ACADEMIC PROGRAMS

The engineering program in each of the fields of chemical (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/), civil (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/), computer (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#BACH_OF_SCI), electrical (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#BACH_OF) and mechanical engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/mechanicalandaerospaceengineering/#BACH) is designed to lead to a bachelor's degree in eight semesters, approximately a four-year period. While students pursue curricula according to their chosen fields of interest, they all take certain core courses in mathematics, chemistry, physics, English and engineering fundamentals. All of the programs permit additional specialization in minors in areas such as aerospace engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/mechanicalandaerospaceengineering/#MINOR_AERO), bioengineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#MINOR_BIO), chemical processing (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#CHEM_PROC), composite materials engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#COM_MAT_ENG), computer systems (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#COMP_SYS), energy production engineering, engineering mechanics (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/#ENG_MECH), environmental engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/#ENVIRON_ENG), geotechnical engineering, human movement biomechanics, materials engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#MAT_ENG), mechanical systems (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/mechanicalandaerospaceengineering/#MINOR_MECH_SYS), polymer materials (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#POLY), robotic systems, signals and systems (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#SIGNALS), structures (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/#strut), transportation engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/#TRANSPORT) and water resources engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/civilandenvironmentalengineeringandengineeringmechanics/#WATER) in the School of Engineering and in other areas such as languages, music and political science in other units of the University. Concentrations within specific majors in the School of Engineering include aerospace engineering (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/mechanicalandaerospaceengineering/#AREO_CONC), electrical energy systems, electro-optics (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#ELECTRO), energy systems-chemical (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/chemicalandmaterialsengineering/#ENERGY_SYS), energy systems-mechanical (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/mechanicalandaerospaceengineering/#ENERGY_SYS) and robotics (http://catalog.udayton.edu/undergraduate/schoolofengineering/programsofstudy/electricalandcomputerengineering/#ROBO). Although emphasis is on fundamental theories, continued attention is paid to the solution of practical problems that 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, http://www.abet.org and electronic and computer, industrial, global manufacturing systems and mechanical engineering technology are accredited by the Engineering Technology Accreditation Commission of ABET, http://www.abet.org.

Courses

EGR 101. Discover Engineering Seminar. 0 Hours
This course will be the venue to introduce Discover Engineering students to the disciplines/departments across the School of Engineering to help them select their major.

EGR 102. Introduction to the University Experience for Engineers. 0 Hours
This is a first semester course required for all majors the School of Engineering. The 2 primary components of this course include: (1) Introduction to the University of Dayton Educational Experience (2) Students as Reflective Decision-Makers and Active Learners This course will also be the venue to introduce all School of Engineering students to the disciplines/departments across the School of Engineering. This course is part of the Integrated Engineering Core (IEC).

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 105. Engineering Innovative Design for non-engineering majors. 3 Hours
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.

EGR 150. Enrichment Workshop I. 0 Hours
A workshop structured to provide collaborative learning in fundamental engineering topics of calculus, chemistry, and physics facilitated by upper-class engineering students. This course is offered in the fall semester.

EGR 151. Enrichment Workshop II. 0 Hours
A workshop structured to provide collaborative learning in fundamental engineering topics of calculus, chemistry and physics facilitated by upper-class engineering students. This course is offered in the spring semester.

EGR 190. Multi-Ethnic Engineers Program Workshop. 0 Hours
A series of workshops to facilitate the academic transition, professional development and success of first and second year Multi-Ethnic Engineers Program 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. Prerequisite(s): EGR-102 and (CEE-101 or CME-101 or ECE-101 or EGR-101 or MEE-101 or SET-101).

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. 3,4 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 203L. Electrical and Electronic Circuits Lab. 1 Hour
Laboratory investigate of basic electrical and electronic circuits. Introduction to laboratory reporting, safety, and instrumentation. (1 semester hour). Corequisite(s): EGR 203.

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 301. ETHOS Center Internship. 12 Hours
Full time domestic or international technical internship with a non-profit or international non-governmental agency. Permission only.

EGR 308. Engineering for the Performing Arts. 3 Hours
Experiential course exploring the best practices and upcoming trends in the materials, methods, and procedures used in engineering scenic environments for the performing arts, through the integration of the technical Theatre and Engineering disciplines. This course will provide students with practical experience in working with performance technology industry partners through the testing of emergent performance technology for product development and the uses of this technology to help support arts education needs in our community. Open to all university students.

EGR 311. Principles of Nanotechnology. 3 Hours
Nanoscale properties: optical, mechanical and thermal effects at the nanoscale, quantum confinement effects. Fabrication techniques: top downand bottom up techniques; nano-patterning, thin films. Nanometrology: scanning electron microscope, atomic force and microscope. Nanoelectronics: single electron devices, grapheme 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. 3 Hours
This course is open to juniors and seniors, and is a community-based global learning course to develop the knowledge, skills, and mindset for engaging in international engineering design for the common good. This course explores the interconnections between both human-centered and equity-centered design and appropriate technology, in the context of historical, political, ideological, ethical, cultural, and practical perspectives. Students will critically explore ways to apply systems thinking, cultural humility, and principles of effective and ethical community development work as they engage with international community partners on sociotechnical projects. The course also offers students the opportunity to explore the relationships between engineering and social justice, through examining their own social locations and intercultural effectiveness, as well as critically reflecting on the role that engineers and engineering might play in creating socially just societies. This course also provides students with the conceptual and methodological tools to engage communities in respectful and productive ways as they prepare for ETHOS Center international immersions. Prerequisites: Junior or senior status, EGR 103.

EGR 331. Sociotechnical Engineering for the Common Good. 3 Hours
This community engaged learning course will focus on integrating community building practices and the importance of these practices for human-centered and equity-centered engineering design; applying the engineering entrepreneurial mindset and skillset to community-driven technical projects to address community needs and inequities; and integrating social justice and human rights principles into engