative grade-point average in all courses which have an engineering prefix must be at least 2.0 (C average).
3. All prescribed courses outlined in the respective curricula must have been passed with grades of D or better. Although courses may be scheduled in terms other than as listed, all prerequisites and corequisites must be met.
4. All students in the School of Engineering must register under Grade Option 1 for all courses in engineering, mathematics, and science except those offered only under Grade Option 2.
5. The student must have taken their last 30 semester hours through the School of Engineering at the University of Dayton.

The semester hours of credit required for graduation in each engineering curriculum administered by the School of Engineering are as follows:

Bachelor of Chemical Engineering	137
Bachelor of Civil Engineering	138
Bachelor of Electrical Engineering	134
Bachelor of Mechanical Engineering	132
Bachelor of Science in Computer Engineering	137

The semester hours of credit required for graduation in each engineering technology curriculum administered by the School of Engineering are as follows:

Bachelor of Science in Engineering Technology

Electronic and Computer Engineering Technology Major	131
Global Manufacturing Systems Engineering Technology Major	133
Industrial Engineering Technology Major	131
Mechanical Engineering Technology Major	132

Engineering First-Year Requirements

Students who are recent high school graduates or who have earned fewer than 15 semester hours of collegiate credit are classified as first-year students and must meet common engineering program requirements. Such credit requirements may be met in a number of ways, including:

1. Advanced college-level course work at the University of Dayton or other collegiate institutions,
2. Advanced placement examinations,

3. Departmental examinations during the first term, or
4. Taking the prescribed courses as part of the first year.

Required First-Year Program		31-35
CHM 123	General Chemistry	3
CMM 100	Principles of Oral Communication	3
EGR 100	Enrichment Workshop ²	0
EGR 103	Engineering Innovation	2
ENG 100 & ENG 200 or ENG 200H	Writing Seminar I and Writing Seminar II Writing Seminar II	3-6
HST 103	The West & the World ³	3
MTH 168 & MTH 169	Analytic Geometry & Calculus I and Analytic Geometry & Calculus II	8
PHL 103	Introduction to Philosophy	3
PHY 206	General Physics I - Mechanics ⁴	3
REL 103	Introduction to Religious & Theological Studies	3
Basic Science Laboratory ⁵		1
First-Year Student Orientation		0-1
Programming ⁶		0-4

¹ Chemical engineering majors take CMM the first semester. Electrical, computer and mechanical engineering majors take this requirement the second semester. Civil engineering majors postpone this requirement.

² Required both semesters.

³ Chemical engineering students must take CHM 124 and CHM 124L in the second semester and postpone one of the three Humanities Base courses until the third semester.

⁴ Chemical engineering students postpone this requirement until the second semester.

⁵ Chemical, civil, and mechanical engineering students must take CHM 123L; computer and electrical engineering students take PHY 210L.

⁶ Chemical, mechanical and civil engineering students are not required to take any programming course in the first year. Computer and electrical engineering students must take CPS 150 in the second semester. Mechanical engineering students take MEE 104L in the second semester of the first year.

Transfer Students

The engineering programs welcome transfer students from both community and senior colleges and work closely with many schools to facilitate transfers from pre-engineering programs. Students may complete the first two years of study in other accredited institutions and transfer to the University of Dayton with little or no loss of credit provided that they have followed programs similar to those prescribed by the University of Dayton School of Engineering.

The School of Engineering has dual degree arrangements as well as curriculum agreements with Sinclair Community College and Edison Community College.

Bachelor's Plus Master's Program

The School of Engineering offers a combined program leading to both a bachelor's degree in an engineering major and a master's degree.

Physics majors (College of Arts and Sciences) may also participate. The program is designed for the qualified student who wishes to pursue either greater specialization in a major area or to complement the undergraduate program with a related graduate-level concentration. Most students who select the program have received some advanced placement upon entry to engineering at the first-year level or take occasional summer courses.

The formal request for entrance into this program may be made as early as before the first semester of the student's junior year, but the student should consult their department to determine exactly when this request should be made. Admission requirements include a minimum cumulative grade point average of 3.00 and permission from the chairperson of the department corresponding to the student's undergraduate major and chair/program director of selected master's program. Students must formally apply to the graduate school during their senior year. Selection of the graduate (master's) program area is indicated below:

Undergraduate Program	Graduate Program Selections
Chemical Engineering	Bioengineering, Chemical Engineering, Civil Engineering, Electro-Optics*, Engineering Management, Engineering Mechanics, Management Science, Materials Engineering, Renewable and Clean Energy
Civil Engineering	Bioengineering, Civil Engineering, Engineering Management, Engineering Mechanics, Management Science, Materials Engineering, Renewable and Clean Energy
Computer Engineering	Bioengineering, Civil Engineering, Electrical Engineering, Electro-Optics*, Engineering Management, Engineering Mechanics, Management Science, Materials Engineering, Renewable and Clean Energy
Electrical Engineering	Bioengineering, Civil Engineering, Electrical Engineering, Electro-Optics, Engineering Management, Engineering Mechanics, Management Science, Materials Engineering, Renewable and Clean Energy
Mechanical Engineering	Aerospace Engineering, Bioengineering, Civil Engineering, Electro-Optics*, Engineering Management, Engineering Mechanics, Management Science, Materials Engineering, Mechanical Engineering, Renewable and Clean Energy
Engineering Technology	Engineering Management, Management Science, Materials Engineering
Physics	Electro-Optics, Materials Engineering

* This major may need additional courses to qualify for the master's program.

The department chairperson and the graduate program director serve as an advisory committee to the student in establishing the combined program requirements. The first-year, sophomore, and junior years follow the curriculum of the student's selected bachelor's program.

A student who elects the combined program must satisfy both undergraduate and graduate degree requirements as to required cumulative grade point average for graduation. The graduate of the combined program will receive a bachelor's degree in the undergraduate major (e.g., Bachelor of Mechanical Engineering) and a master's degree in the graduate area (e.g., Master of Science in Materials Engineering). A student in the 5-year combined program who chooses not to complete the program must complete all the undergraduate major program requirements to receive the bachelor's degree.

Course Area	Semester	Hours
Senior Year	1st Term	2nd Term
Undergraduate department major	11	11
Undergraduate department or University requirement or electives	3	3
Graduate major (taken as graduate credit)	3	3
Total semester hours	17	17
Fifth Year		
Graduate major (including thesis or project)*	12	12

* Civil Engineering majors require three additional semester hours for project option.

ETHOS

Engineers in Technical, Humanitarian Opportunities of Service-Learning

The ETHOS Program is founded on the belief that engineers are more apt and capable of serving our world appropriately when they have experienced opportunities that increase their understanding of technology's global linkage with values, culture, society, politics, and economy. ETHOS seeks to provide these opportunities through international and domestic service internships as well as through collaborative research and hands-on classroom projects that support the development of appropriate technologies for the developing world.

Such experiences expose students to alternative nontraditional technologies that are based on fundamental science and engineering principles and at the same time provide tangible and immediate impacts improving the lives of those who use them. ETHOS maintains as its educational objective to challenge students to think creatively and independently, to work as a team and communicate effectively, and to address issues of appropriate technology, environmental ethics, social responsibility, and cultural sensitivity.

Optional Cooperative Education

Cooperative education offers the student the opportunity to put classroom work into practical use while still in school, resulting in early career identification and greater motivation as well as providing a source of funds. All students majoring in engineering and engineering technology may participate in the cooperative education program. To be eligible, students must have completed three semesters and have a cumulative grade-point average of not less than 2.3. Those applying for the program will be accepted on the basis of grade-point average, motivation, and attitude. The number of students placed depends on the availability of jobs.

Programs of Study

To learn more about the available programs in the School of Engineering, explore the departments:

- Chemical and Materials Engineering (p. 351)
- Civil and Environmental Engineering and Engineering Mechanics (p. 360)
- Electrical and Computer Engineering (p. 365)
- Engineering Management (p. 374)
- Engineering Technology (p. 374)
- Mechanical and Aerospace Engineering (p. 390)

Chemical and Materials Engineering

Major:

- Bachelor of Chemical Engineering (p. 352)

Concentration:

- Energy Systems (p. 354)

Minors:

- Bioengineering (p. 355)
- Chemical Processing (p. 356)
- Composite Materials Engineering (p. 356)
- Energy Production Engineering (p. 356)
- Materials Engineering (p. 357)
- Polymer Materials (p. 357)

The Chemical & Materials Engineering Department offers an undergraduate program leading to a Bachelor of Chemical Engineering degree. Chemical engineering applies the principles of the physical sciences, economics, and human relations to research, design, build, and supervise facilities that convert raw materials into useful products and services.

The majority of chemical engineers are involved in the chemical process industries that produce many of the materials and items needed in everyday life. These include medicine, food, fertilizers, plastics, synthetic fibers, petroleum, petrochemicals, ceramics, and pulp and paper products. A chemical engineer may pursue a professional career in many other fields, such as energy conversion, pollution control, medical research, and materials development in aerospace and electronic industries. Chemical engineers are employed in research, development, design, production, sales, consulting, and management positions. They

are also found in government and academia. Many use a chemical engineering education as a pathway to law, medicine, or corporate management.

The curriculum in chemical engineering serves as basic training for positions in these diverse areas of the manufacturing industry or for graduate study leading to advanced degrees. The first part of the chemical engineering curriculum provides a firm foundation in mathematics, physics, and chemistry. The chemistry background is stressed. The second part of the curriculum offers a balance between classroom and laboratory experience in stressing chemical engineering topics such as transport phenomena, thermodynamics, kinetics and reactor design, separation processes, fluid flow and heat transfer operations, process control, and process design. The development of design tools, communication, and interpersonal skills is integrated throughout the curriculum. The curriculum allows minors in emerging technologies such as bioengineering, environmental engineering and materials engineering. Those interested in attending medical/dental school can pursue a premed preparation as part of their curriculum.

The educational objectives of the chemical engineering program graduates are:

- Chemical Engineering graduates have successful careers in the chemical process industry with the skills necessary to have opportunities to work in non-traditional industries and positions.
- Chemical Engineering graduates are successful at prestigious graduate, medical, and law schools.
- Chemical Engineering graduates are committed to performing ethically while serving their professions, companies, and communities.
- Chemical Engineering graduates exhibit strong critical thinking skills from the breadth of their general education and the depth of their foundation in engineering principles, and engage in continuous intellectual and personal growth.

Faculty

Charles E. Browning, Department Chairperson

Michael Elsass, Chemical Engineering Director

Professors Emeriti: Lu, Snide

Professors: Browning, Eylon, Flach, Fried, Lafdi, Lee, Myers, T. Saliba, Sandhu, Wilkens

Associate Professor: Gold

Assistant Professor: D. Comfort, K. Comfort

Senior Lecturer: Ciric

Lecturer: Elsass

Bachelor of Chemical Engineering (CME) minimum of 137 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹		12
HST 103	The West & the World	
REL 103	Introduction to Religious & Theological Studies	
PHL 103	Introduction to Philosophy	
ENG 100	Writing Seminar I ²	
Second-Year Writing Seminar ³		0-3
ENG 200	Writing Seminar II	

Oral Communication	3
CMM 100	Principles of Oral Communication
Mathematics	3
Social Science	3
Arts	3
Natural Sciences	7
Crossing Boundaries	variable credit
Faith Traditions	
Practical Ethical Action	
Inquiry	
Integrative	
Advanced Study	variable credit
Philosophy and/or Religious Studies	
Historical Studies	
Diversity and Social Justice	3
Major Capstone	0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	General Chemistry	3
CHM 123L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Gen Chemistry Lab	1
CHM 124 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	General Chemistry	3
CHM 124L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Gen Chemistry Lab	1
CHM 313 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Organic Chemistry	3
CHM 313L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Organic Chemistry Lab	1

CHM 314 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Organic Chemistry	3	CME 381 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Adv Math-Chem Engrs	3
CHM 314L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Organic Chem Lab	1	CME 408 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Seminar (2 semesters)	0-1
CME 101 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Intro to CME (2 semesters)	0-1	CME 430 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	CME Design I	3
CME 200 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Prof Development Sem	0-1	CME 431 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	CME Design II	3
CME 203 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Matl&Energy Balance	3	CME 452 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Process Control	3
CME 281 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Chm Engr Computatns	3	CME 453L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Process Control Lab	2
CME 306 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	CME Rctn Kntcs&Engr	3	CME 465 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Fluid Flow&Ht Tr Pro	3
CME 311 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Chm Engr Thrmdynmcs	3	CME 466L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Chem Engr Oper Lab	2
CME 324 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Transport Phenom I	3	CMM 100 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Princ of Oral Comm	3
CME 325 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Transport Phenom II	3	EGR 100 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Enrichment Workshop	0
CME 326L (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Transport Phenom Lab	2	EGR 103 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Engineering Innovatn	2
CME 365 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Separatn Techniques	3	EGR 201 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Engr Mechanics	3

EGR 202 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Engr Thermodynamics	3	PHY 206 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Gen Physics I Mech	3
EGR 203 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Electrl & Elctrnc Crt	3	PHY 207 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Gen Phy II Ele & Mag	3
ENG 100 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Writing Seminar I	6	REL 103 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Int Rel&Theo Studies	3
& ENG 200 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	and Writing Seminar II		SSC 200 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	CAP Pilot	3
or ENG 200H (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Writing Seminar II		Chemistry or Biology elective ¹		3
HST 103 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	West and World	3	CME elective ¹		3
or HST 198 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	HST Scholars Sem		Elective ²		3
MTH 168 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Anly Geom & Calc I	4	Electives		12
MTH 169 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Anly Geom & Calc II	4	Engineering/Science electives ¹		6
MTH 218 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Anly Geom & Calc III	4	Total Hours		
MTH 219 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text&Toolbar=PageWizard)	Appl Diff Equations	3			
PHL 103 (https://nextcatalog.udayton.edu/courseleaf/js/fckeditor/editor/fckeditor.html?InstanceName=attr_text)	Intro To Philosophy	3	ASI 320 (p. 351)	Cities and Energy ^{1,2}	3
			CME 203 (p. 351)	Matl&Energy Balance	3
			CME 311 (p. 351)	Chm Engr Thrmdynmcs	3
			CME 324 (p. 351)	Transport Phenom I	3
			CME 325 (p. 351)	Transport Phenom II	3
			CME 326L (p. 351)	Transport Phenom Lab	1-2
			CME 430 (p. 351)	CME Design I	3
			CME 431 (p. 351)	CME Design II	3

¹ Must be selected from list approved by the Chemical and Materials Engineering Department.

² Must be selected from approved list of PHL or REL ethics courses.

Concentration in Energy Systems - Chemical (CES)

This concentration is open to all engineering students. The Energy Systems Concentration provides an interdisciplinary concentration in energy systems and its social consequences. Students completing this concentration will be prepared for jobs in both industrial and building energy systems, a rapidly growing market.

ASI 320 (p. 351)	Cities and Energy ^{1,2}	3
CME 203 (p. 351)	Matl&Energy Balance	3
CME 311 (p. 351)	Chm Engr Thrmdynmcs	3
CME 324 (p. 351)	Transport Phenom I	3
CME 325 (p. 351)	Transport Phenom II	3
CME 326L (p. 351)	Transport Phenom Lab	1-2
CME 430 (p. 351)	CME Design I	3
CME 431 (p. 351)	CME Design II	3

CME 465 (p. 351)	Fluid Flow&Ht Tr Pro	3
CME 466L (p. 351)	Chem Engr Oper Lab	2

CME elective

Select one course from: 3

CME 486 (p. 351)	Intro-Petroleum Engr	
or CME 586 (p. 351)	Intro-Petroleum Engr	
CME 524 (p. 351)	Electrochemical Powr	
or MEE 575 (p. 351)	Fatg&Frac-Mtl&Alloy	
CME 565 (p. 351)	Fund of Combustion	
CME 574 (p. 351)	Air Pollutn I	

Select two courses from: 6

Select any CME elective course above ³		
AEE 560 (p. 351)	Propulsion Systems	
or MEE 560 (p. 351)	Propulsion Systems	
CME 507 (p. 351)	Adv Thermodynamics	
or MEE 511 (p. 351)	Adv Thermodynamics	
CME 579 (p. 351)	Energy Materials	
or MAT 579 (p. 351)	Mtls Adv Egr Appl	
MEE 413 (p. 351)	Propulsion	
or MEE 513 (p. 351)	Propulsion	
MEE 420 (p. 351)	Energy Effcnt Bldgs	
or MEE 569 (p. 351)	Energy Eff Bldgs	
MEE 471 (p. 351)	Des-Thermal Systems	
or MEE 571 (p. 351)	Des-Thermal Systems	
MEE 473 (p. 351)	Renewable Energy Sys	
or MEE 573 (p. 351)	Renewable Energy Sys	
MEE 478 (p. 351)	Energy Eff Manufact	
or MEE 578 (p. 351)	Energy Eff Manufactr	

Total Hours

36-37

¹ Or another approved humanities elective related to Energy Systems.² Satisfies History requirement.³ Course cannot have already been chosen as CME elective.**Minor in Bioengineering (BIE)**

This minor is open to chemical, civil, computer, electrical, and mechanical engineering majors. The program is designed to expose the student to the use of engineering principles in biological systems and applications.

BIO 151 (p. 351)	Concepts of Bio I	3
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or BIO 152 (p. 351)	Concepts of Bio II	
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CME 490 (p. 351)	Intro-Bioengineering I	3
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or CME 590 (p. 351)	Intro Bioengineering	
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Select one course from: 3

CME 491 (p. 351)	Biomed Engr I	3
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or CME 591 (p. 351)	Biomed Engr I	
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MEE 430 (p. 351)	Biomechanical Engr	3
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or MEE 530 (p. 351)	Biomechanical Egr	
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Select one course from: ¹ 3

BIE 511 (p. 351)	Biomaterials	3
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BIE 595 (p. 351)	Special Problems	
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BIO 151 (p. 351)	Concepts of Bio I	
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BIO 152 (p. 351)	Concepts of Bio II	
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BIO 312 (p. 351)	General Genetics	
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BIO 403 (p. 351)	Physiology I	
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BIO 411 (p. 351)	General Microbiology	
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BIO 440 (p. 351)	Cell Biology	
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CHM 420 (p. 351)	Biochemistry	
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CME 530 (p. 351)	Biomaterials	3
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CHM 451 (p. 351)	Gen Biochemistry I	
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CHM 452 (p. 351)	Gen Biochemistry II	
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CME 491 (p. 351)	Biomed Engr I	3
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or CME 591 (p. 351)	Biomed Engr I	
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CME 492 (p. 351)	Chem & Bio Sensors	
Total Hours		27

¹ Course cannot have already been chosen above.

Minor in Chemical Processing (CHP)

This minor is open to civil, computer, electrical, and mechanical engineering majors. The program is designed to acquaint the student with industrial operations in the chemical process industries such as heat exchange, distillation, extraction, humidification, etc. The elective courses cover a wide range of topics to accommodate the student's special interests.

CME 203 (p. 351)	Matl&Energy Balance	3
CME 324 (p. 351)	Transport Phenom I	3
CME 365 (p. 351)	Separatn Techniques	3
Select one course from:		3
CME 306 (p. 351)	CME Rctn Kntcs&Engr	
CME 430 (p. 351)	CME Design I	
CME 452 (p. 351)	Process Control	
CME 465 (p. 351)	Fluid Flow&Ht Tr Pro	
CME 499 (p. 351)	Special Problems	
Total Hours		12

Minor in Composite Materials Engineering (CMA)

This minor is open to chemical, civil, and mechanical engineering majors. The program is designed to expose the student to the design, processing, and characterization of composite materials and their various applications in industry.

CME 510 (p. 351)	High Prf Therm-Polymr	3
or MAT 510 (p. 351)	High Prf Therm-Polymr	
CME 512 (p. 351)	Adv Composites	3
or MAT 542 (p. 351)	Adv Composites	
Select two courses from:		6
CEE 540 (p. 351)	Composites Design	
or MAT 540 (p. 351)	Composite Design	
CEE 543 (p. 351)	Analy Mech-Cmp Matls	

or MAT 543
(p. 351) Analy Mech-Cmp Matls | |

CEE 546 (p. 351)	Finite Elmnt Anly I	
or MEE 546 (p. 351)	Finite Elmnt Anly I	
CME 509 (p. 351)	Intro Polymr Science	
or MAT 509 (p. 351)	Intro-Polymer Sci	
CME 527 (p. 351)	Methds-Polymer Anly	
or MAT 527 (p. 351)	Methds-Polymer Anly	
CME 528 (p. 351)	Chem Behav of Matls	
or MAT 528 (p. 351)	Chem Behav of Matls	
CME 580 (p. 351)	Polymers Durability	
or MAT 580 (p. 351)	Polymer Durability	
Total Hours		12

MINOR IN ENERGY PRODUCTION ENGINEERING (EPE)

This minor is open to all engineering majors. A selection of courses covering the production of energy:

Select four courses from:		12
BIE/CME/RCL 533 (p. 351)	Biofuel	
CME 486/586 (p. 351)	Intro-Petroleum Engr	
CME/MEE/ RCL 524 (p. 351)	Electrochemical Powr	
CHM/GEO 234 (p. 351)	Energy Resources	
ECE 316 (p. 351)	Intro Elec Enrgy Sys	
ECE 583 (p. 351)	Adv Photovoltaics	
MAT 579 (p. 351)	Mtls Adv Egr Appl	
MEE 473/573/ RCL 573 (p. 351)	Renewable Energy Sys	
RCL 590 (p. 351)	Spec Probs in RCL ¹	
RCL 590 (p. 351)	Spec Probs in RCL ²	
RCL 590 (p. 351)	Spec Probs in RCL ³	
Total Hours		12

- ¹ Must be Thermal Systems Analysis.
² Must be Solar Energy Engineering.
³ Must be Wind Energy Engineering.

Minor in Materials Engineering (MAT)

This minor is open to all engineering majors. A general overview of materials with choice courses in polymers, composites, nanomaterials, and material characterization.

MAT 501 (p. 351)	Prin-Materials I	3
MAT 502 (p. 351)	Prin of Materials II	3
Select two courses from:		6
CME 509 (p. 351) or MAT 509 (p. 351)	Intro Polymr Science Intro-Polymer Sci	
CME 510 (p. 351) or MAT 510 (p. 351)	High Prf Therm-Polymr High Prf Therm-Polymr	
CME 511 (p. 351) or MAT 511 (p. 351)	Prin of Corrosion Prin of Corrosion	
CME 512 (p. 351) or MAT 542 (p. 351)	Adv Composites Adv Composites	
CME 527 (p. 351) or MAT 527 (p. 351)	Methds-Polymer Analy Methds-Polymer Analy	
CME 528 (p. 351) or MAT 528 (p. 351)	Chem Behav of Matls Chem Behav of Matls	
CME 579 (p. 351) or MAT 579 (p. 351)	Energy Materials Mtls Adv Egr Appl	
CME 580 (p. 351) or MAT 580 (p. 351)	Polymers Durability Polymer Durability	
MAT 504 (p. 351)	Technqs-Materls Anal	
MAT 506 (p. 351)	Mech Behavior-Matrils	
MAT 507 (p. 351)	Intro-Ceramic Matrils	
MAT 508 (p. 351)	Prin-Materls Selectn	
MAT 521 (p. 351)	NDE/SHM	

MAT 535 (p. 351)	High Temperture Matl	
MAT 541 (p. 351)	Exp Mech Cmpsite Mat	
MAT 543 (p. 351)	Analy Mech-Cmp Matls	
MAT 544 (p. 351)	Mech-Composite Struc	
MAT 575 (p. 351)	Fracture & Fatigue	
MAT 577 (p. 351)	Lght Structrl Metals	
MAT 590 (p. 351)	Selected Readings	
MAT 595 (p. 351)	Special Problems	
MAT 601 (p. 351)	Surface Chem Solids	
MAT 604 (p. 351)	Nanostruc Matrils	
MEE 312 (p. 351)	Engr Materials I	
Total Hours		12

Minor in Polymer Materials (PME)

This minor is open to all engineering majors. Coverage of polymers including thermosets and thermoplastics and composite materials in which polymers are used as constituents. Methods of polymer processing and polymer characterization are also included.

CME 509 or MAT 509	Introduction to Polymer Science - Thermoplastics Introduction to Polymer Science-Thermoplastics	3
CME 510 or MAT 510	High Performance Thermoset Polymers High Performance Thermostat Polymers	3
Select two courses from:		6
CME 512 or MAT 542	Advanced Composites Advanced Composites	
CME 527 or MAT 527	Methods of Polymer Analysis Methods of Polymer Analysis	
CME 528 or MAT 528	Chemical Behavior of Materials Chemical Behavior of Materials	
CME 580 or MAT 580	Polymer Decomposition, Degradation & Durability Polymer Durability	
MAT 540	Composite Design	
MAT 543	Analytical Mechanics of Composite Materials	
Total Hours		12

First Year

Fall	Hours Spring	Hours
CME 101	0-1 CHM 124	3
CHM 123 (Satisfies CAP Natural Science)	3 CHM 124L	1
CHM 123L	1 CME 101	0-1

ENG 100 (Satisfies CAP Writing Seminar Requirement)	3 EGR 100	0
EGR 100	0 HST 103 (Satisfies CAP First Year Humanities Common)	3
EGR 103	2 MTH 169	4
MTH 168 (Satisfies CAP Math Requirement)	4 PHY 206 (Satisfies CAP Natural Science)	3
PHL 103 (Satisfies CAP First Year Humanities Common)	3 REL 103 (Satisfies CAP First Year Humanities Common)	3
	16-17	17-18

Second Year

Fall	Hours Spring	Hours
CHM 313	3 CHM 314	3
CHM 313L	1 CHM 314L	1
CME 200	0 CME 200	0-1
CME 203	3 CME 281	3
EGR 202	3 CMM 100 (Satisfies CAP Communication)	3
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 MTH 219	3
MTH 218	4 PHY 207	3
	17	16-17

Third Year

Fall	Hours Spring	Hours
CME 311	3 CME 306	3
CME 324	3 CME 325	3
CME 381	3 CME 326L	2
EGR 201	3 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3
Art Study (Satisfies CAP Art Study)	3 CME 365	3
Social Science (Satisfies CAP Social Science)	3 EGR 203	3
	18	17

Fourth Year

Fall	Hours Spring	Hours
Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3 Advanced HST (Satisfies CAP Crossing Boundaries)	3
CME 466L	2 CME 453L	2
CME 430	3 CME 408	0
CME 452	3 CME 431	3
CME 408	0-1 CME Elective	3
CHM/BIO Elective	3 TECH Elective	3
CME 465	3 CME Advanced Elective	3
	17-18	17

Total credit hours: 135-139

Courses**CME 101. Introduction to Chemical Engineering. 0-1 Hours**

Introduction to the chemical engineering faculty, facilities, and curriculum; survey of career opportunities in chemical engineering. Introduction to the University first-year experience.

CME 198. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analysing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CME 200. Professional Development Seminar. 0-1 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

CME 203. Material & Energy Balances. 3 Hours

Introductory course on the application of mass and energy conservation laws to solve problems typically encountered in chemical process industries. Prerequisite(s): CHM 123; MTH 168. Corequisite(s): EGR 202.

CME 281. Chemical Engineering Computations. 3 Hours

Development of computational skills with an emphasis on algorithm development and problem solving. Computational skills are applied to typical problems in chemical engineering, engineering data analysis and statistics. Corequisite(s): CME 203.

CME 298. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CME 306. Chemical Reaction Kinetics & Engineering. 3 Hours

Chemical reaction kinetics, ideal reactor analysis and design, multiple reactor/reaction systems, and heterogeneous catalysis. Prerequisite(s): CME 311.

CME 311. Chemical Engineering Thermodynamics. 3 Hours

Development and application of the fundamental principles of chemical thermodynamics: Vapor/liquid equilibrium, solution thermodynamics, chemical reaction equilibria, and thermodynamic analysis of chemical engineering processes. Prerequisite(s): CME 203; EGR 202; MTH 218.

CME 324. Transport Phenomena I. 3 Hours

Viscosity, shell momentum balances, isothermal equations of change, thermal conductivity, shell energy balances, non-isothermal equations of change, mass diffusivity, shell species mass balances, equations of change for multicomponent systems. Prerequisite(s): CME 203, CME 281; MTH 219. Corequisite(s): CME 381.

CME 325. Transport Phenomena II. 3 Hours

Multidimensional momentum, energy, and mass transport, dimensionless parameters, turbulence and numerical solution methods. Prerequisite(s): CME 324, CME 381.

CME 326L. Transport Phenomena Laboratory. 1-2 Hours

Viscosity, conductivity, diffusion coefficient measurements, velocity, temperature, concentration profiles, engineering instrumentation, and experimental error analysis. Prerequisite(s): CME 324. Corequisite(s): CME 325.

CME 365. Separation Techniques. 3 Hours

Equilibrium staged separations: distillation, extraction and absorption, with an emphasis on distillation. Prerequisite(s): CME 311, CME 324.

CME 381. Advances Mathematics for Chemical Engineers. 3 Hours

Study of analytical and numerical techniques to support upper-level chemical engineering classes. Vector analysis, matrices, differential equations, numerical integration and differentiation, root finding, and curve fitting ordinary and partial differential equations. Prerequisite(s): CME 281; MTH 219.

CME 398. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CME 408. Seminar. 0-1 Hours

Presentation of lectures on contemporary chemical engineering subjects by students, faculty, and engineers in active practice. Registration required of senior students only.

CME 409. Introduction to Polymer Science - Thermoplastics. 3 Hours

Broad technical overview of the nature of synthetic macromolecules, including the formation of polymers and their structure, structure-property relationships, polymer characterization and processing, and applications of polymers. Fundamental topics such as viscoelasticity, the glassy state, time-temperature superposition, polymer transitions, and free volume will also be reviewed. The course focuses on thermoplastic polymers. Prerequisite(s): CHM 313, PHY 206, MTH 219.

CME 410. High Performance Thermoset Polymers. 3 Hours

Survey of high performance thermoset resins, focusing on chemistry, processing and properties of six general resin families; vinyl ester, epoxy, phenolic, cyanate ester, bismaleimide, and polyimides. The course will include fundamental discussions of polymerization mechanisms, network structure development, rheology and time-temperature transformation, resin toughening, and structure-processing-property relationships. Characterization techniques will also be reviewed. Prerequisite(s): CHM 313.

CME 412. Advanced Composites. 3 Hours

Materials and processing. Comprehensive introduction to advanced fiber reinforced polymeric matrix composites. Constituent materials and composite processing will be emphasized with special emphasis placed on structure-property relationships, the role of matrix in composite processing, mechanical behavior, and laminate processing. Specific topics will include starting materials, material forms, processing, quality assurance, test, methods, and mechanical behavior. Prerequisite(s): (CME 409 or CME 509 or MAT 501) or permission of instructor.

CME 429. Computational Chemistry. 3 Hours

Introduction to computational chemistry including a discussion of ab initio, semiempirical, and DFT methods and an overview of molecular mechanics and molecular simulation methods. Lectures are supplemented by simulation exercises using commercial programs such as Gaussian and Molecular Studio. Prerequisite(s): CHM 124 or permission of instructor.

CME 430. Chemical Engineering Design I. 3 Hours

Study of basic design concepts, safety and health issues, capital cost estimation, manufacturing cost estimation, basic economics and profitability analysis, materials of construction, materials selection and process vessel design. Prerequisite(s): CME 203.

CME 431. Chemical Engineering Design II. 3 Hours

Project-based study of principles of process design and economics, use of process flowsheet simulators, short-cut design procedures, process optimization, and plant layout. Prerequisite(s): CME 306, CME 365, CME 430, CME 465.

CME 432. Chemical Product Design. 3 Hours

Application of the design process to products based on chemical technology. Coverage of the entire design process from initial identification of product needs, to the generation and selection of product ideas, and culminating in the manufacture of a new product.

CME 452. Process Control. 3 Hours

Mathematical models, Laplace transform techniques, and process dynamics. Feedback control systems, hardware, and instrumentation. Introduction to frequency response, advanced techniques, and digital control systems. Prerequisite(s): CME 381.

CME 453L. Process Control Laboratory. 2 Hours

Team-based, project oriented study of process dynamics and digital control using computer-based data acquisition and control systems with a focus on real time process monitoring and control. Prerequisite(s): (CME 452, CME 466L) or permission of instructor.

CME 465. Fluid Flow & Heat Transfer Processes. 3 Hours

Fluid mechanics, transportation and metering of fluids, heat transfer and its applications. Prerequisite(s): CME 311, CME 324.

CME 466L. Chemical Engineering Unit Operations Laboratory. 2 Hours

Study of the equipment and utilization of various chemical engineering processes. Team based experimentation includes designing, and performing experiments on common chemical process unit operations apparatuses. After experimentation, students analyze data and compare with literature for experiment validation. Report writing and group presentations are emphasized. Prerequisite(s): CME 365. Corequisite(s): CME 465.

CME 486. Introduction to Petroleum Engineering. 3 Hours

Introduction to the fundamental concepts in petroleum engineering. Petroleum topics include overviews of areas such as petroleum geology, petroleum fluids and thermodynamics, drilling and completion, and production and multiphase flow. In addition this course will cover refinery operations.

CME 489. Principles of Biology for Bioengineers. 3 Hours

This course is designed for students with undergraduate majors in engineering or non-biological sciences. The focus of the course is to provide a common broad base of basic knowledge and terminology in the biological sciences required for coursework in the bioengineering emphasis tracts. Prerequisite(s): (BIO 151, BIO 152) or permission of instructor.

CME 490. Introduction to Bioengineering. 3 Hours

This class provides an introduction to bioengineering - a branch of engineering focusing on biological systems, biomaterials, engineering applications in living systems, and many other areas. By the end of this course, students will be able to understand bioengineering applications and processes, and properly apply engineering fundamentals, including transport phenomena and reaction kinetics, to these systems. Prerequisite(s): (BIO 151, CME 324 or BIE 505) or permission of instructor.

CME 491. Biomedical Engineering I. 3 Hours

Introduction to the fundamental concepts in biomedical engineering with a special focus on chemical engineering applications. Biomedical topics include overviews of areas such as biomaterials, tissue engineering, biosensors and biomedical engineering technology. Prerequisite(s): (BIO 151; (CHM 420 or CHM 451); CME 324, CME 365) or permission of instructor.

CME 492. Chemical Sensors & Biosensors. 3 Hours

Analysis performed with chemical sensors complement laboratory analyses and offer the potential for more rapid and on-line analyses in complex sample matrices. The demand for new chemical sensors, biosensors, and sensing concepts is rapidly increasing and associated with the growing need to understand and/or control complex chemical and biochemical processes or detect the presence of toxic chemical or biological agents. Prerequisite(s): Permission of instructor.

CME 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

CME 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): CME 493.

CME 498. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CME 499. Special Problems in Chemical Engineering. 1-6 Hours

Particular assignments to be arranged and approved by chairperson of the department.

- Structures (p. 362)
- Transportation Engineering (p. 362)
- Water Resources Engineering (p. 363)

The Department of Civil and Environmental Engineering and Engineering Mechanics offers a broad-based curriculum leading to a Bachelor of Civil Engineering (BCE) degree. The BCE program offers sufficient elective courses to obtain a concentration in construction, environmental engineering, structures, water resources, geotechnical or transportation.

The mission of the program is to graduate broadly educated, technically competent individuals prepared for professional careers or for advanced studies.

Within the first several years following completion of the program, University of Dayton Bachelor of Civil Engineering graduates are prepared to meet the following program educational objectives:

- have successful careers in civil engineering or other professions
- pursue advanced degrees in support of their chosen profession
- conduct professional and personal endeavors in a responsible and ethical manner
- seek service and leadership roles in their profession and community
- continue their professional and personal growth through a process of life-long learning.

Civil engineering is the profession in which knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgment to develop ways to economically utilize the materials and forces of nature in improving and protecting the environment and providing structures and facilities for community, industry, and transportation for the progressive well-being of humanity.

Civil engineers, leading users of high technology in wide-ranging applications in both the public and the private sectors, are essential to the continued improvement of society. Civil engineers can enter traditional fields such as construction, bridge and building design and analysis, highway design and traffic control, water treatment and distribution, environmental engineering, water resources, and geotechnics. Their broad education however, also prepares them for materials engineering, engineering management, and the aerospace, power, and automotive industries. Civil engineering has applications in conceptual and detail design, field operations, computers, and consulting.

Members of the student chapters of the American Society of Civil Engineers (ASCE), Chi Epsilon, Institute of Transportation Engineers (ITE), and National Society of Professional Engineers (NSPE) have the opportunity to meet regularly with practicing engineers in the Dayton community.

Faculty

Donald V. Chase, Chairperson
 Professors Emeriti: Bogner, J. Whitney
 Distinguished Service Professor: Ryckman
 Professor: J. Saliba
 Associate Professor: Donaldson, Eustace, D. Taylor
 Assistant Professors: Bilgin, Crosson, Toubia, T. Whitney
 Lecturer: Alakkad
 Visiting Professor: Chase

Civil and Environmental Engineering and Engineering Mechanics

Major:

- Bachelor of Civil Engineering (p. 361)

Minors:

- Engineering Mechanics (p. 361)
- Environmental Engineering (p. 362)

Bachelor of Civil Engineering (cee) minimum of 138 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103 The West & the World	
REL 103 Introduction to Religious & Theological Studies	
PHL 103 Introduction to Philosophy	
ENG 100 Writing Seminar I ²	
Second-Year Writing Seminar ³	0-3
ENG 200 Writing Seminar II	
Oral Communication	3
CMM 100 Principles of Oral Communication	
Mathematics	3
Social Science	3
Arts	3
Natural Sciences	7
Crossing Boundaries	variable credit
Faith Traditions	
Practical Ethical Action	
Inquiry	
Integrative	
Advanced Study	variable credit
Philosophy and/or Religious Studies	
Historical Studies	
Diversity and Social Justice	3
Major Capstone	0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CEE 101 Introduction to Civil Engineering (2 semesters)	0
CEE 200 Professional Development Seminar (2 semesters)	0
CEE 213 Surveying	2
CEE 214 Highway Geometrics	2
CEE 215L Surveying Field Practice	3
CEE 221L Civil Computation Laboratory	2
CEE 300 Seminar (2 semesters)	0
CEE 311 Civil Engineering Materials & 311L and Civil Engineering Materials Laboratory	3
CEE 312 Geotechnical Engineering & 312L and Geotechnical Engineering Laboratory	4
CEE 313 Hydraulics & 313L and Hydraulics Laboratory	4
CEE 316 Analysis of Structures I	3
CEE 333 Water Resources Engineering	3
CEE 400 Professional Development Seminar (2 semesters)	0
CEE 403 Transportation Engineering	3

CEE 411 Design of Steel Structures	3
CEE 412 Design of Concrete Structures	3
CEE 425 Civil Engineering Systems	3
CEE 434 Water & Wastewater Engineering & 434L and Water & Wastewater Engineering Laboratory	4
CEE 450 Civil Engineering Design ¹	3
CHM 123 General Chemistry & 123L and General Chemistry Laboratory	4
CHM 124 General Chemistry	3
CMM 100 Principles of Oral Communication	3
EGM 202 Dynamics	3
EGM 303 Mechanics II	3
EGR 100 Enrichment Workshop (2 semesters)	0
EGR 103 Engineering Innovation	2
EGR 201 Engineering Mechanics	3
EGR 202 Engineering Thermodynamics	3
EGR 203 Electrical & Electronic Circuits	3
ENG 100 Writing Seminar I & ENG 200 and Writing Seminar II or ENG 200H Writing Seminar II	6
GEO 218 Engineering Geology	3
HST 103 The West & the World or HST 198 History Scholars' Seminar	3
HST 343 History of Civil Engineering	3
MTH 168 Analytic Geometry & Calculus I	4
MTH 169 Analytic Geometry & Calculus II	4
MTH 218 Analytic Geometry & Calculus III	4
MTH 219 Applied Differential Equations	3
PHL 103 Introduction to Philosophy	3
PHY 206 General Physics I - Mechanics	3
PHY 207 General Physics II - Electricity & Magnetism	3
REL 103 Introduction to Religious & Theological Studies	3
CEE electives ^{3,4}	9
Electives	12
Tech elective	3
Total Hours	138

¹ Admittance into CEE 450 requires successful completion of all required engineering courses with an average academic unit GPA of no less than 2.0, or approval of the chair.

² Three semester hours waived if accepted into ENG 200H.

³ Select from list approved by the Department of Civil and Environmental Engineering and Engineering Mechanics.

⁴ May be used to concentrate studies in the areas of construction, environmental, structures, geotechnical, transportation, and water resources engineering.

Minor in Engineering Mechanics (eme)

This minor is open to all engineering majors. The program provides a broad treatment of engineering mechanics including theoretical, numerical, and experimental topics.

Select four courses from: ¹

12

CEE 540 Composites Design

or EGM 540	Composite Design
EGM 303	Mechanics II
EGM 503	Introduction to Continuum Mechanics
EGM 511	Experimental Stress Analysis
EGM 533	Theory of Elasticity
EGM 546	Finite Element Analysis I
MAT 540	Composite Design
MEE 504	Fundamentals of Fluid Mechanics
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Total Hours	12

¹ Courses selected may not be those already required for student's major.

Minor in Environmental Engineering (eve)

This minor is open to all non-civil engineering majors. The program defines contemporary problems of pollution and identifies the technological approaches necessary to preserve the quality of our environment.

Select four courses from: ¹		12
CEE 390	Environmental Pollution Control ²	
CEE 434	Water & Wastewater Engineering ³	
CEE 499	Special Problems in Civil Engineering ⁴	
or CME 499	Special Problems in Chemical Engineering	
CEE 560	Biological Processes in Wastewater Engineering	
CEE 562	Physical & Chemical Water & Wastewater Treatment Processes	
CEE 563	Hazardous Waste Engineering	
or CME 563	Hazardous Waste Engineering	
CEE 564	Solid Waste Engineering	
CEE 574	Fundamentals of Air Pollution Engineering I	
CEE 575	Fundamentals of Air Pollution Engineering II	
or CME 575	Fundamentals of Air Pollution Engineering II	
CEE 576	Environmental Engineering Separation Processes	
CHM 341	Environmental Chemistry	
EGR 330	Engineering Design & Appropriate Technology ⁴	
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Total Hours		12

¹ Courses selected may not be those already required for student's major. It is recommended the minor include one course pertaining to water, air, and solid pollution control.

² Not permissible for CME students.

³ Or CEE 595 Special Problems in Civil Engineering.

⁴ No more than three credit hours of EGR 330, CEE 499, or other special project coursework may be applied to this minor. Subject to approval of the CEE chairperson within two weeks of the start of the semester.

Minor in Structures (str)

This minor is open to all non-civil engineering majors. The program provides a broad coverage of general concepts of structural design as applied to buildings, mechanical systems, and machinery.

Select four courses from: 12

CEE 311 (p. 360) & 311L (p. 360)	Civil Engr Materials and Civil Engr Matls Lab
CEE 316 (p. 360)	Anal of Strctures I
CEE 411 (p. 360)	Dsg-Steel Structures
CEE 412 (p. 360)	Dsgn-Concrete Struc
CEE 500 (p. 360)	Adv Struct Analysis
CEE 501 (p. 360)	Struct. Analysis by Computer
CEE 502 (p. 360)	Prestressed Concrete
CEE 504 (p. 360)	Structural Dynamics
CEE 505 (p. 360)	Plastic Design in Steel
CEE 507 (p. 360)	Masonry Design
CEE 508 (p. 360)	Design Timber Struc
CEE 524 (p. 360)	Foundation Engr
CEE 540 (p. 360)	Composites Design
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Total Hours	12

Minor in Transportation Engineering (tre)

This minor is open to all non-civil engineering majors. The program provides broad coverage in the planning, design, operations, and management of the transportation system.

Select four courses from: ¹ 12

CEE 403 (p. 360)	Transportation Engr
CEE 515 (p. 360)	Pavmt Engineering
CEE 550 (p. 360)	Hghwy Geometrc Dsgn
CEE 551 (p. 360)	Traffic Engineering
CEE 552 (p. 360)	Intelligent Transportation Sys
CEE 553 (p. 360)	Travel Demand Mdng
CEE 554 (p. 360)	Urban Public Trnsprt
CEE 555 (p. 360)	Hgwy Traffic Safety
CEE 558 (p. 360)	Traffic Engr Rsrch

CEE 595 (p. 360)	Special Problems-CEE	
Total Hours		12

¹ Courses selected may not be those already required for student's major.

Minor in Water Resources Engineering (wre)

This minor is open to all non-civil engineering majors. The program provides broad coverage to the general concepts used in water resources engineering including hydraulics and hydrology issues within economic, optimization, operation, and management frameworks.

Select four courses from: ¹		12
CEE 313 (p. 360)	Hydraulics	
CEE 333 (p. 360)	Water Resources Engr	
CEE 580 (p. 360)	Hydrology & Seepage	
CEE 582 (p. 360)	Adv Hydraulics	
CEE 584 (p. 360)	Open Flow Channel	
CEE 595 (p. 360)	Special Problems-CEE	
Total Hours		12

¹ Courses selected may not be those already required for student's major.

First Year

Fall	Hours Spring	Hours
EGR 100	0 EGR 100	0
HST 103 (Satisfies CAP First-Year Humanities Common)	3 CMM 100	3
PHY 206 (Satisfies CAP Natural Science)	3 EGR 201	3
MTH 168 (Satisfies CAP Math Requirement)	4 MTH 169	4
PHL 103 (Satisfies CAP First-Year Humanities Common)	3 REL 103 (Satisfies CAP First Year Humanities Common)	3
CEE 101	0 CEE 101	0
EGR 103	2 CHM 123 (Satisfies CAP Natural Science)	3
ENG 100 (Satisfies CAP Writing Seminar)	3 CHM 123L (Satisfies CAP Natural Science)	1
	18	17

Second Year

Fall	Hours Spring	Hours
CEE 221L	2 GEO 218 (Satisfies CAP Crossing Boundaries & Inquiry)	3

PHY 207	3 EGM 303	3
EGM 202	3 EGR 202	3
MTH 218	4 MTH 219	3
CEE 213	2 CEE 214	2
CEE 200	0 CEE 200	0
CHM 124	3 ENG 200 (Satisfies CAP Second Year Writing Seminar)	3
	CEE 215L (SUMMER)	3
	17	20

Third Year

Fall	Hours Spring	Hours
CEE 300	0 CEE 300	0
CEE 313 & 313L	4 CEE 311 & 311L	3
CEE 316	3 CEE 312 & 312L	4
CEE 403	3 CEE 333	3
EGR 203	3 CEE 411	3
Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3 CEE 425	3
	16	16

Fourth Year

Fall	Hours Spring	Hours
CEE 400	0 CEE 400	0
CEE 412	3 CEE 450 (Satisfies CAP Capstone Requirement)	3
CEE 434 & 434L	4 CEE/TECH Elective	3
CEE Elective	3 CEE Elective	3
CEE Elective	3 Social Science (Satisfies CAP Social Science)	3
Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3 HST 343 (Satisfies CAP Crossing Boundaries, Advanced History)	3
	Art Study (Satisfies CAP Art Study)	3
	16	18

Total credit hours: 138

Civil Environmental Engr Courses

CEE 101. Introduction to Civil Engineering. 0-1 Hours

Introduction to the civil engineering faculty, facilities, and curriculum; to the career opportunities offered by the civil engineering profession; and to the areas of specialization within civil engineering.

CEE 198. Research & Innovation Laboratory. 1,6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CEE 200. Professional Development Seminar. 0 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

CEE 213. Surveying. 2 Hours

Theory of measurements, computation, and instrumentation. Boundary and construction surveys, triangulation, and level net adjustments. First term, each year. Corequisite(s): MTH 168.

CEE 214. Highway Geometrics. 2 Hours

Study of circular and spiral curves, vertical curves, grade lines, earthwork and mass diagram, slope and grade stakes, and contour grading. Second term, each year. Prerequisite(s): CEE 213.

CEE 215L. Surveying Field Practice. 3 Hours

Field work and computation in topography, highway surveying, triangulation, level net, celestial observations, evaluation of errors, and preparation of plans. Five eight-hour days a week for three weeks. Summer, each year. Prerequisite(s): CEE 214.

CEE 221L. Civil Computation Laboratory. 2 Hours

Introduction to commonly-used software in civil engineering profession. Emphasis on the use of spreadsheets to solve civil engineering problems. Introduction to computer aided drawing and design and the use of popular CADD packages in the civil engineering profession.

CEE 298. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CEE 300. Seminar. 0 Hours

Practice in the presentation and discussion of papers; lectures by staff and prominent engineers. Attendance required of all civil engineering juniors.

CEE 310L. Civil Engineering Laboratory. 1 Hour

Civil Engineering Laboratory.

CEE 311. Civil Engineering Materials. 2 Hours

Physical and mechanical properties of construction materials; Portland cement concrete, bituminous materials, wood, ferrous and non-ferrous metals, masonry units; proportioning of concrete mixtures including admixtures. Prerequisite(s): EGM 303. Corequisite(s): CEE 311L.

CEE 311L. Civil Engineering Materials Laboratory. 1 Hour

Laboratory experiments in the physical and mechanical properties of construction materials; Portland cement concrete, bituminous materials, wood, ferrous and non-ferrous metals, and masonry units; proportioning of concrete mixtures including admixtures. Corequisite(s): CEE 311.

CEE 312. Geotechnical Engineering. 3 Hours

Principles of soil structures, classification, capillarity, permeability, flow nets, shear strength, consolidation, stress analysis, slope stability, lateral pressure, bearing capacity, and piles. Second term, each year. Prerequisite(s): CEE 313; EGM 303. Corequisite(s): CEE 312L; GEO 218.

CEE 312L. Geotechnical Engineering Laboratory. 1 Hour

Laboratory tests to evaluate and identify soil properties for engineering purposes. Design problems are also included. Second term, each year. Corequisite(s): CEE 312.

CEE 313. Hydraulics. 3 Hours

Basic principles of fluid mechanics in closed conduits and open channels. Principles include fluid statics, conservation of mass, conservation of momentum, conservation of energy, and fluid dynamics. Presentation of fluid mechanics principles through the solution of practical problems and a comprehensive semester project. Prerequisite(s): EGM 202. Corequisite(s): CEE 313L.

CEE 313L. Hydraulics Laboratory. 1 Hour

Laboratory experiments and problems associated with CEE 313. Corequisite(s): CEE 313.

CEE 316. Analysis of Structures I. 3 Hours

Elastic analysis of structures; deflection, moment-area theorems; conjugate-beam; virtual work influence lines; analysis of indeterminate structures using force methods; theories of failure, stiffness matrices, and use of software to analyze structures. Prerequisite(s): EGM 303.

CEE 317. Analysis of Structures II. 3 Hours

Elastic analysis of structures; virtual work; Castigliano's theorems; slope deflection and moment distribution; computer analysis of structural systems, influence lines, column analogy, limit analysis. Departmental elective. Prerequisite(s): CEE 316.

CEE 333. Water Resources Engineering. 3 Hours

Integrated study of the principles of water movement and management. Focus areas include hydrology, water distribution, storm water management, and waste water collection. Second semester, each year. Prerequisite(s): CEE 313.

CEE 390. Environmental Pollution Control. 3 Hours

Study of environmental pollution problems relating to air, water, and land resources. Causes and effects of pollution technology for solving problems. Legal and political considerations. For juniors and seniors other than civil engineering students. Credit may not be applied toward civil engineering degree. Prerequisite(s): Some knowledge of chemistry.

CEE 398. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CEE 400. Professional Development Seminar. 0 Hours

Practice in the presentation and discussion of papers; lectures by staff and prominent engineers. Attendance required of all civil engineering seniors.

CEE 403. Transportation Engineering. 3 Hours

Fundamentals of transportation engineering, including design, construction, maintenance, and economics of transportation facilities. Design of pavement structures and drainage systems. Prerequisite(s): CEE 214.

CEE 408. Seminar. 0 Hours

Seminar in Civil & Environmental Engineering.

CEE 411. Design of Steel Structures. 3 Hours

Design and behavior of structural steel connections, columns, beams, and beams subjected to tension, compression, bending, shear, torsion, and composite action. Second semester, each year. Prerequisite(s): CEE 316.

CEE 412. Design of Concrete Structures. 3 Hours

Design and behavior of reinforced concrete slabs, beams, columns, walls, and footings subjected to tension, compression, bending, shear, and torsion. First semester, each year. Prerequisite(s): CEE 311, CEE 316.

CEE 420. Engineering Economics. 1 Hour

Basic principles and techniques of economic analysis of engineering projects. Prerequisite(s): MTH 169.

CEE 421. Construction Engineering. 3 Hours

Organization, planning, and control of construction projects, including a study of the use of machinery, economics of equipment, methods, materials, estimates, cost controls, and fundamentals of CPM and PERT contracts and bonds and legal aspects of contracting. Departmental elective.

CEE 422. Design & Construction Project Management. 3 Hours

Fundamentals of project management as they relate to the design and construction professional, and the application of project management techniques to the design and construction of major projects. Departmental elective.

CEE 425. Civil Engineering Systems. 3 Hours

Analysis and evaluation of civil engineering systems using operations research tools including systems modeling, optimization and probability, and statistics. Civil engineering systems will also be examined from an economic perspective. Prerequisite(s): Junior or senior status.

CEE 434. Water & Wastewater Engineering. 3 Hours

Problems of water pollution; development and design of public water supply and waste water treatment systems; legal, political, ethical, and moral considerations. First term, each year. Prerequisite(s): CHM 124. Corequisite(s): CEE 313, CEE 434L.

CEE 434L. Water & Wastewater Engineering Laboratory. 1 Hour

Laboratory exercises, demonstrations, and design problems associated with water and wastewater engineering. First semester, each year. Corequisite(s): CEE 434.

CEE 450. Civil Engineering Design. 3 Hours

Group design of complete projects, drawing on the knowledge acquired in a spectrum of civil engineering subjects. Second semester, each year. Prerequisite(s): CEE 312, CEE 333, CEE 403, CEE 411, CEE 412, CEE 434.

CEE 463. Hazardous Waste Treatment. 3 Hours

The fundamental principles of the design and operation of hazardous waste control and hazardous substances remediation processes. Hazardous waste regulations, risk assessment, and management. Department Elective. Prerequisite(s): CHM 124.

CEE 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

CEE 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): CEE 493.

CEE 498. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

CEE 499. Special Problems in Civil Engineering. 1-6 Hours

Particular assignments to be arranged and approved by chairperson of the department. Departmental elective.

Engineering Mechanics Courses

EGM 202. Dynamics. 3 Hours

Kinematics, including translation, rotation, plane motion, and relative motion; kinetics of particles and bodies by the methods of force-mass-acceleration, work-energy, and impulse-momentum. Each semester, each year. Prerequisite(s): EGR 201.

EGM 303. Mechanics II. 3 Hours

The study of stresses, strains, and deflections in tension, compression, shear, flexure, and torsion; shear and moment diagrams; analysis of stresses and strains at a point; Mohr's circle; analysis of columns. Each semester, each year. Prerequisite(s): EGR 201.

EGM 304. Advanced Strength of Materials. 3 Hours

Stresses and strains at a point; shear center; unsymmetrical bending; curved beams; flat plates; torsion of noncircular bars; beams on elastic support; buckling; introduction to mechanics of composite materials. First and second terms each year. Prerequisite(s): EGM 303.

EGM 499. Special Problems in Engineering Mechanics. 1-6 Hours

Particular assignments to be arranged and approved by chairperson of the department.

Electrical and Computer Engineering

Majors:

- Bachelor of Electrical Engineering (p. 366)
- Bachelor of Science, Computer Engineering (p. 368)

Concentrations:

- Electrical Energy Systems (p. 369)
- Electro-Optics (p. 369)
- Robotics (p. 369)

Minors:

- Computer Systems (p. 369)
- Signals and Systems (p. 369)

The Department of Electrical and Computer Engineering offers two ABET accredited undergraduate programs leading to the Bachelor of Electrical Engineering and the Bachelor of Science in Computer

Engineering. The department offers masters and doctoral degrees in electrical engineering and is closely coupled to the graduate program in electro-optics where both master's and doctoral degrees are offered. The electrical and computer engineering department offers an accelerated 5 year B.S. - M.S. program, where students completing their baccalaureate degree can attain their Master of Science in Electrical Engineering within one additional year. The department also offers an undergraduate concentration in electro-optics, in collaboration with the Physics Department and the Electro-Optics Program. An Undergraduate concentration in Robotics is available for both Electrical and Computer Engineering majors beginning in Fall 2011. A new undergraduate concentration in Electrical Engineering Systems is also available beginning in Fall 2012.

The mission of the Department of Electrical and Computer Engineering is to develop in students the skills and knowledge to learn, lead and serve in their profession and their community.

Our electrical engineering alumni will be prepared to:

1. find rewarding careers as engineering professionals. As electrical engineers they will be prepared to design and develop new products, technologies and processes that incorporate one or more of the following elements: analog and digital circuits, signals and systems, propagation and processing of signals, and control systems.
2. continue their professional education either formally, in graduate school, professional schools, or through industrial training programs; or informally, through activities such as continuing education, attendance in short courses, professional workshops and conferences.
3. exercise and further develop their skills in professional communication through activities such as project briefings, conference presentations, technical reports and manuals, and journal publications.
4. participate in activities for the betterment of society, and carry on the traditions of the University of Dayton by maintaining high ethical standards in their professional activities, and by serving their country and community through service, leadership and mentoring.

Our computer engineering alumni will be prepared to:

1. find rewarding careers as engineering professionals. As computer engineers they will be prepared to design and develop new products, technologies and processes that incorporate one or more of the following elements: analog and digital circuits, signals and systems, computer design, software development, and hardware/software integration.
2. continue their professional education either formally, in graduate school, professional schools, or through industrial training programs; or informally, through activities such as continuing education, attendance in short courses, professional workshops and conferences.
3. exercise and further develop their skills in professional communication through activities such as project briefings, conference presentations, technical reports and manuals, and journal publications.
4. participate in activities for the betterment of society, and carry on the traditions of the University of Dayton by maintaining high ethical standards in their professional activities, and by serving their country and community through service, leadership and mentoring.

Electrical engineering is an exciting field within the engineering discipline. It offers the opportunity to enter some of the most rewarding and challenging careers available. The explosion of capabilities in the computer, communication, automotive, medical, entertainment and aerospace industries, as well as homeland security has resulted from advances in the electronics field. Electrical engineers are equipped to enter this dynamic arena as well as equally challenging and rewarding careers in the fields of electro-optics, communication, radar, signal and image processing, biomedicine, controls, robotics and instrumentation, and many more. Electrical engineers work in all phases of technological programs. They are involved from the conception of the basic ideas through design, fabrication, verification, manufacturing, and marketing of the final product.

Computer engineering represents perhaps the most sought-after professional component of an engineering team which develops the technological possibilities inherent in the design, construction, and operation of computer systems. The computer engineer performs a wide variety of tasks involving hardware, software, peripherals, computer-controlled systems, and hardware-software integration, as well as computer applications in the multitude of areas listed in the previous paragraph.

Both electrical engineering and computer engineering are broad-based engineering disciplines that provide for a wide range of career choices within the engineering field as well as providing an excellent basis for careers in such diverse areas as business, law, and medicine.

The electrical engineering curriculum is designed to provide an understanding of basic electrical engineering principles with emphasis on the development of problem solving skills. The computer engineering curriculum draws from software courses taken in computer science and hardware related courses taken from Electrical and Computer Engineering, culminating in the integration of hardware and software in systems design. An extensive laboratory experience is integrated with the classroom work to assure that the student develops a working knowledge of the fundamentals. Upper level courses integrate the knowledge base with current technology and computational tools resulting in a graduate capable of making a contribution to the engineering profession by either entering the work force or pursuing a graduate education.

Faculty

Guru Subramanyam, Chairperson
Professors Emeriti: Evers, Kee, Rogers, Scarpino, Thiele, Williamson
Professors: Asari, Banerjee, Chatterjee, Duncan, Hardie, Haus, Moon, Ordonez, Sarangan, Subramanyam, Vorontsov, Weber, Wicks, Zhan
Associate Professors: Daniels, Gulians, Loomis, Penno, Taha
Assistant Professors: Balster, Hirakawa
Adjunct Professors: Barrera, Coutu, Kessler, Kim, Malas, Patterson, Wang

**Bachelor of Electrical Engineering (ele)
minimum of 134 credit hours**

Common Academic Program (CAP)

*credit hours will vary depending on courses selected		
First-Year Humanities Commons ¹		12
HST 103	The West & the World	
REL 103	Introduction to Religioius & Theological Studies	
PHL 103	Introduction to Philosophy	
ENG 100	Writing Seminar I ²	

Second-Year Writing Seminar ³	0-3	ECE 332 (p. 365)	Electromagnetics	3
ENG 200 Writing Seminar II		ECE 333 (p. 365)	Appl Electromagnetcs	3
Oral Communication	3	ECE 334 (p. 365)	Discrete Signals&Sys	3
CMM 100 Principles of Oral Communication		ECE 340 (p. 365)	Engr Prblty&Rndm Prc	3
Mathematics	3	ECE 401 (p. 365)	Communictn Systems and Communicatn Sys Lab	4
Social Science	3	ECE 415 (p. 365)	Control Systems	3
Arts	3	ECE 431L (p. 365)	Multdsply Design I	1
Natural Sciences	7	ECE 432L (p. 365)	Mutdsply Design II	3
Crossing Boundaries	variable credit	ECE 433 (p. 365)	Proj Mangmt&Innovtn	1
Faith Traditions		EGR 100 (p. 365)	Enrichment Workshop (2 semesters)	0
Practical Ethical Action		EGR 103 (p. 365)	Engineering Innovatn	2
Inquiry		EGR 201 (p. 365)	Engr Mechanics	3
Integrative		EGR 202 (p. 365)	Engr Thermodynamics	3
Advanced Study	variable credit	EGR 203 (p. 365)	Electrc & Elctrnc Crt	3
Philosophy and/or Religious Studies		ENG 100 (p. 365) & ENG 200 (p. 365) or ENG 200H (p. 365)	Writing Seminar I and Writing Seminar II	6
Historical Studies		HST 103 (p. 365) or HST 198 (p. 365)	West and the World	3
Diversity and Social Justice	3	MTH 168 (p. 365)	Anly Geom & Calc I	4
Major Capstone	0-3	MTH 169 (p. 365)	Anly Geom & Calc II	4
		MTH 218 (p. 365)	Anly Geom & Calc III	4
		MTH 219 (p. 365)	Appl Diff Equations	3
		MTH 310 (p. 365)	Lin Alg & Matrices	3
		PHL 103 (p. 365)	Intro To Philosophy	3
		PHL 316 (p. 365) or PHL 319 (p. 365)	Engineering Ethics	3
		PHY 206 (p. 365)	Information Ethics	3
			Gen Physics I Mech	3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 (p. 365)	General Chemistry	3
CMM 100 (p. 365)	Principles of Oral Communication	3
CPS 150 (p. 365)	Algorith&Progrm I	4
ECE 101 (p. 365)	Intro to Elec Engr (2 semesters)	0
ECE 200 (p. 365)	Sophomore Seminar (2 semesters)	0
ECE 201L (p. 365)	Circuit Anlys Lab	1
ECE 203 (p. 365)	Intro Matlab Prog	1
ECE 204 (p. 365)	Electronic Devices and Electrnc Devices Lab & 204L (p. 365)	4
ECE 215 (p. 365) & 215L (p. 365)	Introduction to Digital Systems and Digital Systems Lab	4
ECE 303 (p. 365) & 303L (p. 365)	Signals & Sytems and Signals & Systems Lab	4
ECE 304 (p. 365) & 304L (p. 365)	Electrnc Systems and Electrnc Systems Lab	4
ECE 314 (p. 365) & 314L (p. 365)	Fund-Comptr Arch and Fund-Comptr Arch Lab	4

PHY 210L (p. 365)	Gen Physics Lab I	1
PHY 232 (p. 365)	Physics of Waves	3
REL 103 (p. 365)	Introduction to Religious and Theological Studies	3
Electives		12
Technical electives ¹		12
Total Hours		134

¹ Select from list approved by the Department of Electrical and Computer Engineering.

Bachelor of Science in Computer Engineering (cpe) minimum of 137 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103 The West & the World	
REL 103 Introduction to Religious & Theological Studies	
PHL 103 Introduction to Philosophy	
ENG 100 Writing Seminar I ²	
Second-Year Writing Seminar ³	0-3
ENG 200 Writing Seminar II	
Oral Communication	3
CMM 100 Principles of Oral Communication	
Mathematics	3
Social Science	3
Arts	3
Natural Sciences	7
Crossing Boundaries	variable credit
Faith Traditions	
Practical Ethical Action	
Inquiry	
Integrative	
Advanced Study	variable credit
Philosophy and/or Religious Studies	
Historical Studies	
Diversity and Social Justice	3
Major Capstone	0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123	General Chemistry	3
CMM 100	Principles of Oral Communication	3
CPS 150	Algorithms & Programming I	4
CPS 151	Algorithms & Programming II	4

CPS 346	Operating Systems I	3
CPS 350	Data Structures & Algorithms	3
CPS 444	Systems Programming I	3
ECE 101	Introduction to Electrical & Computer Engineering (2 semesters)	0
ECE 200	Professional Development Seminar (2 semesters)	0
ECE 201L	Circuit Analysis Laboratory	1
ECE 203	Introduction to MATLAB Programming	1
ECE 204 & 204L	Electronic Devices and Electronic Devices Laboratory	4
ECE 215 & 215L	Introduction to Digital Systems and Digital Systems Laboratory	4
ECE 303 & 303L	Signals & Systems and Signals & Systems Laboratory	4
ECE 304 & 304L	Electronic Systems and Electronic Systems Laboratory	4
ECE 314 & 314L	Fundamentals of Computer Architecture and Fundamentals of Computer Architecture Laboratory	4
ECE 334	Discrete Signals & Systems	3
ECE 340	Engineering Probability & Random Processes	3
ECE 431L	Multidisciplinary Design I	1
ECE 432L	Multidisciplinary Design II	3
ECE 433	Project Management & Innovation	1
ECE 444	Advanced Digital Design	3
ECE 449	Computer Systems Engineering	3
EGR 100	Enrichment Workshop (2 semesters)	0
EGR 103	Engineering Innovation	2
EGR 201	Engineering Mechanics	3
EGR 202	Engineering Thermodynamics	3
EGR 203	Electrical & Electronic Circuits	3
ENG 100 & ENG 200	Writing Seminar I and Writing Seminar II	6
or ENG 200H	Writing Seminar II	
HST 103 or HST 198	The West & the World History Scholars' Seminar	3
MTH 168	Analytic Geometry & Calculus I	4
MTH 169	Analytic Geometry & Calculus II	4
MTH 218	Analytic Geometry & Calculus III	4
MTH 219	Applied Differential Equations	3
MTH 310	Linear Algebra & Matrices	3
PHL 103	Introduction to Philosophy	3
PHL 319	Information Ethics	3
PHY 206	General Physics I - Mechanics	3
PHY 210L	General Physics Laboratory	1
PHY 232	The Physics of Waves	3
REL 103	Introduction to Religious & Theological Studies	3
Computer Science elective		3
Electives		12
Technical electives ¹		6
Total Hours		137

- ¹ Select from list approved by the Department of Electrical and Computer Engineering.

CONCENTRATION IN Electrical Energy Systems (EES)

The Electrical Energy Systems Concentration will prepare our Electrical and Computer Engineering students in all aspects of Electrical Energy Systems including generation, transmission, distribution, utilization, storage, as well as enabling technologies for the smart grid.

Required ECE courses:

ECE 316	Introduction to Electrical Energy Systems	3
or ECE 499	Special Problems in Electrical & Computer Engineering	
ECE 414	Electromechanical Devices	3
ECE 471	Contemporary Power Systems & the Smart Grid	3
Select one course from:		3
ECE 472	Smart Grid Technologies	
MEE 473	Renewable Energy Systems	
Total Hours		12

Concentration in Electro-Optics (eop)

The departments of Electrical & Computer Engineering and Physics, with the support of the Electro-Optics Graduate Program at University of Dayton, offers an undergraduate concentration in Electro-Optics.

This multidisciplinary concentration is open to Electrical Engineering, Computer Engineering and Physics undergraduates with appropriate prerequisite background. This concentration will enable students to pursue new coop opportunities and possible careers in photonics, and better prepare students to pursue new coop opportunities and possible careers in photonics and better prepare students who wish to pursue graduate degrees in the area of optics. All the courses listed below are approved as free technical electives for ECE undergraduate students.

ECE 443	Introduction to Electro-Optics	3
PHY 404	Physical Optics	3
Select two courses from:		6
EOP 501	Geometric Optics	
EOP 502	Optical Radiation & Matter	
EOP 505	Introduction to Lasers	
EOP 506/ECE 573	Electro-Optical Devices & Systems	
EOP 513/ECE 572	Linear Systems & Fourier Optics	
EOP 514/ECE 574	Guided-Wave Optics	
Total Hours		12

Concentration in Robotics (rob)

Robotics (CPE Majors)		15
ECE 415	Control Systems	3
ECE 416	Introduction to Industrial Robotic Manipulators	3
ECE 447	Digital Control Systems	3
Select two courses from:		6
CPS 480	Artificial Intelligence	

ECE 414	Electromechanical Devices	
ECE 444	Advanced Digital Design	
ECE 445	Signal Processing	
MEE 321	Theory of Machines	
MEE 434	Mechatronics	
MEE 438	Robotics & Flexible Manufacturing	
Robotics (ELE Majors)		12
ECE 416	Introduction to Industrial Robotic Manipulators	3
ECE 447	Digital Control Systems	3
Select two courses from:		6
CPS 480	Artificial Intelligence	
ECE 414	Electromechanical Devices	
ECE 444	Advanced Digital Design	
ECE 445	Signal Processing	
MEE 321	Theory of Machines	
MEE 434	Mechatronics	
MEE 438	Robotics & Flexible Manufacturing	

Minor in Computer Systems (cos)

This minor is open to chemical, civil, and mechanical engineering majors, and other students with appropriate prerequisite background who receive permission from the ECE Department Chair. The program builds strength in the area of computer systems and digital design, with emphasis on computer hardware.

Computer Systems (non-MEE majors)		16
CPS 150 (p. 365)	Algorithm&Progrm I	4
or ECE 444 (p. 365)	Adv Digital Design	
ECE 201L (p. 365)	Circuit Anlys Lab	1
ECE 215 (p. 365) & 215L (p. 365)	Introduction to Digital Systems and Digital Systems Lab	4
ECE 314 (p. 365) & 314L (p. 365)	Fund-Comptr Arch and Fund-Comptr Arch Lab	4
EGR 203 (p. 365)	Electrc'l & Elctrnc Crt	3
Computer Systems (MEE majors)		15
CPS 150 (p. 365)	Algorithm&Progrm I (or equivalent)	4
ECE 215 (p. 365) & 215L (p. 365)	Introduction to Digital Systems and Digital Systems Lab	4
ECE 314 (p. 365) & 314L (p. 365)	Fund-Comptr Arch and Fund-Comptr Arch Lab	4
ECE 444 (p. 365)	Adv Digital Design	3

Minor in Signals and Systems (sas)

This minor is open to chemical, civil, and mechanical engineering majors, and other students with appropriate prerequisite background who receive permission from the ECE Department Chair. The program provides the

essential background in signals and systems theory including continuous and discrete systems. An advanced course is selected by the students to allow them to specialize in controls or signal processing.

ECE 201L (p. 365)	Circuit Anlys Lab	1
ECE 203 (p. 365)	Intro Matlab Prog	1
ECE 303 (p. 365)	Signals & Sytems and Signals & Systems Lab & 303L (p. 365)	4
ECE 334 (p. 365)	Discrete Signals&Sys	3
ECE 415 (p. 365)	Control Systems	3
or ECE 445 (p. 365)	Signal Processing	
EGR 203 (p. 365)	Electrol & Elctrnc Crt	3
Total Hours		15

Electrical Engineering

First Year

Fall	Hours Spring	Hours
ECE 101	0 ECE 101	0
PHY 206 (Satisfies CAP Natural Science)	3 CHM 123 (Satisfies CAP Natural Science)	3
MTH 168 (Satisfies CAP Math Requirement)	4 CPS 150	4
HST 103 (Satisfies CAP First Year Humanities Common)	3 EGR 100	0
PHL 103 (Satisfies CAP First Year Humanities Common)	3 MTH 169	4
ENG 100 (Satisfies CAP Writing Seminar)	3 CMM 100 (Satisfies CAP Communication)	3
EGR 100	0 REL 103 (Satisfies CAP First Year Humanities Common)	3
EGR 103	2	
18		17

Second Year

Fall	Hours Spring	Hours
ECE 200	0 ECE 200	0
PHY 210L	1 PHY 232 (Satisfies CAP Crossing Boundaries Inquiry)	3
ECE 203	1 ECE 215	3
EGR 201	3 ECE 215L	1
MTH 218	4 MTH 219	3
EGR 203	3 ECE 204	3
ECE 201L	1 ECE 204L	1

ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 EGR 202	3
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16 17

Third Year

Fall	Hours Spring	Hours
ECE 332	3 ECE 333	3
ECE 314	3 ECE 340	3
ECE 314L	1 ECE 334	3
MTH 310	3 ECE 304	3
ECE 303	3 ECE 304L	1
ECE 303L	1 Social Science (Satisfies CAP Social Science)	3
Art Study (Satisfies CAP Art Study)	3	
17		16

Fourth Year

Fall	Hours Spring	Hours
TECH Elective	3 TECH Elective	3
TECH Elective	3 TECH Elective	3
ECE 415	3 ECE 432L	3
ECE 431L	1 ECE 433	1
ECE 401	3 Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3
ECE 401L	1 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3
Advanced HST (Satisfies CAP Crossing Boundaries)	3	
17		16

Total credit hours: 134

Computer Engineering

First Year

Fall	Hours Spring	Hours
ECE 101	0 CMM 100 (Satisfies CAP Communication)	3
ENG 100 (Satisfies CAP Writing Seminar)	3 CPS 150	4
HST 103 (Satisfies CAP First Year Humanities Common)	3 REL 103 (Satisfies CAP First Year Humanities Common)	3
PHL 103 (Satisfies CAP First Year Humanities Common)	3 ECE 101	0
MTH 168 (Satisfies CAP Math Requirement)	4 MTH 169	4
EGR 103	2 CHM 123 (Satisfies CAP Natural Science)	3
EGR 100	0 EGR 100	0

PHY 206 (Satisfies CAP Natural Science)	3		
	18		17
Second Year			
Fall	Hours Spring		Hours
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 EGR 201		3
CPS 151	4 CPS 350		3
PHY 210L	1 ECE 215		3
ECE 200	0 ECE 215L		1
MTH 218	4 MTH 219		3
EGR 203	3 ECE 204		3
ECE 201L	1 ECE 204L		1
ECE 203	1 ECE 200		0
	17		17
Third Year			
Fall	Hours Spring		Hours
Art Study (Satisfies CAP Art Study)	3 Social Science (Satisfies CAP Social Science)		3
CPS 346	3 EGR 202		3
ECE 314	3 ECE 340		3
ECE 314L	1 PHY 232 (Satisfies CAP Crossing Boundaries Inquiry)		3
MTH 310	3 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)		3
ECE 303	3 ECE 334		3
ECE 303L	1		
	17		18
Fourth Year			
Fall	Hours Spring		Hours
ECE 444	3 ECE 449		3
CPS 444	3 CPS Elect		3
TECH Elect	3 TECH Elect		3
ECE 431L	1 ECE 432L (Satisfies CAP Capatone Requirement)		3
ECE 304	3 ECE 433		1
ECE 304L	1 Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)		3
ADV HST (Satisfies CAP Crossing Boundaries Advanced History Integrative)	3		
	17		16

Total credit hours: 137

Courses

ECE 101. Introduction to Electrical & Computer Engineering. 0 Hours

Introduction to electrical and computer engineering faculty, facilities, and curriculum. Career opportunities in electrical and computer engineering and areas of specialization are discussed.

ECE 198. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis, and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

ECE 200. Professional Development Seminar. 0 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

ECE 201L. Circuit Analysis Laboratory. 1 Hour

Laboratory course stressing experimental techniques, laboratory reporting, safety, and instrumentation. Experimental investigation of basic steady-state and transient circuits. Corequisite(s): ECE 201 or EGR 203.

ECE 203. Introduction to MATLAB Programming. 1 Hour

MATLAB system and development environment, vector and matrix operations using MATLAB, linear algebra and calculus using MATLAB, MATLAB graphics, flow control, symbolic math toolbox. Prerequisite(s): (CPS 132 or CPS 150) or equivalent.

ECE 204. Electronic Devices. 3 Hours

Study of the terminal characteristics of electronic devices and basic single stage amplifier configurations using bipolar junction transistors and field-effect transistors. Analysis of the devices includes a qualitative physical description, volt-ampere curves, and the development of small- and large-signal equivalent circuit models. Prerequisite(s): EGR 203. Corequisite(s): ECE 204L.

ECE 204L. Electronic Devices Laboratory. 1 Hour

Laboratory investigation of electronic devices: diodes, bipolar junction transistors, field-effect transistors and operational amplifiers. Corequisite(s): ECE 204.

ECE 215. Introduction to Digital Systems. 3 Hours

Introduction to binary systems, logic circuits, Boolean algebra, simplification methods, combinational circuits and networks, programmable logic devices, flip flops, registers, counters, memory elements, and analysis and design of sequential circuits. Prerequisite(s): EGR 203. Corequisite(s): ECE 215L.

ECE 215L. Digital Systems Laboratory. 1 Hour

Laboratory investigation of digital logic circuits and systems covered in ECE 215. Logic gate characteristics; combinational logic design and analysis; latches and flip-flops; synchronous and asynchronous sequential logic; simple digital systems. Experiments include design and analysis of digital systems using breadboarding, FPGA boards, modeling and simulation tools, hardware description languages, and logic synthesis tools. Prerequisite(s): ECE 201, ECE 201L. Corequisite(s): ECE 215.

ECE 298. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis, and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

ECE 303. Signals & Systems. 3 Hours

Mathematical framework associated with the analysis of linear systems including signal representation by orthogonal functions, convolution, Fourier and Laplace analysis, and frequency response of circuits and systems. Prerequisite(s): ECE 204; MTH 218. Corequisite(s): ECE 303L.

ECE 303L. Signals & Systems Laboratory. 1 Hour

Laboratory investigation of signals and systems including signal decomposition, system impulse response, convolution, frequency analysis of systems, and filter design and realization. Prerequisite(s): ECE 204. Corequisite(s): ECE 303.

ECE 304. Electronic Systems. 3 Hours

ELECTRONIC SYSTEMS Study of cascaded amplifiers, feedback amplifiers, linear integrated circuits, and oscillators including steady state analysis and analysis of frequency response. Prerequisite(s): ECE 303. Corequisite(s): ECE 304L.

ECE 304L. Electronic Systems Laboratory. 1 Hour

Design, construction and verification of multistage amplifiers, differential amplifiers, feedback amplifiers, passive and active filters, and oscillators. Prerequisite(s): ECE 303. Corequisite(s): ECE 304.

ECE 314. Fundamentals of Computer Architecture. 3 Hours

Study of computer systems organization, representation of data and instructions, instruction set architecture, processor and control units, memory devices and hierarchy, I/O devices and interfacing peripherals, high- to low-level language mapping, system simulation and implementation, applications and practical problems. Prerequisite(s): CPS 150; ECE 215. Corequisite(s): ECE 314L.

ECE 314L. Fundamentals of Computer Architecture Laboratory. 1 Hour

Laboratory investigation of digital computer architecture covered in ECE 314. Computer sub-systems such as central processing units, control units, I/O units, and hardware/software interfaces will be experimentally considered. Simulation and implementation will be used to study applications and practical problems. Prerequisite(s): ECE 215. Corequisite(s): ECE 314.

ECE 316. Introduction to Electrical Energy Systems. 3 Hours

A broad introduction to electric energy concepts. Generation, transmission, distribution, and utilization of electric energy. Renewable energy, three phase systems, transformers, power electronics, motors and generators. Contemporary topics. Prerequisite(s): EGR 203 or equivalent.

ECE 332. Electromagnetics. 3 Hours

Study of vector calculus, electro- and magneto-statics, Maxwell's equations, and electromagnetic plane waves and their reflection and transmission from discontinuities. Prerequisite(s): PHY 232.

ECE 333. Applied Electromagnetics. 3 Hours

Electromagnetic theory applied to problems in the areas of waveguides, radiation, electro-optics and electromagnetic interference and electromagnetic compatibility. Prerequisite(s): ECE 332.

ECE 334. Discrete Signals & Systems. 3 Hours

Introduction to discrete signals and systems including sampling and reconstruction of continuous signals, digital filters, frequency analysis, the z-transform, and the discrete Fourier transform. Prerequisite(s): ECE 303.

ECE 340. Engineering Probability & Random Processes. 3 Hours

Axiomatic probability, derived probability relationships, conditional probability, statistical independence, total probability and Bayes' Theorem, counting techniques, common random variables and their distribution functions, transformations of random variables, moments, autocorrelation, power spectral density, cross correlation and covariance, random processes through linear and nonlinear systems, linear regression, and engineering decision strategies. Prerequisite(s): ECE 303; MTH 218.

ECE 398. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis, and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

ECE 401. Communication Systems. 3 Hours

Study of amplitude, angle, pulse, and digital communication systems including generation, detection, and analysis of modulated signals and power, bandwidth, and noise considerations. Prerequisite(s): ECE 304, 340. Corequisite(s): ECE 401L.

ECE 401L. Communication Systems Laboratory. 1 Hour

Design, fabrication, and laboratory investigation of modulators, detectors, filters, and associated communication components and systems. Prerequisite(s): ECE 304. Corequisite(s): ECE 401.

ECE 414. Electromechanical Devices. 3 Hours

Properties and theory of electromechanical devices: nonlinear electro-magnetic actuators; rotating machine analysis; field and circuit concepts and direct current, synchronous, and induction machines: special-purpose machines and fractional horsepower machines. Prerequisite(s): ECE 316 or equivalent.

ECE 415. Control Systems. 3 Hours

Study of mathematical models for control systems and analysis of performance characteristics and stability. Design topics include pole-placement, root locus, and frequency domain techniques. Prerequisite(s): ECE 303.

ECE 416. Introduction to Industrial Robotic Manipulators. 3 Hours

Topics include homogeneous transformations, direct and inverse kinematics, trajectory generation, and selected topics of robot vision. Prerequisite(s): ECE 303.

ECE 431L. Multidisciplinary Design I. 1 Hour

Multidisciplinary engineering design projects and problems. Introduction to product development using the Product Realization Process. Concentration on proposals, specifications, conceptualization and decision analysis. Projects result in final design and prototyping in the follow-on course. Prerequisite(s): ECE 304, ECE 314.

ECE 432L. Multidisciplinary Design II. 3 Hours

Combination of lecture and laboratory experiences. The focus of the lecture is on project management aspects of engineering design, including communication, collaboration, project tracking methods, cost estimating, overhead, direct labor costs, time value of money, depreciation, and return on investment. The focus of the lab is on a multidisciplinary team design project. Detailed evaluation of the Product Realization Process (PRP), including specifications, innovation, conceptualization, decision analysis, embodiment design, final design and prototyping. Analysis of the design criteria for safety, ergonomic, environmental, financial, ethical, and socio-political impact. Periodic oral and status reports. Culminates in a comprehensive written report and oral presentation. Prerequisite(s): CPE majors: ECE 340, ECE 431L, ECE 444; ELE majors: ECE 340, ECE 431L, (ECE 401 or ECE 415).

ECE 433. Project Management & Innovation. 1 Hour

Introduces students and teams to project management, entrepreneurship, and innovation. Topics include project management, cost estimating, time value of money, patent law, marketing, finance, and business plan development. Prerequisite(s): Junior status.

ECE 440. Physical Electronics. 3 Hours

Introduction to wave mechanics, electron ballistics, theory of metals and semiconductors, electron emission, space charge flow, and modern electron devices. Prerequisite(s): MTH 219; PHY 232.

ECE 441. Integrated Circuit Electronics. 3 Hours

Integrated circuit design, construction and verification including the study of biasing, multistage differential and analog power amplification, and computer assisted design tools for "on-chip" design and layout. Prerequisite(s): ECE 304.

ECE 442. Engineering Electromagnetics. 3 Hours

Processing Maxwell's equations and applying the predictions to the analysis and design of engineering systems that make use of electromagnetic energy from ELF through optical frequencies. Topics include propagation, radiation, interactions with matter, guided waves, and antenna fundamentals. Prerequisite(s): ECE 333.

ECE 443. Introduction to Electro-Optics. 3 Hours

Introductory overview of electro-optics starting with Maxwell's equations and leading to lasers, holography, and other timely applications. Prerequisite(s): ECE 332.

ECE 444. Advanced Digital Design. 3 Hours

Systems approach to digital design including: structured top-down development process using simple and complex logic modules from various logic families; practical aspects of the design, construction, and verification of digital subsystems; application of microcomputer and/or controller as a flexible logic device; real-time embedded systems design; and the use of HDL tools and simulation. Prerequisite(s): ECE 314.

ECE 445. Signal Processing. 3 Hours

Study of signal conditioning, digital signal processing, and data processing. Topics include transducers, high gain amplifier design, digital filtering, and spectrum estimation. Specialized application determined by instructor. Prerequisite(s): ECE 334.

ECE 446. Microelectronic Systems Design. 3 Hours

Basic integrated circuit design concepts, system layout, application of design methodology, the fabrication process, manufacturing limitations of the design process, and CAD/CAE utilization to realize the design process. Prerequisite(s): ECE 304.

ECE 447. Digital Control Systems. 3 Hours

Analysis and synthesis of feedback control systems including digital compensators. Topics include performance and stability analysis, regulator and servomechanism design using time and frequency domain methods, and digital implementation case studies. Prerequisite(s): ECE 415; ECE 334 or equivalent.

ECE 448. Fiber Optic Communications. 3 Hours

General light guidance principles; ray optics; dispersion; single mode, multimode, and graded index fibers; basic laser and LED source principles; photodetectors; error probability in digital optical systems; rise time analysis; loss budget analysis; local area networks and long haul communication links. Prerequisite(s): ECE 333 Corequisite(s): ECE 401.

ECE 449. Computer Systems Engineering. 3 Hours

An introduction to advanced computer architecture and computer systems design. Topics include: exploration of principle architecture features of modern computers, pipelining, memory hierarchy, I/O devices, interconnection networks, introduction to parallel and multiprocessor systems, and the use of hardware description languages (HDLs) in system implementation. Prerequisite(s): ECE 444; (CPS 346 or permission of instructor).

ECE 450L. Projects Laboratory. 1-3 Hours

Project-oriented laboratory applying engineering skills in the design, development, and demonstration of electrical and electronic systems. Prerequisite(s): Permission of project advisor.

ECE 471. Contemporary Power Systems & the Smart Grid. 3 Hours

Introduction to electrical power systems; generation, transmission and utilization; power system analysis; power system control; energy management; and an introduction to smart grid technologies. Prerequisites(s): ECE 316 or equivalent.

ECE 472. Smart Grid Technologies. 3 Hours

An introductory study of enabling technologies and energy issues necessary for full realization of the Smart Grid. Course topics vary. This course can be taken multiple times. Prerequisite(s): ECE 471 or equivalent.

ECE 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

ECE 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): ECE 493.

ECE 498. Multidisciplinary Research & Innovation Laboratory. 1-6 Hours

Students participate in 1.) selection and design, 2.) investigation and data collection, 3.) analysis, and 4.) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

ECE 499. Special Problems in Electrical & Computer Engineering. 1-6 Hours

Particular assignments to be arranged and approved by the department chairperson.

Engineering Management

Minors:

- Engineering Management (p. 374)
- Operations Engineering (p. 374)

Minor in Engineering Management (enm)

This twelve credit hour minor is open to all engineering and engineering technology majors. Completion of this minor will provide the student with understanding of basic concepts relevant to the management of engineering operations. Students who anticipate moving from technical to managerial positions during their careers may wish to consider this minor.

ENM 505 (p. 374)	Mgt of Engr Sysms	3
ENM 530 (p. 374)	Engineering Economy	3
or ISE 430 (p. 374)	Engineering Economy	
Select two courses from:		6
ENM 500 (p. 374)	Prob&Stat for Engrs	
ENM 515 (p. 374)	Human Factors Engr	
ENM 534 (p. 374)	Decision Making	
ENM 539 (p. 374)	Sys Engr/Prjct Mgmt	
ENM 560 (p. 374)	Quality Assurance	
ENM 565 (p. 374)	Reliability Engr I	
ENM 582 (p. 374)	Engr Organizatnl Dev	
ISE 300 (p. 374)	Prob & Stat Egrs	
ISE 421 (p. 374)	Intro to OPS Rsrch ¹	
ISE 455 (p. 374)	System Dynamics	
ISE 460 (p. 374)	Quality Assurance	
ISE 465 (p. 374)	Reliably&Maintnbty	
MSC 521 (p. 374)	Intro to OPS Rsrch	
MSC 555 (p. 374)	System Dynamics I	
MSC 572 (p. 374)	System Simulation	
Total Hours		12

¹ ENM 500 (p. 374) (or ISE 300 (p. 374) or MTH 367 (p. 374)) is a prerequisite.

Minor in Operations Engineering (ope)

This twelve hour minor is open to all engineering and engineering technology majors. Completion of this minor will provide the student with a strong foundation in the analytical tools needed to plan, design, optimize, and manage complex engineering operations. Students who anticipate moving into problem-solving and decision-support roles during their engineering careers may wish to consider this minor.

ENM 500 (p. 374)	Prob&Stat for Engrs	3
or ISE 300 (p. 374)	Prob & Stat Egrs	
ISE 421 (p. 374)	Intro to OPS Rsrch ¹	3
or MSC 521 (p. 374)	Intro to OPS Rsrch	
MTH 367 (p. 374)	Statistical Meth I	3
Select one course from:		3
ENM 560 (p. 374)	Quality Assurance ²	
ENM 561 (p. 374)	Dsgn & Analy Expr	
ENM 565 (p. 374)	Reliability Engr I	
ISE 460 (p. 374)	Quality Assurance	
MSC 572 (p. 374)	System Simulation	
Total Hours		12

¹ ENM 500 (p. 374) (or ISE 300 (p. 374) or MTH 367 (p. 374)) is a corequisite.

² ENM 500 (p. 374) (or ISE 300 (p. 374) or MTH 367 (p. 374)) is a prerequisite.

Engineering Technology

Majors:

- Bachelor of Science, Electronic and Computer Engineering Technology (p. 375)
- Bachelor of Science, Industrial Engineering Technology (p. 376)
- Bachelor of Science, Global Manufacturing Systems Engineering Technology (p. 378)
- Bachelor of Science, Mechanical Engineering Technology (p. 380)

Minors:

- Automotive Systems (p. 381)
- Electronic and Computer Engineering Technology (p. 376)
- Engineering Technology (p. 381)
- Global Manufacturing Systems Engineering Technology (p. 379)
- Industrial Automation and Applied Robotic Systems (p. 382)
- Industrial Engineering Technology (p. 377)
- Integrated Arts and Technology (p. 382)
- Mechanical Engineering Technology (p. 381)

- Quality Assurance (p. 378)
- Sustainable Manufacturing (p. 383)

The School of Engineering also offers a Bachelor of Science in Engineering Technology. The programs in which the degree is offered are electronic and computer engineering technology, global manufacturing systems engineering technology, industrial engineering technology, and mechanical engineering technology. The engineering technologist is usually involved in the design, performance evaluation, service and sales of products, equipment, and manufacturing systems or the management of these activities. The management of process operations and plant facilities are also important career paths.

The engineering technology programs provide: (1) specialized technical courses that emphasize rational thinking and the application of engineering and scientific principles to the practical solution of technological problems; (2) courses in applied mathematics and science sufficient to support the technical courses and to prepare the student for future growth; and (3) education to prepare students to communicate intelligently and to take places in society as responsible, humane, complete professionals.

The University of Dayton engineering technology programs prepare graduates who:

- are competent and productive in the practice of both the technical and communication aspects of their profession;
- demonstrate ethical and professional standards of conduct
- exhibit leadership qualities as appropriate for the practice of their profession;
- are involved in service activities that benefit their profession and their community; and
- are engaged in continuing professional development.

Electronic and Computer Engineering Technology

The Electronic and Computer Engineering Technology Program (ECT) prepares students for careers in the electronics and computer fields. The ECT curriculum, while including a strong emphasis on computers, centers on applied engineering topics in circuit analysis, analog and digital electronic design, digital communications, digital circuits, microprocessors, software and data acquisition instrumentation. The graduate is prepared to work in industry at a variety of tasks including analog and digital design, microprocessor hardware and software applications, electronic controls, automation, engineering sales and support, product design and development, and data communications. The curricula provide the strong foundation in the basic principles necessary to support any future career studies or development as dictated by changing technology or career roles.

Faculty

Scott Schneider, Chairperson of Department of Engineering Technology
Professors Emeriti: Farren, Hanneman, Hazen

Professor: Segalewitz

Associate Professors: Globig, Schneider

Bachelor of Science with a major in Electronic and Computer Engineering Technology (ECT) minimum of 131 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103 The West & the World	
REL 103 Introduction to Religious & Theological Studies	
PHL 103 Introduction to Philosophy	
ENG 100 Writing Seminar I ²	
Second-Year Writing Seminar ³	0-3
ENG 200 Writing Seminar II	
Oral Communication	3
CMM 100 Principles of Oral Communication	
Mathematics	3
Social Science	3
Arts	3
Natural Sciences	7
Crossing Boundaries	variable credit
Faith Traditions	
Practical Ethical Action	
Inquiry	
Integrative	
Advanced Study	variable credit
Philosophy and/or Religious Studies	
Historical Studies	
Diversity and Social Justice	3
Major Capstone	0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 & 123L	General Chemistry and General Chemistry Laboratory	4
CMM 100	Principles of Oral Communication	3
ECT 110	Electrical Circuits I	3
ECT 110L	Electrical Circuits I Laboratory	1
ECT 120	Electrical Circuits II	3
ECT 206 & 206L	Electron Devices I and Electron Devices I Laboratory	4
ECT 224 & 224L	Digital Computer Fundamentals and Digital Computer Fundamentals Laboratory	4
ECT 306 & 306L	Electronic Devices II and Electronic Devices II Laboratory	4
ECT 357	Microprocessors I	3
ECT 358 & 358L	Microprocessors II and Microprocessors II Laboratory	4

ECT 361	Programming Structures	3
ECT 362	Concepts & Applications of Computer Operating Systems	3
ECT 408	Data Acquisition & Measurements	2
ECT 452	Feedback Controls	3
ECT 465	Digital Data Communications	3
ECT 466	Microcomputer Architecture	3
ECT 490	Senior Project	3
EGR 103	Engineering Innovation	2
ENG 100 & ENG 200 or ENG 200H	Writing Seminar I and Writing Seminar II ¹ Writing Seminar II	6
HST 103 or HST 198	The West & the World History Scholars' Seminar	3
IET 316	Quantitative Analysis	3
IET 317	Industrial Economic & Financial Analysis	3
IET 323	Project Management	3
MCT 110L	Technical Drawing & CAD Laboratory	2
MCT 220	Statics & Dynamics	3
MFG 431	Controls for Industrial Automation	3
MTH 137	Calculus I with Review	4
MTH 138	Calculus I with Review	4
MTH 207	Introduction to Statistics	3
PHL 103	Introduction to Philosophy	3
PHY 201 & 201L	General Physics and General Physics Laboratory	4
REL 103	Introduction to Religious & Theological Studies	3
SET 100	Engineering Technology First Year Seminar (2 semesters)	0
SET 101	Enrichment Workshop (2 semesters)	0
SET 153L	Technical Computation Laboratory	1
SET 200	Professional Development Seminar	0
SET 200	Professional Development Seminar	0
SET 499	Seminar	1
Electives		15
Technical electives ²		12
Total Hours		131

¹ The University's general reading and writing competency requirements are satisfied by completing ENG 100 and ENG 200, or ENG 200H with a grade of C- or higher. Students admitted to the University Honors program and students with sufficiently high verbal scores on the SAT and ACT are placed in ENG 200H. ENG 200H is a one-semester course which satisfies the University requirement. Students who are placed in ENG 200H do not receive credit for ENG 100 but are free to take elective course work in place of the waived first semester of composition.

² Select from list approved by the Department of Engineering Technology.

Minor in Electronic and Computer Engineering Technology (ECT)

This minor provides a concentration in the electronic and computer field that will compliment the student's major program of study. It is open to all

engineering technology majors except electronic or computer engineering technology. It is also available for other majors within the University if certain prerequisites have been met.

ECT 120	Electrical Circuits II	3
ECT 224 & 224L	Digital Computer Fundamentals and Digital Computer Fundamentals Laboratory	4
Select one emphasis from: ^{1,2}		6-8
Analog Devices Emphasis		
ECT 206 & 206L	Electron Devices I and Electron Devices I Laboratory	
ECT 306 & 306L	Electronic Devices II and Electronic Devices II Laboratory	
Microprocessor Emphasis		
ECT 357	Microprocessors I	
ECT 358 & 358L	Microprocessors II and Microprocessors II Laboratory	
Software Emphasis		
ECT 361	Programming Structures	
ECT 362	Concepts & Applications of Computer Operating Systems	
Total Hours		13-15

¹ Courses cannot be already required for student's major.

² Accompanying laboratories are recommended but not required.

Industrial Engineering Technology

The Industrial Engineering Technology Program has as its objective providing specialized education to prepare students for management and technical staff positions in manufacturing and service organizations such as health care, banking, transportation, food service, and government. Graduates may be involved in the economic selection and location of equipment, the planning of work methods and expected output, quality assurance, facilities layout, and scheduling and controlling the flow of materials. The curriculum emphasizes courses in work measurement, planning and control of lean processes, human factors, safety, facilities layout design and simulation, economic and financial analysis, statistical process control, management of projects and global technical organizations, cost estimating and cost control, and mathematical decision-making.

Faculty

Scott Schneider, Interim Chairperson of the Department of Engineering Technology

Charlie Edmonson, Program Coordinator

Professors: Edmonson, Summers, Untener

Associate Professors: Blust, Falkowski, Globig

Adjunct Professor: R. Reynolds

Bachelor of Science with a major in Industrial Engineering Technology (let) minimum of 131 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103	The West & the World

REL 103	Introduction to Religious & Theological Studies	
PHL 103	Introduction to Philosophy	
ENG 100	Writing Seminar I ²	
Second-Year Writing Seminar ³		0-3
ENG 200	Writing Seminar II	
Oral Communication		3
CMM 100	Principles of Oral Communication	
Mathematics		3
Social Science		3
Arts		3
Natural Sciences		7
Crossing Boundaries		variable credit
Faith Traditions		
Practical Ethical Action		
Inquiry		
Integrative		
Advanced Study		variable credit
Philosophy and/or Religious Studies		
Historical Studies		
Diversity and Social Justice		3
Major Capstone		0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 & 123L	General Chemistry and General Chemistry Laboratory	4
CMM 100	Principles of Oral Communication	3
ECT 110 & 110L	Electrical Circuits I and Electrical Circuits I Laboratory	4
EGR 103	Engineering Innovation	2
ENG 100 & ENG 200	Writing Seminar I and Writing Seminar II ¹	6
or ENG 200H	Writing Seminar II	
HST 103	The West & the World	3
or HST 198	History Scholars' Seminar	
IET 230	Work Measurement	3
IET 316	Quantitative Analysis	3
IET 317	Industrial Economic & Financial Analysis	3
IET 318	Statistical Process Control	3
IET 323	Project Management	3
IET 332	Facilities Layout Design	3
IET 408	Lean Management Methods	3
IET 415	Management of Global Technical Organizations	3
IET 418	Cost Estimating & Control	3
IET 420	Industrial & Environmental Safety	3
IET 435	Human Factors	3
IET 490	Senior Project	3
MCT 110L	Technical Drawing & CAD Laboratory	2

MCT 111L	Introduction to Design Laboratory	2
MCT 220	Statics & Dynamics	3
MCT 313	Industrial Mechanisms	3
MFG 108L	Manufacturing Processes Laboratory	1
MFG 204 & 204L	Materials & Processes and Materials & Processes Laboratory	4
MFG 206L	Dimensional Metrology Laboratory	1
MFG 208L	Geometric Dimensioning & Tolerancing Laboratory	1
MFG 438	Sustainable Manufacturing & Product Design	3
MTH 137	Calculus I with Review	4
MTH 138	Calculus I with Review	4
MTH 207	Introduction to Statistics	3
PHL 103	Introduction to Philosophy	3
PHY 201 & 201L	General Physics and General Physics Laboratory	4
REL 103	Introduction to Religious & Theological Studies	3
SET 100	Engineering Technology First Year Seminar (2 semesters)	0
SET 101	Enrichment Workshop (2 semesters)	0
SET 153L	Technical Computation Laboratory	1
SET 200	Professional Development Seminar (2 semesters)	0
SET 499	Seminar	1
Electives		15
Technical electives ²		15
Total Hours		131

¹ The University's general reading and writing competency requirements are satisfied by completing ENG 100 and ENG 200, or ENG 200H with a grade of C- or higher. Students admitted to the University Honors program and students with sufficiently high verbal scores on the SAT and ACT are placed in ENG 200H. ENG 200H is a one-semester course which satisfies the University requirement. Students who are placed in ENG 200H do not receive credits for ENG 100 but are free to take elective course work in place of the waived first semester of composition.

² Select from list approved by the Department of Engineering Technology.

Minor in Industrial Engineering Technology (iet)

This minor is open to all majors except industrial engineering technology. The program provides a concentration in the industrial field that will complement the student's major field of study. All prerequisites and corequisites must be followed.

Choose four courses from: ¹		12
IET 230 (p. 374)	Work Measurement	
IET 317 (p. 374)	Industri Econ&Analys	
IET 318 (p. 374)	Statistcl Proc Contr	
IET 319 (p. 374)	Quality Improv Mthds	

IET 320 (p. 374)	Quality Assur Technqs	
IET 321 (p. 374)	Quality Management	
IET 332 (p. 374)	Facilities Layout Ds	
IET 408 (p. 374)	Lean Mgt Methods	
IET 415 (p. 374)	Mgt of Glbal Tch Org	
IET 418 (p. 374)	Cost Estmtng&Control	
IET 420 (p. 374)	Indstrl&Environ Sfty	
IET 435 (p. 374)	Human Factors	
IET - Human Performance Emphasis ²		12
IET 230 (p. 374)	Work Measurement	
IET 415 (p. 374)	Mgt of Glbal Tch Org	
IET 420 (p. 374)	Indstrl&Environ Sfty	
IET 435 (p. 374)	Human Factors	
IET - Production Management Emphasis ³		18
IET 230 (p. 374)	Work Measurement	
IET 318 (p. 374)	Statistcl Proc Contr	
IET 332 (p. 374)	Facilities Layout Ds	
IET 408 (p. 374)	Lean Mgt Methods	
IET 418 (p. 374)	Cost Estmtng&Control	
IET 420 (p. 374)	Indstrl&Environ Sfty	
IET - Cost Management Emphasis ⁴		12
IET 317 (p. 374)	Indstrl Econ&Analys	
IET 408 (p. 374)	Lean Mgt Methods	
IET 415 (p. 374)	Mgt of Glbal Tch Org	
IET 418 (p. 374)	Cost Estmtng&Control	

Minor in Quality Assurance (qua)

This minor is open to all majors. The program provides a concentration in the field of quality control, quality assurance, and quality management. Upon successful completion of this minor, the student will have command of statistical quality tools as well as the breadth of quality management concepts and experience in practical application of the tools. All prerequisites and corequisites must be followed.

IET 318	Statistical Process Control	3
IET 319	Quality Improvement Methods	3
IET 320	Quality Assurance Techniques	3
IET 321	Quality Management	3
Total Hours		12

Global Manufacturing Systems Engineering Technology

Today's global economy has increasingly become borderless and is dominated by multi-national companies. This requires tomorrow's engineers to be able to work efficiently in multicultural teams. The Global Manufacturing Systems Engineering Technology program is creating a new type of "global engineer" both answering industry's demand and giving the upcoming engineer a competitive advantage in today's market place.

In the Global Manufacturing Systems Engineering Technology program you will use state-of-the-art technology to plan, design, and implement the tools and machines needed to produce high quality products at competitive prices. Throughout the program you will also apply important concepts of the lean enterprise, global competitiveness, green engineering concepts, and customer satisfaction.

The curriculum is highly interdisciplinary since the manufacturing professional must possess extensive technical skills and excellent humanistic skills in communications, computers, teamwork, information technology, globalism and multiculturalism. The technical courses emphasize engineering materials and manufacturing processes; mechanical, hydraulic, and pneumatic automation and electronic controls; computer integrated manufacturing; manufacturing planning and control; extensive laboratory experiences; the technical sciences and applied mathematics from college algebra, probability, statistics, calculus, and linear programming. The curriculum contains strong components from the humanities, social sciences, and communications, plus foreign language and multicultural requirements. The technical electives allow the student versatility in developing technical breadth or depth. The program is designed to prepare the graduates for challenging careers in manufacturing and serves as an excellent foundation for a variety of advanced degree options.

Faculty

Scott Schneider, Interim Chairperson of the Department of Engineering Technology
 Robert L. Wolff, Program Coordinator
 Professor Emeritus: Simon
 Professors: Summers, Untener, Wolff
 Associate Professors: Blust, Falkowski
 Assistant Professor: Kozak
 Adjunct Professor: Wendeln

Bachelor of Science with a major in Global Manufacturing Systems Engineering Technology (gmt) minimum of 133 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103	The West & the World

REL 103	Introduction to Religious & Theological Studies		
PHL 103	Introduction to Philosophy		
ENG 100	Writing Seminar I ²		
Second-Year Writing Seminar ³		0-3	
ENG 200	Writing Seminar II		
Oral Communication		3	
CMM 100	Principles of Oral Communication		
Mathematics		3	
Social Science		3	
Arts		3	
Natural Sciences		7	
Crossing Boundaries		variable credit	
Faith Traditions			
Practical Ethical Action			
Inquiry			
Integrative			
Advanced Study		variable credit	
Philosophy and/or Religious Studies			
Historical Studies			
Diversity and Social Justice		3	
Major Capstone		0-3	
¹ Completed with ASI 110 and ASI 120. ² Or ENG 100A and ENG 100B, or ENG 200H, by placement. ³ Completed with ENG 200H or ASI 120.			
Major Requirements			
CHM 123 & 123L	General Chemistry and General Chemistry Laboratory	4	
CMM 100	Principles of Oral Communication	3	
ECT 110 & 110L	Electrical Circuits I and Electrical Circuits I Laboratory	4	
ECT 408	Data Acquisition & Measurements	2	
EGR 103	Engineering Innovation	2	
ENG 100 & ENG 200 or ENG 200H	Writing Seminar I and Writing Seminar II ¹	6	
HST 103	The West & the World	3	
IET 316	Quantitative Analysis	3	
IET 317	Industrial Economic & Financial Analysis	3	
IET 318	Statistical Process Control	3	
IET 323	Project Management	3	
IET 408	Lean Management Methods	3	
MCT 110L	Technical Drawing & CAD Laboratory	2	
MCT 111L	Introduction to Design Laboratory	2	
MCT 220	Statics & Dynamics	3	
MCT 221	Strength of Materials	3	
MCT 313	Industrial Mechanisms	3	
MCT 336 & 336L	Fluid Power and Fluid Power Laboratory	4	
MFG 108L	Manufacturing Processes Laboratory ¹	1	
MFG 204 & 204L	Materials & Processes and Materials & Processes Laboratory	4	
MFG 206L	Dimensional Metrology Laboratory	1	
MFG 208L	Geometric Dimensioning & Tolerancing Laboratory	1	
MFG 240	Manufacturing & Product Design	3	
MFG 427	Computer Integrated Manufacturing & Global Manufacturing	3	
MFG 431	Controls for Industrial Automation	3	
MFG 432	Plastics, Composites & Nano Materials & Processes	3	
MFG 434	Robotics & Computer Numerical Control	3	
MFG 438	Sustainable Manufacturing & Product Design	3	
MFG 490	Senior Project	3	
MTH 137	Calculus I with Review	4	
MTH 138	Calculus I with Review	4	
MTH 207	Introduction to Statistics	3	
PHL 103	Introduction to Philosophy	3	
PHY 201 & 201L	General Physics and General Physics Laboratory	4	
REL 103	Introduction to Religious & Theological Studies	3	
SET 100	Engineering Technology First Year Seminar (2 semesters)	0	
SET 101	Enrichment Workshop (2 semesters)	0	
SET 153L	Technical Computation Laboratory	1	
SET 200	Professional Development Seminar (2 semesters)	0	
SET 499	Seminar	1	
Electives		15	
Language requirements ²		8	
Technical elective ³		3	
Total Hours		133	
¹ The University's general reading and writing competency requirements are satisfied by completing ENG 100 and ENG 200 or ENG 200H with a grade of C- or higher. Students admitted to the University Honors program and students with sufficiently high verbal scores on the SAT and ACT are placed in ENG 200H. ENG 200H is a one-semester course which satisfies the University requirement. Students who are placed in ENG 200H do not receive credit for ENG 100 but are free to take elective course work in place of the waived first semester of composition. ² Students who have no or limited experience in a foreign language will be required to complete a two-course language sequence either LNG 101/LNG 141 (6 sem. hours) depending on their beginning proficiency. Students entering the University of Dayton and enrolled in the program will fulfill this requirement. Students passing the proficiency examination of one or both foreign language course requirements will be required to complete additional Technical electives to fulfill program credits requirements. ³ Select from list approved by the Department of Engineering Technology.			
Minor in Global Manufacturing Systems Engineering Technology (gmt)			
This minor is open to all engineering technology majors except manufacturing. The program provides a concentration in manufacturing			

that will complement the student's major field of study. All prerequisites and corequisites must be followed.

Select four courses from: ¹ 12

MFG 204 & 204L	Materials & Processes and Materials & Processes Laboratory
MFG 240	Manufacturing & Product Design
MFG 424	Robotics
MFG 427	Computer Integrated Manufacturing & Global Manufacturing
MFG 431	Controls for Industrial Automation
MFG 432	Plastics, Composites & Nano Materials & Processes
MFG 434	Robotics & Computer Numerical Control
MFG 438	Sustainable Manufacturing & Product Design
Total Hours 12	

¹ Courses selected may not be those already required for student's major.

Mechanical Engineering Technology

The Mechanical Engineering Technology Program emphasizes the practical application of the principles of the mechanical field. Career opportunities are in mechanical design, computer-aided design, product evaluation and development, manufacturing engineering, computer-aided manufacturing, plant engineering, technical sales, technical service, fluid power, automation, and supervision. A significant portion of the graduates are in technical management. The curriculum includes a core of technical sciences; applied courses in design, thermodynamics, fluid mechanics, and manufacturing; extensive laboratory experiences; and mathematics from college algebra through probability, statistics, calculus, and differential equations. Courses are required in oral and written communication, with components in the humanities and social sciences to provide insight into the impact of technology on society. Concepts from basic education are stressed in technical courses. The curriculum is broad to prepare graduates for employment and provide a foundation on which to base continued study of changing technology.

Faculty

Scott Schneider, Interim Chairperson of Department of Engineering Technology
 David H. Myszka, Program Coordinator
 Professor Emeritus: Mott
 Professors: Edmonson, Myszka, Untener, Wolff
 Associate Professors: Blust, Falkowski
 Assistant Professor: Kozak

Bachelor of Science with a major in Mechanical Engineering Technology (mct) minimum of 132 credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹ 12

HST 103	The West & the World
REL 103	Introduction to Religious & Theological Studies
PHL 103	Introduction to Philosophy

ENG 100	Writing Seminar I ²	
Second-Year Writing Seminar ³		0-3
ENG 200	Writing Seminar II	
Oral Communication		3
CMM 100	Principles of Oral Communication	
Mathematics		3
Social Science		3
Arts		3
Natural Sciences		7
Crossing Boundaries		variable credit
Faith Traditions		
Practical Ethical Action		
Inquiry		
Integrative		
Advanced Study		variable credit
Philosophy and/or Religious Studies		
Historical Studies		
Diversity and Social Justice		3
Major Capstone		0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 & 123L	General Chemistry and General Chemistry Laboratory	4
CMM 100	Principles of Oral Communication	3
ECT 110 & 110L	Electrical Circuits I and Electrical Circuits I Laboratory	4
ECT 408	Data Acquisition & Measurements	2
EGR 103	Engineering Innovation	2
ENG 100 & ENG 200	Writing Seminar I and Writing Seminar II ¹	6
or ENG 200H	Writing Seminar II	
HST 103	The West & the World	3
IET 316	Quantitative Analysis	3
IET 317	Industrial Economic & Financial Analysis	3
IET 323	Project Management	3
MCT 110L	Technical Drawing & CAD Laboratory	2
MCT 111L	Introduction to Design Laboratory	2
MCT 220	Statics & Dynamics	3
MCT 221	Strength of Materials	3
MCT 231	Fluid Mechanics	3
MCT 313	Industrial Mechanisms	3
MCT 317	Machine Dynamics	3
MCT 330	Design of Machine Elements	3
MCT 336 & 336L	Fluid Power and Fluid Power Laboratory	4
MCT 342	Thermodynamics	3

MCT 490	Mechanical Engineering Technology Senior Project	3
MFG 108L	Manufacturing Processes Laboratory	1
MFG 204 & 204L	Materials & Processes and Materials & Processes Laboratory	4
MFG 206L	Dimensional Metrology Laboratory	1
MFG 208L	Geometric Dimensioning & Tolerancing Laboratory	1
MFG 240	Manufacturing & Product Design	3
MFG 431	Controls for Industrial Automation	3
MTH 137	Calculus I with Review	4
MTH 138	Calculus I with Review	4
MTH 207	Introduction to Statistics	3
PHL 103	Introduction to Philosophy	3
PHY 201 & 201L	General Physics and General Physics Laboratory	4
PHY 202 & 202L	General Physics and General Physics Laboratory	4
REL 103	Introduction to Religious & Theological Studies	3
SET 100	Engineering Technology First Year Seminar (2 semesters)	0
SET 101	Enrichment Workshop (2 semesters)	0
SET 153L	Technical Computation Laboratory	1
SET 200	Professional Development Seminar (2 semesters)	0
SET 499	Seminar	1
Electives		15
Technical electives ²		12
Total Hours		132

¹ The University's general reading and writing competency requirements are satisfied by completing ENG 100 and ENG 200 or ENG 200H with a grade of C- or higher. Students admitted to the University Honors program and students with sufficiently high verbal scores on the SAT and ACT are placed in ENG 200H. ENG 200H is a one-semester course which satisfies the University requirement. Students who are placed in ENG 200H do not receive credit for ENG 100 but are free to take elective course work in place of the waived first semester of composition.

² Select from list approved by the Department of Engineering Technology.

Minor in Mechanical Engineering Technology (mct)

This minor is open to all engineering technology majors except mechanical. The program provides a concentration in the mechanical field that will complement the student's major field of study. All prerequisites and corequisites must be followed.

Select four courses from: ¹	12
MCT 221	Strength of Materials
MCT 231	Fluid Mechanics
MCT 313	Industrial Mechanisms
MCT 330	Design of Machine Elements
MCT 336 & 336L	Fluid Power and Fluid Power Laboratory
MCT 342	Thermodynamics

MCT 423	Product Development
MCT 430	Design of Fluid Power Systems
MCT 432	Heat Power
MCT 438	Heat Transfer
MCT 440	Applied Vibrations
MCT 445 & 445L	Experimental Mechanics and Experimental Mechanics Laboratory
MCT 446	Applied Finite Element Modeling
Total Hours	12

¹ Courses selected may not be those already required for student's major.

Minor in Automotive Systems (ast)

This minor is open to all engineering technology majors. It is also available for other majors within the University if certain prerequisites have been met. The program provides a concentration in the automotive field that will compliment the student's major program of study.

ECT 456	Automotive Electrical & Safety Systems	3
MCT 456	Automotive Powertrain & Chassis Systems	3
Select two courses from: ¹		6
ECT 224	Digital Computer Fundamentals	
ECT 357	Microprocessors I	
IET 332	Facilities Layout Design	
IET 415	Management of Global Technical Organizations	
MCT 231	Fluid Mechanics	
MCT 342	Thermodynamics	
MCT 446	Applied Finite Element Modeling	
MFG 204	Materials & Processes	
MFG 204L	Materials & Processes Laboratory	
MFG 432	Plastics, Composites & Nano Materials & Processes	
Total Hours		12

¹ Courses cannot be required by student's major.

Minor in Engineering Technology (egt)

This minor is open to all majors in the College of Arts & Sciences, the School of Business Administration, and the School of Education and Allied Professions with the appropriate prerequisite background and approval of the Engineering Technology Department Chair. The program introduces the principles of applied engineering and complements many majors at the University.

Engineering Technology ¹		15
ECT 110	Electrical Circuits I	3
IET 323	Project Management	3
MCT 110L	Technical Drawing & CAD Laboratory	2
MFG 204 & 204L	Materials & Processes and Materials & Processes Laboratory	4
Select one course from:		3
ECT 120	Electrical Circuits II	
ECT 224	Digital Computer Fundamentals	
ECT 361	Programming Structures	

IET 317	Industrial Economic & Financial Analysis
IET 408	Lean Management Methods
IET 415	Management of Global Technical Organizations
IET 435	Human Factors
MCT 220	Statics & Dynamics
MCT 231	Fluid Mechanics
MFG 427	Computer Integrated Manufacturing & Global Manufacturing
MFG 432	Plastics, Composites & Nano Materials & Processes
MFG 434	Robotics & Computer Numerical Control

¹ Prerequisites: SET 153L or equivalent competency and MTH 137 or equivalent competency.

Minor in Industrial Automation and Applied Robotic Systems (ARS)

This minor is open to all majors in the School of Engineering. The program provides a concentration in the industrial automation and applied robotic systems field that will complement the student's major field of study. All prerequisites and corequisites must be followed.

Industrial Automation and Applied Robotic Systems ¹

ECT 452	Feedback Controls	3
MFG 424	Robotics	3
MFG 431	Controls for Industrial Automation	3
MFG 434	Robotics & Computer Numerical Control	3
Total Hours		12

¹ If the minor's required courses are already required by the student's major, the student may select ECT 224/ECT 224L, MCT 313, and/or MCT 317 to complete a total of at least twelve semester hours. Students in Engineering programs may not select courses with content similar to courses offered in their major.

MINOR IN INTEGRATED ARTS AND TECHNOLOGY (IAT)

The Integrated Arts and Technology minor allows students to connect their aptitude for technical discipline with their passion for the arts. Students select one arts program (graphic design, music, or theatre) and take at least 12 credits of coursework in that program. To put their knowledge to work in a practical and beneficial setting, students will also complete a service-learning project related to their arts program, which may provide academic credit.

This minor is open to all students enrolled in School of Engineering programs. All prerequisites and corequisites must be followed.

Graphic Design Emphasis

Select four courses from:		12
CMM 344 (p. 374)	Multimda Dsgn/Prd I	
CMM 444 (p. 374)	Multimedia Dsn&Prd II	
SET 400 (p. 374)	Special Topics	

VAD 215 (p. 374)	Computr Appl-Design
VAD 218 (p. 374)	Computr Appl-Illust
VAD 220 (p. 374)	Design Processes I
VAD 240 (p. 374)	Form and Concept
VAD 310 (p. 374)	Computer Illustratn
VAD 320 (p. 374)	Design Processes II
VAD 344 (p. 374)	Desgn for Multmda I
VAD 351 (p. 374)	Motion Design
VAD 360 (p. 374)	Web Design
VAP 340 (p. 374)	Digital Processes II
VAR 345 (p. 374)	Cmptr Modl&Anmtn I
VAR 440 (p. 374)	Cmptr Modl&Anmtn II
VAR 445 (p. 374)	Cmptr Modl&Anmtn III

Total Hours 12

Technical Music Emphasis

Select four courses from: 12

CMM 340 (p. 374)	Fund of Broadcasting
CMM 341 (p. 374)	Audio Production
MUS 205 (p. 374)	Music, Technology and Culture
MUS 223 (p. 374)	Intro Music Tech
MUS 323 (p. 374)	Rec&Digital Media
SET 400 (p. 374)	Special Topics

Total Hours 12

Television and Stage Production Emphasis

Select four courses from: 12

CMM 341 (p. 374)	Audio Production	3
CMM 342 (p. 374)	Fund-Video Productn	3
CMM 442 (p. 374)	Adv Television Prod	3
SET 400 (p. 374)	Special Topics	4
THR 203 (p. 374)	Technical Productn	3

THR 305 (p. 374)	Theatre Stagecraft	3
THR 307 (p. 374)	Theatre Lighting	3
Total Hours		34

Minor in Sustainable Manufacturing (smf)

This minor is open to all majors in the School of Engineering, except Global Manufacturing Systems Engineering Technology (GMT). The program provides a concentration in sustainable manufacturing that will complement the student's major field of study. All prerequisites and corequisites must be followed.

Sustainable Manufacturing ¹

ECT 461 (p. 374)	Powr Distribtn&Contrl	3
MFG 204 (p. 374)	Materials&Processes	3
MFG 204L (p. 374)	Matrls&Processes Lab	1
MFG 432 (p. 374)	Mtrls&Proc Plastics	3
MFG 438 (p. 374)	Sustnble Mfg&Prd Des	3
Total Hours		13

¹ If the minor's required courses are already required by the student's major, the student may select IET 420 (p. 374), MEE 472 (p. 374), MEE 473 (p. 374), MEE 478 (p. 374), and/or SEE 250 (p. 374) to complete a total of at least twelve semester hours. Students in Engineering programs may not select courses with content similar to courses offered in their major.

Electronic and Computer engineering technology

First Year

Fall	Hours Spring	Hours
SET 100	0 SET 100	0
SET 101	0 SET 101	0
EGR 103	2 ECT 110	3
SET 153L	1 ECT 110L	1
MTH 137 (Satisfies CAP Math Requirement)	4 MTH 138	4
CHM 123 (Satisfies CAP Natural Science)	3 HST 103 (Satisfies CAP First-Year Humanities Common)	3
CHM 123L	1 REL 103 (Satisfies CAP First-Year Humanities Common)	3
ENG 100 (Satisfies CAP Writing Seminar)	3 CMM 100 (Satisfies CAP Communication)	3
PHL 103 (Satisfies CAP First-Year Humanities Common)	3	
17		17

Second Year

Fall	Hours Spring	Hours
SET 200	0 SET 200	0
ECT 224	3 MCT 220	3
ECT 224L	1 ECT 357	3
ECT 120	3 ECT 206	3
ECT 361	3 ECT 206L	1
PHY 201	3 MTH 207	3
PHY 201L	1 Social Science (Satisfies CAP Social Science)	3
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3	
17		16

Third Year

Fall	Hours Spring	Hours
MCT 110L	2 ECT 408	2
ECT 358	3 ECT 362	3
ECT 358L	1 ECT 465	3
ECT 306	3 TECH Elective	3
ECT 306L	1 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3
IET 316	3 MFG 431	3
Art Study (Satisfies CAP Art Study)	3	
16		17

Fourth Year

Fall	Hours Spring	Hours
ECT 466	3 ECT 490	3
SET 499	1 ECT 452	3
IET 317	1-3 TECH Elective	3
IET 323	3 TECH Elective	3
TECH Elective	3 Advanced HST (Satisfies CAP Crossing Boundaries)	3
Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3	
14-16		15

Total credit hours: 129-131

industrial engineering technology

First Year

Fall	Hours Spring	Hours
SET 100	0 SET 100	0
SET 101	0 SET 101	0
SET 153L	1 MTH 138	4
MTH 137 (Satisfies CAP Math Requirement)	4 IET 230	3
EGR 103	2 MFG 204	3
CHM 123 (Satisfies CAP Natural Science)	3 MFG 204L	1

CHM 123L	1 HST 103 (Satisfies CAP First-Year Humanities Common)	3
ENG 100 (Satisfies CAP Writing Seminar)	3 PHL 103 (Satisfies CAP First-Year Humanities Common)	3
REL 103 (Satisfies CAP First-Year Humanities Common)	3	
	17	17

Second Year

Fall	Hours Spring	Hours
SET 200 (Satisfies CAP Second Year Writing Seminar)	0 SET 200	0
IET 317	1-3 MCT 313	3
IET 323	3 IET 318	3
MCT 110L	2 MCT 111L	2
MCT 220	3 Art Study (Satisfies CAP Art Study)	3
MTH 207	3 MFG 208L	1
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 MFG 206L	1
	CMM 100 (Satisfies CAP Communication)	3
	15-17	16

Third Year

Fall	Hours Spring	Hours
IET 408	3 IET 418	3
IET 332	3 IET 316	3
PHY 201	3 ECT 110	3
PHY 201L	1 ECT 110L	1
MFG 108L	1 TECH Elective	3
MFG 438	3 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3
Social Science (Satisfies CAP Social Science)	3	
	17	16

Fourth Year

Fall	Hours Spring	Hours
SET 499	1 IET 490	3
IET 420	3 IET 415	3
IET 435	3 TECH Elect	3
TECH Elect	3 TECH Elect	3
TECH Elect	3 Advanced HST (Satisfies CAP Crossing Boundaries)	3

Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3
	16
	15

Total credit hours: 129-131

Global Manufacturing Systems engineering technology**First Year**

Fall	Hours Spring	Hours
SET 100	0 SET 100	0
SET 101	0 SET 101	0
MCT 110L	2 SET 153L	1
MTH 137 (Satisfies CAP Math Requirement)	4 EGR 103	2
MFG 108L	1 MTH 138	4
CHM 123 (Satisfies CAP Natural Science)	3 MFG 204	3
CHM 123L	1 MFG 204L	1
ENG 100 (Satisfies CAP Writing Seminar)	3 PHL 103 (Satisfies CAP First-Year Humanities Common)	3
REL 103 (Satisfies CAP First-Year Humanities Common)	3 HST 103 (Satisfies CAP First-Year Humanities Common)	3
	17	17

Second Year

Fall	Hours Spring	Hours
MCT 111L	2 ECT 110	3
MFG 208L	1 ECT 110L	1
MFG 206L	1 SET 200	0
IET 408	3 IET 318	3
MCT 220	3 MFG 240	3
SET 200	0 MCT 221	3
CMM 100 (Satisfies CAP Communication)	3 ENG 200 (Satisfies CAP Second Year Writing Seminar)	3
MTH 207	3	
	16	16

Third Year

Fall	Hours Spring	Hours
MCT 336	3 IET 323	3
MCT 336L	1 SET 499	1
MCT 313	3 MFG 431	3
MFG 434	3 Language Requirement	3
PHY 201	3 TECH Elect	3
PHY 201L	1 Art Study (Satisfies CAP Art Study)	3
MFG 432	3	
	17	16

Fourth Year

Fall	Hours Spring	Hours
IET 317	1-3 MFG 490	3

IET 316	3 MFG 427	3
MFG 438	3 ECT 408	2
Language Requirement	3 Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3
Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3 Social Science (Satisfies CAP Social Science)	3
	Advanced HST (Satisfies CAP Crossing Boundaries)	3
	13-15	17

Total credit hours: 129-131

Mechanical Engineering Technology

First Year

Fall	Hours Spring	Hours
SET 100	0 MCT 110L	2
SET 101	0 SET 100	0
EGR 103	2 SET 101	0
MTH 137 (Satisfies CAP Math Requirement)	4 SET 153L	1
MFG 108L	1 MFG 204	3
CHM 123 (Satisfies CAP Natural Science)	3 MFG 204L	1
CHM 123L	1 MTH 138	4
ENG 100 (Satisfies CAP Writing Seminar)	3 PHL 103 (Satisfies CAP First-Year Humanities Common)	3
REL 103 (Satisfies CAP First-Year Humanities Common)	3 HST 103 (Satisfies CAP First-Year Humanities Common)	3
	17	17

Second Year

Fall	Hours Spring	Hours
MCT 111L	2 SET 200	0
MFG 208L	1 IET 316	3
MCT 220	3 MCT 221	3
SET 200	0 MCT 231	3
MTH 207	3 MFG 206L	1
PHY 201	3 PHY 202	3
PHY 201L	1 PHY 202L	1
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 CMM 100 (Satisfies CAP Communication)	3
	16	17

Third Year

Fall	Hours Spring	Hours
ECT 110	3 SET 499	1
ECT 110L	1 IET 317	1-3
MCT 336	3 MCT 330	3
MCT 336L	1 MFG 240	3
MCT 313	3 MCT 317	3

IET 323	3 MFG 431	3
Art Study (Satisfies CAP Art Study)	3	
	17	14-16

Fourth Year

Fall	Hours Spring	Hours
MCT 342	3 MCT 490	3
ECT 408	2 TECH Elective	3
TECH Elective	3 TECH Elective	3
TECH Elective	3 Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3
Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3 Advanced HST (Satisfies CAP Crossing Boundaries)	3
Social Science (Satisfies CAP Social Science)	3	
	17	15

Total credit hours: 130-132

Electronic Computer Tech Courses

ECT 110. Electrical Circuits I. 3 Hours

Practical concepts of single voltage source DC and AC circuits: current, voltage, resistance, power, series and parallel circuits, capacitance, magnetic circuits, and inductance. Corequisite(s): ECT 110L.

ECT 110L. Electrical Circuits I Laboratory. 1 Hour

Experiments in single voltage source DC and AC circuits to accompany ECT 110. Three laboratory hours per week. Corequisite(s): ECT 110.

ECT 120. Electrical Circuits II. 3 Hours

Practical concepts of multiple voltage and current source DC and AC circuits: reactance, impedance, phase, circuit analysis, power factor, resonance, filters, and transformers. Circuit calculations using vectors, complex algebra, and simultaneous equations. Prerequisite(s): ECT 110.

ECT 206. Electron Devices I. 3 Hours

Fundamentals of semiconductor diodes, transistors (bipolar and field effect), amplifiers, biasing and small signal analysis. Prerequisite(s): ECT 120.

ECT 206L. Electron Devices I Laboratory. 1 Hour

To accompany ECT 206. Three hours of laboratory a week.

ECT 224. Digital Computer Fundamentals. 3 Hours

Fundamental theory and techniques of electronic data processing to include binary arithmetic, switching theory (Boolean algebra), and basic circuitry (gates, adders, registers, and memory). Prerequisite(s): ECT 110.

ECT 224L. Digital Computer Fundamentals Laboratory. 1 Hour

To accompany ECT 224. Three hours of laboratory a week.

ECT 306. Electronic Devices II. 3 Hours

Fundamentals of integrated circuits, operational amplifiers, transistors, photoelectric devices, silicon-controlled rectifiers, and their associated circuits. Prerequisite(s): ECT 206.

ECT 306L. Electronic Devices II Laboratory. 1 Hour

To accompany ECT 306. Three hours of laboratory a week.

ECT 357. Microprocessors I. 3 Hours

Study of microprocessor architecture, hardware, software, applications, and development tools. Prerequisite(s): ECT 224.

ECT 358. Microprocessors II. 3 Hours

Advanced microprocessors study including development tools and software with regards to interfacing equipment in applications. Prerequisite(s): ECT 357, ECT 361. Corequisite(s): ECT 358L.

ECT 358L. Microprocessors II Laboratory. 1 Hour

To accompany ECT 358. Emphasis on microcomputer programming. Three hours of laboratory a week. Prerequisite(s): ECT 357.

ECT 361. Programming Structures. 3 Hours

The study of programming language concepts. Emphasis on the C language and its application to microcomputer hardware and software development. Prerequisite(s): SET 153L.

ECT 362. Concepts & Applications of Computer Operating Systems. 3 Hours

Introduction to the fundamentals and applications of computer operating systems and the interaction of hardware and software. Operating systems for large-scale, mini-, and microcomputers introduced through case studies. Prerequisite(s): ECT 357, ECT 361.

ECT 400. Selected Topics. 1-4 Hours

Investigation and discussion of current technical topics in electronic and computer engineering technology. May be taken more than once. Prerequisite(s): Permission of department chairperson.

ECT 408. Data Acquisition & Measurements. 2 Hours

Measurement and evaluation of the characteristics of engineering materials, structural mechanics, electromechanical systems, and physical systems. Emphasis on data acquisition, signal conditioning and manipulation, and virtual instrumentation. Prerequisite(s): ECT 110L; (ECT 206 or MCT 221); ENG 102; SET 153L.

ECT 452. Feedback Controls. 3 Hours

Study of principles of control including Nyquist criteria, Bode plots, PID loops, motor control virtual instrumentation, and advanced concepts. Laplace transform analysis is utilized. Prerequisite(s): ECT 306, ECT 408.

ECT 456. Automotive Electrical & Safety Systems. 3 Hours

Theory and design of charging systems, batteries, control systems, safety systems, and various sensor technologies. Overview of manufacturing and commercial aspects of the automotive industry. Prerequisite(s): ECT 110 or EGR 203.

ECT 461. Power Distribution & Control. 3 Hours

Study of power distribution systems including components, basic operation, polyphase circuits, characteristics, and application. Emphasis on the generation of electric power, its transmission, and its application to high power systems. Prerequisite(s): ECT 110.

ECT 465. Digital Data Communications. 3 Hours

Study of communication methods and protocols. Applications to networks, satellite communication, phone systems, fiber optics, modems, and other data transmission. A special emphasis is placed on digital networks. Prerequisite(s): ECT 358 or equivalent.

ECT 466. Microcomputer Architecture. 3 Hours

To develop an understanding of the basic hardware architecture of industry standard microcomputers including CPUs, standard busses, memory, mass storage devices, Systems-on-a-Chip and their implementation, I/O devices, and network interfaces. Study of architecture of recent microprocessors. Prerequisite(s): ECT 357 or equivalent.

ECT 490. Senior Project. 3 Hours

The design, construction and presentation of an original project. The project may be individual or part of an interdisciplinary engineering technology team project. Written and oral reports. Prerequisite(s): CMM 110, (CMM 111 or CMM 112); ECT 408; IET 323; MTH 138; senior status.

ECT 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): ECT 493.

Engineering Technology Courses

SET 100. Engineering Technology First Year Seminar. 0 Hours

Seminar for all engineering technology majors. Introduction to the University of Dayton, the School of Engineering, the Department of Engineering Technology, engineering technology programs and careers. Emphasizes professional ethics, critical thinking and communications, and team dynamics. Academic policies, academic planning, registration procedures, counseling and career placement services. Required of all first-year engineering technology students both semesters.

SET 101. Enrichment Workshop. 0 Hours

Workshop structured to provide collaborative learning for first-year Engineering Technology students. Work will focus on math, chemistry and other first year courses. Required of all first-year engineering technology students both semesters.

SET 153L. Technical Computation Laboratory. 1 Hour

Introduction to applications and use of computers for engineers with concentration on spreadsheets, electronic communications, and object oriented programming using Visual Basic.

SET 198. Research & Innovation Laboratory. 1-6 Hours

Students participate in 1) selection and design, 2) investigation and data collection, 3) analysis and 4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered. Prerequisite(s): Permission of department chairperson.

SET 200. Professional Development Seminar. 0 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

SET 298. Research & Innovation Laboratory. 1-6 Hours

Students participate in 1) selection and design, 2) investigation and data collection, 3) analysis and 4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered. Prerequisite(s): Permission of department chairperson.

SET 300. Engineering Technology Transfer Seminar. 0 Hours

A seminar for full-time engineering technology majors who transferred from another academic institution. Introduction to the University of Dayton, the School of Engineering, the Department of Engineering Technology, engineering technology programs, and careers. Emphasizes professional ethics, critical thinking and communication, and team dynamics. Academic policies, academic planning, registration procedures, counseling, and career placement services.

SET 398. Research & Innovation Laboratory. 1-6 Hours

Students participate in 1) selection and design, 2) investigation and data collection, 3) analysis and 4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered. Prerequisite(s): Permission of department chairperson.

SET 400. Special Topics in Engineering Technology. 0-4 Hours

Investigation and discussion of current topics in engineering technology. May be taken more than once. Prerequisite(s): Permission of department chairperson.

SET 498. Research & Innovation Laboratory. 1-6 Hours

Students participate in 1) selection and design, 2) investigation and data collection, 3) analysis and 4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered. Prerequisite(s): Permission of department chairperson.

SET 499. Seminar. 1 Hour

Career planning for engineering technology majors. The job search process, resume preparation, the job interview, professional development. Required of all engineering technology majors in the junior or senior year.

Global Manufact Sys Egr Tech Courses

MFG 108L. Manufacturing Processes Laboratory. 1 Hour

Application of metal-cutting theory using single- and multiple-point cutting tools, basic metal removal process of toolroom and production machines. Experience on conventional milling machines, shapers, lathes, surface grinders, and drill presses. Three hours of laboratory a week.

MFG 204. Materials & Processes. 3 Hours

Chemical and physical properties of metals, ceramics, and polymers; casting processes; powdered metallurgy; metal forming; plastics processes. Oral and written presentation of a team case study. Corequisite(s): MFG 204L.

MFG 204L. Materials & Processes Laboratory. 1 Hour

Testing of materials for tensile strength, impact and hardness properties, cooling curves and equilibrium diagram development, heat treating and hardenability curve determination, cold forming, plastics materials processing, micro polishing and metallography; visits to local industries. Three hours of laboratory a week. Corequisite(s): MFG 204.

MFG 206L. Dimensional Metrology Laboratory. 1 Hour

Theory and practice of precision measurement including the surface plate, angle and sine plates; surface texture and roundness; optical microscope and profile projector; mechanical and electronic gages; coordinate measuring machine; length standards and height gages; fixed and functional gages; sources of measurement error. Three hours of laboratory a week. Prerequisite(s): MCT 110L; MTH 137.

MFG 208L. Geometric Dimensioning & Tolerancing Laboratory. 1 Hour

Study of the use of ANSI Y14.5M-1994, the engineering standard for geometric dimensioning and tolerancing. Includes the proper use of GD&T symbols, reading and interpretation of engineering drawings, techniques for determining part adherence to design requirements and workmanship standards. Prerequisite(s): MCT 110L.

MFG 240. Manufacturing & Product Design. 3 Hours

Manufacturing planning; process planning; advanced cutting tools; workholders; power presses-blanking, forming, draw dies, fine blanking; group technology, gage, jig, and fixture design. Prerequisite(s): MCT 110L; MFG 108L, MFG 204.

MFG 400. Selected Manufacturing Topics. 1-4 Hours

Investigation and discussion of current topics in manufacturing engineering technology. May be taken more than once. Prerequisite(s): Permission of department chairperson.

MFG 424. Robotics. 3 Hours

Study of robotics including history, robot geometry, cost justification, end-effector (types, use, and design), sensors, and programming. Application of robots in industries. Robot programming and operation projects and end-effector design projects. Prerequisite(s): MCT 220, MCT 313; SET 153L.

MFG 427. Computer Integrated Manufacturing & Global Manufacturing. 3 Hours

Computer Integrated Manufacturing (CIM) systems and interrelationships; group technology, computer-aided process planning, expert systems, local area networks, automated flow lines, data collection, and material handling. Also covered are global manufacturing issues and specific country concerns. Prerequisite(s): ECT 110; MFG 108L, MFG 204; SET 153L.

MFG 431. Controls for Industrial Automation. 3 Hours

Topics include: fundamentals of digital logic, pneumatic power, electromechanical sensors and actuators, pneumatic and electrical control circuit analysis and design, industry safety and design standards, concepts of mechatronics, programmable logic controllers, and networking communications. Prerequisite(s): ECT 110; SET 153L.

MFG 432. Plastics, Composites & Nano Materials & Processes. 3 Hours

Introduction to the more common plastics, composites, and nano engineering materials and their properties. Study of processes including extrusion, injection molding, blow molding, compression and transfer molding, and forming. Topics on part and tooling design. Prerequisite(s): CHM 123; MFG 204.

MFG 434. Robotics & Computer Numerical Control. 3 Hours

Programming of CNC turning and machining centers and industrial robots; application of CAM software to design and edit CNC and robot programs, edit programs, and display tool and motion paths. Parametric part programming concepts to produce complex surfaces. Programming of robotic devices. Prerequisite(s): MCT 110L; MFG 108L; SET 153L.

MFG 435. Advanced Numerical Control. 3 Hours

Instruction in the programming of complex, multi-axis CNC machines. Extended parametric programming. Programming language techniques. Prerequisite(s): MFG 434.

MFG 438. Sustainable Manufacturing & Product Design. 3 Hours

Design for the environment, sustainable manufacturing processes and business practices to support these topics are developed. Prerequisite(s): (MFG 108L, MFG 204; MTH 138) or permission of instructor.

MFG 490. Senior Project. 3 Hours

Study and research in a specific area that integrates major elements from previous design and manufacturing process courses, culminating in individual and/or group projects, technical reports, and presentations. Prerequisite(s): CMM 110, (CMM 111 or CMM 112); IET 323; MFG 108L, MFG 208L, MFG 240, MFG 431; MCT 111L; MTH 138; senior status.

MFG 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

MFG 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): MFG 493.

Industrial Engineering Tech Courses

IET 230. Work Measurement. 3 Hours

Fundamentals of work simplification, motion economy, and productivity improvement using the techniques of time-and-motion study. Setting of labor standards using the techniques of stop watch, pre-determined time, standard data, and work sampling. Prerequisite(s): MTH 137.

IET 230L. Work Measurement Laboratory. 1 Hour

The application of real-world time-and-motion-study techniques such as operation process, worker-machine, and assembly charts. Calculations for time standards, production efficiency, line balance, cost reduction, labor, and equipment. A written and oral report on a team project. Three hours of laboratory each week. Prerequisite(s): MTH 137 Corequisite(s): IET 230.

IET 316. Quantitative Analysis. 3 Hours

Introduction of the mathematical techniques used to support decision making and managerial analysis. Probability theory, decision theory, linear programming, queuing theory, matrix algebra, differential and integral calculus, and differential equations. Prerequisite(s): MTH 138 or MTH 168; MTH 207.

IET 317. Industrial Economic & Financial Analysis. 1-3 Hours

Comparison of manufacturing or service industry projects and investments based on their economic value. Quantification of costs and benefits; analysis using present worth, annual worth, and rate of return methods. Study of simple and compound interest. Basic financial accounting concepts, including balance sheets, income statements, change of financial condition, etc. Prerequisite(s): MTH 137.

IET 318. Statistical Process Control. 3 Hours

Statistics and probability theory applied to produce control charts (\bar{x} -bar, R , s , p , u , and c) to monitor processes. Interpretation and application of these charts. Problem solving techniques, Pareto analysis, and modern quality management techniques. Prerequisite(s): MTH 207.

IET 319. Quality Improvement Methods. 3 Hours

Study of problem-solving methodologies and techniques. Team development. Students will learn to use Pareto diagrams, force field analysis, cause and effect diagrams, process mapping, and other problem-solving tools. Quality costs, product liability, and ethics are also covered. Prerequisite(s): IET 318.

IET 320. Quality Assurance Techniques. 3 Hours

Students will be exposed to a variety of current quality assurance topics that companies use to improve quality, increase productivity, and reduce costs. Topics include: total preventive maintenance, quality function deployment, reliability engineering, design of experiments, and sample size selection. Prerequisite(s): IET 318; MTH 207.

IET 321. Quality Management. 3 Hours

Provides students with an understanding of managing a total quality environment to improve quality, increase productivity and reduce costs. An introduction to Deming, Juran, and others. Total Quality Management implementation strategies, requirements of ISO 9000, QS 9000, and the Malcolm Baldrige award will be covered. Prerequisite(s): IET 318; MTH 207.

IET 323. Project Management. 3 Hours

Study of the structure, techniques, and application of project management including project proposals, project plans, decision making, styles of management, and communications. Semester team project with written and oral presentations. Prerequisite(s): SET 153L.

IET 332. Facilities Layout Design. 3 Hours

Design of manufacturing and service facilities for the most efficient flow of raw materials, work-in-process, and completed stock through a work place. Facilities layout, material handling, and warehousing in relation to trends toward reduced inventory, smaller lot sizes, and just-in-time. Prerequisite(s): MCT 110L. Corequisite(s): MCT 111L.

IET 346. Six Sigma Yellow Belt. 1.5 Hour

This course is designed to facilitate skill acquisition along with clinical reasoning and decision making as it relates to the physical therapy care and management of various advanced topics including cardiopulmonary rehabilitation, women's health issues, manual therapy strategies, electrotherapeutics as well as orthopedic, neurological, and pediatric therapeutic interventions. Prerequisite(s): Successful completion of all prior course work as outlined in the University of Dayton DPT curriculum.

IET 400. Selected Topics. 1-4 Hours

Self-paced research course. Preparation of a documented written research project on an engineering technology subject. May not be taken more than once. Prerequisite(s): Junior or senior status; permission of department chairperson.

IET 408. Lean Management Methods. 3 Hours

Study of the principles and current practices of optimizing production using Lean Management concepts. Lean Thinking, Just-in-Time, Kaizen, set-up reduction, pull systems, focused factories, standard operations, total productive maintenance, and defect-free processing methods are studied and applied. Prerequisite(s): Junior or senior status.

IET 415. Management of Global Technical Organizations. 3 Hours

Study of the structure of industrial and service organizations; study of the duties and responsibilities of a manager or supervisor in a global technical organization in developing an effective project or production team. Study of labor administration; labor legislation, current labor practices and international management.

IET 418. Cost Estimating & Control. 3 Hours

Study of the fundamentals of cost estimating of labor, material, and overhead for products, projects, operations, and systems. The concepts of internal and external cost estimating, types of costs, budgets, and profit. Semester team and individual projects, written and oral. Study of job order and process cost accounting, activity based costing, and cost-volume-profit relationships. Prerequisite(s): MTH 137.

IET 420. Industrial & Environmental Safety. 3 Hours

Application of safety techniques and principles to identify and correct unsafe situations and practices. Study of system safety, failure modes and effects analysis, fault tree analysis, preliminary hazard analysis, hazardous materials and practices, OSHA, health and personal protection.

IET 423. The IET in Service Organizations. 3 Hours

Case studies, articles, guest speakers, and projects to provide insight into how industrial engineering technology skills and training can be applied to service industries including hospitals, banks, and eating and retailing establishments. Prerequisite(s): IET major; junior status.

IET 425. Elements of Cost Control. 3 Hours

Survey of the methods of breakdown and cost analysis of labor, material, and overhead used in manufacturing and service organizations. Basic financial and cost accounting including balance sheets, income statements, change of financial condition, ratio analysis, and Activity-Based Costing. Prerequisite(s): MTH 137.

IET 435. Human Factors. 3 Hours

Methods to improve the interface between humans and their environment. Human characteristics are studied to determine the best way to design the task, product, work station, or other environmental features to accommodate the human. Written and oral projects. Prerequisite(s): (Junior or senior status) or permission of instructor.

IET 446. Six Sigma Green Belt. 3 Hours

Learn, practice, and use six-sigma tools in preparation of a final certification project in a commercial business situation. Use, analyze and solve an identified business variation problem to achieve industry recognized certification.

IET 490. Senior Project. 3 Hours

Applications of IET principles to a real world project using student teams for analysis and productivity improvement. Students will manage a project, applying planning, scheduling, monitoring, and control techniques. Oral and written project proposals, status updates, and final reports presented by teams of students to the management of the sponsoring organizations. Prerequisite(s): CMM 110, (CMM 111 or CMM 112); IET 317, IET 323, IET 332, IET 408, IET 435; MTH 138; senior status.

IET 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

IET 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): IET 493.

Mechanical Engineering Tech Courses**MCT 110L. Technical Drawing & CAD Laboratory. 2 Hours**

Technical sketching and shape description, orthographic projection theory, multi-view drawings, necessary views, sectional views, working and shop drawings, dimensioning practices, tolerancing, thread and fastener representation and nomenclature, assembly and detail drawings. Six hours of laboratory a week using instruments and commercial computer-aided design (CAD) software.

MCT 111L. Introduction to Design Laboratory. 2 Hours

Advanced topics of Computer Aided Design using three-dimensional, parametric, solid modeling software. Laboratory assignments involving the CAD software are completed through a series of individual and team design projects. Introduction to design requirements, conceptualization, and design decisions. Computer drafting topics such as ANSI Y14.5M-1994 geometric dimensioning and tolerancing standards, weld symbols, machining and surface finish symbols. Blueprint reading. Prerequisite(s): MCT 110L.

MCT 220. Statics & Dynamics. 3 Hours

Study of forces on bodies at rest and in motion using Newton's three laws of motion. Vectors, force systems, components, reactions, resultants, free body diagrams, equilibrium, centroids, moment of inertia, kinetics, and kinematics. Prerequisite(s): SET 153L. Corequisite(s): MTH 137.

MCT 221. Strength of Materials. 3 Hours

Analysis and design of load-carrying members, considering stress, strain, and deflection. Study of direct tension, compression, and shear; torsion; shear and moment diagrams; bending; combined stress; analysis of columns; pressure vessels. Prerequisite(s): MCT 220; MFG 204, MFG 204L; MTH 137; SET 153L.

MCT 231. Fluid Mechanics. 3 Hours

Fluid properties, fluid statics including manometry, submerged surfaces, buoyancy and stability of floating bodies. The principles of fluid flow including Bernoulli's and energy equations, energy losses, and pump power. Analysis and design of pipe line systems and open channels; pump selection. Prerequisite(s): MTH 137; SET 153L.

MCT 313. Industrial Mechanisms. 3 Hours

Design and analysis of linkages and cams. Graphical solutions to kinematics problems including the concepts of instantaneous motion and relative motion. Development and analysis of motion diagrams. Study of geometric features of gears and gear transmission systems. Prerequisite(s): MCT 110L, MCT 220; MTH 137; SET 153L.

MCT 317. Machine Dynamics. 3 Hours

Principles of applied engineering mechanics as they relate to machines; static force analysis in both 2 and 3 dimensional systems, kinetics of machine components by the methods of force-mass-acceleration, work-energy, and impulse-momentum; machine balancing; introduction to mechanical vibrations. Prerequisite(s): MCT 111L, MCT 313; MTH 138.

MCT 330. Design of Machine Elements. 3 Hours

Analytical design techniques used to evaluate machine elements; stress analysis, working stress, failure theories, fatigue failure; design methods for spur gears, shafts, keys and couplings, roller and journal bearings, and springs. Original design project. Prerequisite(s): MCT 111L, MCT 221; MFG 208L; SET 153L.

MCT 336. Fluid Power. 3 Hours

Study of hydraulic and pneumatic fluid power components and systems used in industrial, mobile, and aerospace applications; standard symbols in circuit design; circuit analysis; specification for pumps, valves, cylinders, and circuits; hydraulic fluids; filtration; electric motors; system efficiencies; proportional control and electrohydraulic servo control systems; seals; fluid conductors; pneumatic components and systems. Library research project. Prerequisite(s): MCT 221. Corequisite(s): MCT 336L.

MCT 336L. Fluid Power Laboratory. 1 Hour

To accompany MCT 336. Evaluation of fluid power components: pressure, flow, RPM, sound level, current, voltage, power, torque, and time. Graphical design, computational analysis, assembly, and testing of typical circuits and systems. Testing of hydraulic fluids for viscosity, pour point, flash and fire point, specific gravity. Three hours of laboratory a week.

MCT 342. Thermodynamics. 3 Hours

Energy analysis of engineering systems using the concepts and laws of thermodynamics. The principle of the mechanical equivalent of heat, behavior of pure substances, use of thermodynamic property tables, and study of gas mixtures. Application of the Carnot cycle to both heat engines and reversed heat engines. Prerequisite(s): MCT 231; MTH 138; SET 153L.

MCT 400. Selected Mechanical Topics. 1-4 Hours

Investigations and discussion of current technical topics in mechanical engineering technology. Research report. May be taken more than once. Prerequisite(s): Permission of department chairperson.

MCT 423. Product Development. 3 Hours

Synthesis of mechanical devices and systems. Emphasis on the integration of various machine elements into a single unit. Activities include design, scheduling, budgeting, purchasing, fabrication, assembly and performance testing of an original team project. Prerequisite(s): MCT 330.

MCT 430. Design of Fluid Power Systems. 3 Hours

Energy efficiency; pressure drop determinations, variable volume pressure-compensated pumps, accumulators, proportional and electrohydraulic valves, cylinder design, hydraulic motor selection; circuit design, open and closed loop systems, power unit design; sizing of electric motors; use of industrial data and National Fluid Power Assn.-JIC design standards. Individual design project. Prerequisite(s): MCT 336.

MCT 432. Heat Power. 3 Hours

Applications of the principles of thermodynamic cycles. Analysis of energy transfer systems such as internal combustion and gas turbine engines. Power generation through steam cycles including reheat and regenerative cycles. Reversed heat engine cycles and vapor compression cycles used in heating and cooling. Prerequisite(s): MCT 342; SET 153L.

MCT 438. Heat Transfer. 3 Hours

The principles of conduction, convection, and thermal radiation energy transfer. Conduction through series and parallel walls, pipes, and containers. Forced and free convection through films, thermal radiation of energy between surfaces, and the overall transfer of heat. Prerequisite(s): MCT 231; SET 153L.

MCT 440. Applied Vibrations. 3 Hours

Free and forced vibration of single degree of freedom systems with and without damping. Industrial applications including reciprocating and rotating machinery, balancing, isolation, and noise reduction. Demonstrations of vibration sensors and instrumentation. Prerequisite(s): MCT 317; SET 153L.

MCT 445. Experimental Mechanics. 3 Hours

The selection, application, and use of strain gages and strain gage rosettes. Transformation of stress and strain. Advanced mechanics of materials topics with empirical verification of theoretical predictions. Prerequisite(s): MCT 221.

MCT 445L. Experimental Mechanics Laboratory. 1 Hour

Installation of strain gauge rosettes. Experiments to determine the state of strain and stress in structures using strain gauges, photoelasticity, and brittle coatings. Vibration measurement using strain gauges, accelerometers, and motion transducers. Written and oral reports.

MCT 446. Applied Finite Element Modeling. 3 Hours

Introduction to the fundamentals of structural finite element modeling. Geometry creation, element types, material specification, problem solution and results postprocessing. A focus is placed on modeling techniques using commercially available software. Prerequisite(s): MCT 221; SET 153L.

MCT 456. Automotive Powertrain & Chassis Systems. 3 Hours

Theory and design of engines, transmissions, suspension, and chassis systems. Overview of manufacturing and commercial aspects of the automotive industry. Prerequisite(s): EGR 201 or MCT 220.

MCT 490. Mechanical Engineering Technology Senior Project. 3 Hours

Bringing together analytical and graphical techniques from previous courses to accomplish the design of a complete mechanism, machine, or mechanical system. Conceptual, preliminary, and final design. Prototyping and evaluation of an original team project. Written and oral reports. Prerequisite(s): CMM 110, (CMM 111 or CMM 112); IET 323; MCT 111L, MCT 317, MCT 330; MTH 138; senior status.

MCT 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

MCT 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): MCT 493.

Mechanical and Aerospace Engineering

Major:

- Bachelor of Mechanical Engineering (p. 391)

Concentrations:

- Aerospace Engineering (p. 392)
- Energy Systems-Mechanical (p. 392)

Minors:

- Aerospace Engineering (p. 393)
- Mechanical Systems (p. 393)

Mechanical engineers apply principles of motion, energy, force, materials and mathematics to design and analyze a wide variety of products and systems. The field requires an understanding of core concepts including mechanics, kinematics, thermodynamics, heat transfer, materials science, and controls. Mechanical engineers use these core principles along with tools like computer-aided engineering and product life cycle management to design and analyze manufacturing plants, industrial equipment and machinery, heating and cooling systems, automotive systems, aircrafts, robotics, medical devices and more. Today, mechanical engineers are pursuing developments in such fields as composites, mechatronics, nanotechnology, and are helping to create a more sustainable future.

The mechanical engineering curriculum serves as a broad-based education for positions in these diverse fields or for graduate study leading to advanced degrees. The first part of the mechanical engineering curriculum provides a firm foundation in mathematics, physics, chemistry, computer-aided drawing and conceptual design, and the humanities. The second part of the curriculum provides the engineering science fundamentals and laboratory experiences necessary for testing, design, as well as continued learning in the humanities, arts, and social sciences. The final part of the curriculum emphasizes synthesis of knowledge through major design projects. The curriculum includes sufficient elective courses to permit a concentration in aerospace, energy systems, and engineering as well as minors in several other areas.

The education experience, guided by the University of Dayton Catholic and Marianist heritage, seeks to prepare graduates who will:

- have the ability to apply mathematics, science, and engineering fundamentals and computational tools to design components, systems and/or processes;
- have the ability to design and conduct experiments and analyze and interpret data;
- have the ability to communicate their ideas/solutions effectively;
- serve as effective team members and leaders;
- understand the social, environmental and economic impact of engineering in a global context;
- be able to think critically about contemporary issues;
- continue their personal and professional development by engaging in lifelong learning;
- integrate ethical action, integrity, and service into their profession and lives.

Faculty

J. Kelly Kissock, Chairperson

Professors Emeriti: Chuang, Doecker, Eastep, Eimermacher, Schauer

Professors: Doyle, Ervin, Hallinan, Jain, Kashani, Kissock, Murray

Associate Professors: Altman, Petrykowski, Pinnell

Assistant Professors: Bigelow, Choi, Rumpfkeil

Lecturer: Henrick

Bachelor of Mechanical Engineering (MEE) minimum of 132 Credit hours

Common Academic Program (CAP)

*credit hours will vary depending on courses selected

First-Year Humanities Commons ¹	12
HST 103 The West & the World	
REL 103 Introduction to Religious & Theological Studies	
PHL 103 Introduction to Philosophy	
ENG 100 Writing Seminar I ²	
Second-Year Writing Seminar ³	0-3
ENG 200 Writing Seminar II	
Oral Communication	3
CMM 100 Principles of Oral Communication	
Mathematics	3
Social Science	3
Arts	3
Natural Sciences	7
Crossing Boundaries	variable credit
Faith Traditions	
Practical Ethical Action	
Inquiry	
Integrative	
Advanced Study	variable credit
Philosophy and/or Religious Studies	
Historical Studies	
Diversity and Social Justice	3
Major Capstone	0-3

¹ Completed with ASI 110 and ASI 120.

² Or ENG 100A and ENG 100B, or ENG 200H, by placement.

³ Completed with ENG 200H or ASI 120.

Major Requirements

CHM 123 General Chemistry	3
CHM 123L General Chemistry Laboratory	1
or PHY 210L General Physics Laboratory	
CMM 100 Principles of Oral Communication	3
ECE 201L Circuit Analysis Laboratory	1
EGM 202 Dynamics	3
EGM 303 Mechanics II	3
EGR 100 Enrichment Workshop (2 semesters)	0
EGR 103 Engineering Innovation	2
EGR 201 Engineering Mechanics	3
EGR 202 Engineering Thermodynamics	3
EGR 203 Electrical & Electronic Circuits	3
ENG 100 Writing Seminar I	6
& ENG 200 and Writing Seminar II	
or ENG 200H Writing Seminar II	
HST 103 The West & the World	3
or HST 198 History Scholars' Seminar	
MEE 101 Introduction to Mechanical Engineering (2 semesters)	0
MEE 104L Computer Graphics I	1
MEE 200 Professional Development Seminar (2 semesters)	0
MEE 227L Computer Graphics II	1

MEE 308	Fluid Mechanics	3
MEE 312 & 312L	Engineering Materials I and Materials Laboratory	4
MEE 314	Computational Methods	3
MEE 321	Theory of Machines	3
MEE 341	Engineering Experimentation	3
MEE 410 & 410L	Heat Transfer and Thermo-Fluids Laboratory	4
MEE 415	Professional Development I	0
MEE 416	Professional Development II	1
MEE 427 or MEE 425	Mechanical Design I Aerospace Design	3
MEE 431L	Multidisciplinary Engineering Design Laboratory I	1
MEE 432L	Multidisciplinary Engineering Design Laboratory II	3
MEE 433	Project Management & Innovation	1
MEE 439 or MEE 440	Dynamic Systems & Controls Flight Vehicle Performance	4
MEE 460	Engineering Analysis	3
MTH 168	Analytic Geometry & Calculus I	4
MTH 169	Analytic Geometry & Calculus II	4
MTH 218	Analytic Geometry & Calculus III	4
MTH 219	Applied Differential Equations	3
PHL 103	Introduction to Philosophy	3
PHY 206	General Physics I - Mechanics	3
PHY 207	General Physics II - Electricity & Magnetism	3
REL 103	Introduction to Religious & Theological Studies	3
Select one course from:		3
MEE 344	Manufacturing Processes	
MEE 401	Aerodynamics	
MEE 478	Energy Efficient Manufacturing	
Electives		12
Ethics elective ¹		3
Math/Science elective ¹		3
MEE electives ¹		6
Open electives ¹		6
Total Hours		132

¹ Select from list approved by the Mechanical and Aerospace Engineering Department.

Concentration in Aerospace Engineering (AEC)

This concentration is open only to mechanical engineering majors. The program provides a strong background for career specialization in the fields of aircraft and aerospace engineering.

MEE 225 (p. 390)	Intro to Flight	3
MEE 401 (p. 390)	Aerodynamics	3
MEE 409 (p. 390)	Aerospace Structure	3

MEE 425 (p. 390)	Aerospace Design	3
MEE 440 (p. 390)	Flight Vehicle Perf	4
Select one course from:		3
MEE 413 (p. 390)	Propulsion	
Approved graduate AEE course		
Total Hours		19

Concentration in Energy Systems - Mechanical (MRS)

This concentration is open to all engineering students.

Select three courses from:		9
ASI 320 (p. 390)	Cities and Energy	
CEE 390 (p. 390)	Envr Pollutn Cntrl	
CEE 434 (p. 390)	Water & Waste Engr	
ECO 435 (p. 390)	Eco of Environmnt	
PHL 321 (p. 390)	Environmental Ethics	
PHY 220 (p. 390)	Energy & Env Physics	
POL 371 (p. 390)	Environmental Policy	
SEE 301 (p. 390)	Glbl Chng&Erth Sys	
SEE 401 (p. 390)	Sustnblty Research I	
Any approved Arts and Science energy/sustainability related elective		
Select three courses from:		9

AEE 565 (p. 390)	Fundmntls-Combustion	
or MEE 565 (p. 390)	Fund of Combustion	
AEE 566 (p. 390)	Combustion Theory	
MEE 413 (p. 390)	Propulsion	
MEE 420 (p. 390)	Energy Effcnt Bldgs	
MEE 471 (p. 390)	Des-Thermal Systems	
MEE 472 (p. 390)	Des-Environment	
MEE 473 (p. 390)	Renewable Energy Sys	
MEE 478 (p. 390)	Energy Eff Manufact	
MEE 493 (p. 390)	Honors Thesis	

MEE 511 (p. 390)	Adv Thermodynamics
Any approved engineering energy/sustainability related elective	
Total Hours	18

Minor in Aerospace Engineering (AAE)

This minor is open to chemical, civil, and mechanical engineering majors. The program provides a strong background for career specialization in the fields of aircraft and aerospace engineering.

Select four courses from:	12
AEE 558 (p. 390)	Compu Fluid Dyn
MEE 225 (p. 390)	Intro to Flight
MEE 401 (p. 390)	Aerodynamics
MEE 409 (p. 390)	Aerospace Structure
MEE 425 (p. 390)	Aerospace Design
MEE 440 (p. 390)	Flight Vehicle Perf
MEE 413 (p. 390)	Propulsion
Approved AEE related elective	
Total Hours	12

Minor in Mechanical Systems (MES)

This area concentrates on the study of design and analysis as well as modeling and control of mechanical systems. The activities in this area include, but are not limited to, computer-aided design, kinematic synthesis and analysis, acoustics and structural dynamics, noise and vibrations control, system modeling and identifications, and dynamics systems and control.

Select four courses from:	12
ECE 416 (p. 390)	Intro to Robotics
ECE 545 (p. 390)	Automatic Control
MEE 428 (p. 390)	Mech Design II
MEE 430/530 (p. 390)	Biomechanical Engr
MEE 434/537 (p. 390)	Mechatronics
MEE 490 (p. 390)	Special Topics ¹
MEE 503 (p. 390)	Intro Continuum Mech
MEE 519 (p. 390)	Analytical Dynamics
MEE 520 (p. 390)	Theortcl Kinematics

MEE 521 (p. 390)	Kinematic Prin-Dsgn
MEE 522 (p. 390)	Geometric Methods
MEE 523 (p. 390)	Engr Des Optimizatr
MEE 535 (p. 390)	Adv Mech Vibrations
MEE 545 (p. 390)	Computr Methds-Design
MEE 546 (p. 390)	Finite Elmnt Anly I
Total Hours	12

¹ Approval of Department Chair needed.

First Year

Fall	Hours Spring	Hours
MEE 101	0 CMM 100	3
ENG 100 (Satisfies CAP Writing Seminar)	3 REL 103 (Satisfies CAP First Year Humanities Commons)	3
CHM 123 (Satisfies CAP Natural Science)	3 EGR 103	2
CHM 123L	1 PHY 206 (Satisfies CAP Natural Science)	3
EGR 100	0 MTH 169	4
PHL 103 (Satisfies CAP First-Year Humanities Commons)	3 MEE 104L	1
HST 103 (Satisfies CAP First-Year Humanities Commons)	3 EGR 100	0
MTH 168 (Satisfies CAP Math Requirement)	4 MEE 101	0
	17	16

Second Year

Fall	Hours Spring	Hours
ENG 200 (Satisfies CAP Second Year Writing Seminar)	3 Social Science (Satisfies CAP Social Science)	3
EGR 201	3 EGM 202	3
PHY 207	3 MEE 314	3
MTH 218	4 EGR 203	3
MEE 227L	1 ECE 201L	1
EGR 202	3 MTH 219	3
MEE 200	0 MEE 200	0
	17	16

Third Year

Fall	Hours Spring	Hours
SCI/MTH Elect	3 Advanced PHL Ethics (Satisfies CAP Crossing Boundaries and Practical Ethical Action)	3
MEE 321	3 MEE 344	3
MEE 312	3 MEE 341	3

MEE 312L	1 MEE 433	1
EGM 303	3 MEE 410	3
MEE 308	3 MEE 410L	1
MEE 415	0 Open Elect	3
	16	17

Fourth Year

Fall	Hours Spring	Hours
Advanced REL (Satisfies CAP Crossing Boundaries Faith Traditions, Diversity and Social Justice)	3 Advanced HST (Satisfies CAP Crossing Boundaries)	3
Art Study (Satisfies CAP Art Study)	3 MEE 432L	3
MEE 427	3 MEE 460	3
MEE 431L	1 MEE 416	1
MEE 439	4 MEE Elect	3
MEE Elect	3 Open Elect	3
	17	16

Total credit hours: 132

Courses**MEE 101. Introduction to Mechanical Engineering. 0 Hours**

Weekly meeting of first-semester, first-year mechanical engineering students. Orientation to engineering problem solving and team building through hands on applications.

MEE 104L. Computer Graphics I. 1 Hour

Fundamentals of engineering graphics and the part that graphical communication plays in engineering. Introduction to computer aided design (CAD).

MEE 198. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis, and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

MEE 200. Professional Development Seminar. 0 Hours

Presentations on contemporary and professional engineering subjects by students, faculty, and engineers in active practice. The seminar addresses topics in key areas that complement traditional courses and prepare distinctive graduates, ready for life and work. Registration required for all sophomore students.

MEE 225. Introduction to Flight. 3 Hours

An introductory course designed to provide students with a basic understanding of the multitude of disciplines that comprise the aeronautical engineering profession. A background and brief history of flight are covered. Foundational knowledge of aerodynamics, propulsion, aerostructures, aircraft performance and aerospace vehicle design. Laboratory included. Prerequisite(s): PHY 206.

MEE 227L. Computer Graphics II. 1 Hour

Advanced engineering graphics and graphical communication in engineering; introduction to project design. Prerequisite(s): MEE 104L.

MEE 298. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis, and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

MEE 308. Fluid Mechanics. 3 Hours

An introductory course in fluid mechanics. Fundamental concepts including continuity, momentum, and energy relations. Control volume analysis and differential formulations. Internal and external flows in laminar and turbulent regimes. One-dimensional compressible flows. Prerequisite(s): EGR 202. Corequisite(s): MTH 219.

MEE 312. Engineering Materials I. 3 Hours

Atomic structure, bonding, and arrangement in solids. Mechanical and physical properties of solids, phase equilibria, and processing of solids. Strengthening methods in solids, principles of material selection, and characteristics of non-ferrous alloys, polymers, ceramic composites, and construction materials. Corequisite(s): EGM 303; MEE 312L.

MEE 312L. Materials Laboratory. 1 Hour

Conducting mechanical and physical tests on solids including, but not limited to tension, compression, bending, hardness, and impact. Metallographic examination of surfaces. Test standards, data reduction, analysis, interpretation, and written and oral communication of test results. Corequisite(s): EGM 303; MEE 312.

MEE 314. Computational Methods. 3 Hours

Detailed introduction to solving engineering problems through programming in the Matlab technical computing software package. Fundamentals of algorithms, including iterative processes, arrays and logic operations. Graphing of 2D and 3D functions. Graphical user interfaces. Focus on engineering applications that utilize the mathematical techniques of linear algebra, statistics and numerical methods. Corequisite(s): MTH 219.

MEE 321. Theory of Machines. 3 Hours

Applications and design of mechanisms; use of graphical and analytical techniques for the kinematic and dynamic analysis and synthesis of machines. Analysis and design of cams, gears and gear trains. Balancing of rotating masses. Corequisite(s): EGM 202.

MEE 341. Engineering Experimentation. 3 Hours

Basic sensors and instrumentation, design of experiments, data acquisition and processing, and uncertainty and statistical analysis of data. Measurement of strain, motion, pressure, temperature, flow and sound. Measurement applications to engineering phenomena or systems. Course will utilize a mix of lecture, laboratory experiments, and demonstrations. Also a term project to provide design of experiment experience. Corequisite(s): EGM 303; MEE 308.

MEE 344. Manufacturing Processes. 3 Hours

Casting processes including casting defects and design of castings; metal working processes such as extrusion, forging, rolling and wire drawing; sheet metal forming; welding processes; powder metallurgy and design principles for P/M parts, metal removal processes; forming and shaping plastics and composite materials; rapid prototyping. Design principles for manufacturability. Includes laboratory. Prerequisite(s): MEE 312.

MEE 398. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis, and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

MEE 401. Aerodynamics. 3 Hours

Fundamentals of steady, incompressible, and inviscid aerodynamic flows over wings. Emphasis on force and moment determination for air foil and finite wings. Prerequisite(s): MEE 308.

MEE 409. Aerospace Structures. 3 Hours

Structural properties of wing and fuselage sections. Nonsymmetrical bending of skin-stringer wing sections. Shear stresses in thin-walled and skin-stringer multiple-celled sections. Deflection by energy methods. Introduction to finite element stiffness method. Prerequisite(s): EGM 303.

MEE 410. Heat Transfer. 3 Hours

Fundamentals of conduction, convection, and thermal radiation energy transfer. Conduction of heat in steady and unsteady state. Principles of boundary layer theory applicable to free and forced convection heat transfer for internal and external flows. Radiation analysis with and without convection and conduction. Prerequisite(s): MEE 308.

MEE 410L. Thermo-Fluids Laboratory. 1 Hour

Hands-on opportunities for students to gain knowledge of instrumentation used for temperature, flow, heat, and pressure measurement and to visualize thermo-fluids phenomena in a rich problem solving context. Phenomena to be studied include: boundary layer and separation phenomena, internal flow characteristics, hydraulics, conduction, convection, and combustion. Corequisite(s): MEE 410.

MEE 413. Propulsion. 3 Hours

Principles of propulsive devices, aerothermodynamics, diffuser and nozzle flow, energy transfer in turbo-machinery; turbojet, turbo-fan, prop-fan engines; turbo-prop and turboshaft engines. RAM and SCRAM jet analysis and a brief introduction to related materials and air frame-propulsion interaction. Prerequisite(s): MEE 308.

MEE 415. Professional Development I. 0 Hours

Presentations on contemporary mechanical engineering subjects by students, faculty, and engineers in active practice; student involvement in professional and service activities. Registration required of all MEE juniors.

MEE 416. Professional Development II. 1 Hour

Presentations on contemporary mechanical engineering subjects by students, faculty, and engineers in active practice; student involvement in professional and service activities. Registration required of all MEE seniors.

MEE 417. Internal Combustion Engines. 3 Hours

Combustion and energy release processes. Applications to spark and compression ignition, thermal jet, rocket, and gas turbine engines. Emphasis on air pollution problems caused by internal combustion engines. Idealized and actual cycles studied in preparation for laboratory testing of I. C. engines. Prerequisite(s): EGR 202 or permission of instructor.

MEE 420. Energy Efficient Buildings. 3 Hours

Provides knowledge and skills necessary to design and operate healthier, more comfortable, more productive, and less environmentally destructive buildings. A specific design target of E/3 (typical energy use divided by three) is established as a goal. Economic, thermodynamic, and heat transfer analyses are utilized. Extensive software development. Prerequisite(s): MEE 410.

MEE 425. Aerospace Design. 3 Hours

Capstone Air Vehicle Design project that involves both individual and team-based conceptual and preliminary design and sizing. This course integrates the knowledge acquired from the disciplinary subjects already taken (aerodynamics, aerospace structures, propulsion, flight dynamics and intro to flight) in order to size an air vehicle based on a set of requirements. Prerequisite(s): (MEE 225, MEE 401, MEE 409) or permission of instructor. Corequisite(s): MEE 431L.

MEE 427. Mechanical Design I. 3 Hours

Stress and deflection analysis of machine components; theories of failure; fatigue failure of metals. Design and analysis of mechanical components such as gears, shafts, bearings and springs. Prerequisite(s): EGM 303; MEE 321. Corequisite(s): MEE 431L.

MEE 428. Mechanical Design II. 3 Hours

Advanced topics in stress and deflection analysis; analysis and design of mechanical elements such as gears, journal and ball bearings, belts, brakes, and clutches; principles of fracture mechanics; failure analysis; machinery construction principles. Contemporary design methods and issues associated with the product development cycle. Prerequisite(s): MEE 427.

MEE 430. Biomechanical Engineering. 3 Hours

Application of engineering principles to clinical, occupational, and sports biomechanics topics. The course focuses on biomechanical analysis, particularly kinematics and kinetics of human movement, with emphasis on both research and product design.

MEE 431L. Multidisciplinary Engineering Design Laboratory I. 1 Hour

Multidisciplinary team design projects applying general mechanical engineering knowledge. Product development using product realization process (PRP) including: proposal development; design specifications, conceptualization and decision analysis. Projects normally result in a final design and prototyping in a follow-on course. Projects supplemented with an introduction to mechanical components and Computer Aided Engineering (CAE) methods. Corequisite(s): MEE 425 or MEE 427.

MEE 432L. Multidisciplinary Engineering Design Laboratory II. 3 Hours

One hour lecture and five hours of lab per week. Focus of the lecture is on engineering project management, including communication, collaboration, project tracking methods, cost estimating, overhead, direct labor, time value of money, depreciation and return on community based sponsors. Detailed evaluation of the Product Realization Process focusing on conceptual design, embodiment design, final design and prototyping. Analysis of the design criteria for safety, ergonomics, environment, cost and sociological impact. Periodic oral and status reports. Culminates in a comprehensive written report and oral presentation. Prerequisite(s): MEE 425 or MEE 427.

MEE 433. Project Management & Innovation. 1 Hour

Introduces students and teams to project management, entrepreneurship, and innovation. Topics include project management, cost estimating, time value of money, patent law, marketing, finance, and business plan development. Prerequisite(s): Junior status.

MEE 434. Mechatronics. 3 Hours

Emphasis on the integration of sensors, micro-controllers, electromechanical actuators, and control theory in a 'smart' system for a semester long design project. Topics include: sensor signal processing, electromechanical actuator fundamentals, interfacing of sensors and actuators to micro-controllers, digital logic, and programming of micro-controllers, programmable logic controllers and programmable logic devices. Equal mix of lecture and laboratory. Prerequisite(s): ECE 323.

MEE 438. Robotics & Flexible Manufacturing. 3 Hours

Overview of industrial robots; physical configuration, operation, and programming of robots; actuators, drive mechanisms, sensors, vision systems, controls, and control methods for robots; economic considerations; and automated factory concept. Prerequisite(s): MEE 321.

MEE 439. Dynamic Systems & Controls. 4 Hours

Dynamic systems modeling with special emphasis on mechanical systems (one and two degrees of freedom). Covers both transfer function and state space modeling techniques. Analogues drawn between mechanical, electrical, fluid, and thermal physical domains. System nonlinearities and model linearization methods are discussed. Analytical solutions of linear ordinary differential equations using Laplace transformation and state space theory. Feedback control theory, including root locus and frequency response techniques. Prerequisite(s): EGM 202; MTH 219.

MEE 440. Flight Vehicle Performance. 4 Hours

This course is intended to introduce the student to the flight mechanics of aerospace vehicles. Some familiarity with aircraft performance, static stability and control is assumed, but not required. We will use modern analysis methods to develop the topical details including: 1) a study of aerodynamics involved in-flight vehicle motion to obtain an understanding of influence coefficients; 2) use of linear algebra to develop a rational approach to modeling aircraft dynamics; 3) an introduction to modern control theory methodology; and 4) problems and examples that illustrate the use of desktop computational tools currently available. Prerequisite(s): (EGM 202; MEE 401, MEE 225; MTH 219) or permission of instructor.

MEE 460. Engineering Analysis. 3 Hours

Case study approach to engineering problem solving. Emphasis on breaking down problems to tractable parts, modeling physical systems and selection of solution techniques. Problems related to thermal, fluid, structural, and dynamic systems. Problems typically involve solution of ordinary and partial differential equations, Fourier analysis of periodic behavior, simulation, optimization and/or statistical analysis. Analytical and numerical solution techniques, with an emphasis on selecting the most appropriate technique and understanding the limitations of the analysis. Prerequisite(s): MEE 410.

MEE 471. Design of Thermal Systems. 3 Hours

This course integrates thermodynamics, heat transfer, engineering economics, and simulation and optimization techniques in a design framework. Topics include design methodology, energy analysis, heat exchanger networks, thermal-system simulation and optimization techniques.

MEE 472. Design of Environment. 3 Hours

Emphasis on design for environment over the life cycle of a product or process, including consideration of the mining, processing, manufacturing, use, and post-life stages. Course provides knowledge and experience in invention for the purpose of clean design, life cycle assessment strategies to estimate the environmental impact of products and processes, and cleaner manufacturing practices. Course includes a major design project.

MEE 473. Renewable Energy Systems. 3 Hours

Introduction to the impact of energy on the economy and environment. Engineering models of solar thermal and photovoltaic systems. Introduction to wind power. Fuel cells and renewable sources of hydrogen.

MEE 478. Energy Efficient Manufacturing. 3 Hours

This course presents a systematic approach for improving energy efficiency in the manufacturing sector. Current patterns of manufacturing energy use, the need for increased energy efficiency, and models for sustainable manufacturing are reviewed. The lean-energy paradigm is applied to identify energy efficiency opportunities in industrial, electrical, lighting, space conditioning, motor drive, compressed air, process heating, process cooling, and combined heat and power systems. Prerequisite(s): (EGR 202 or equivalent) or permission of instructor.

MEE 490. Special Topics in Mechanical & Aerospace Engineering. 3 Hours

Particular assignments to be arranged and approved by the department chairperson.

MEE 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

MEE 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisite(s): MEE 493.

MEE 498. Research & Innovation Laboratory. 1-6 Hours

Students participate in (1) selection and design, (2) investigation and data collection, (3) analysis, and (4) presentation of a research project. Research can include, but is not limited to, developing an experiment, collecting and analyzing data, surveying and evaluating literature, developing new tools and techniques including software, and surveying, brainstorming, and evaluating engineering solutions and engineering designs. Proposals from teams of students will be considered.

MEE 499. Special Problems in Mechanical & Aerospace Engineering. 1-6 Hours

Particular assignments to be arranged and approved by department chairperson.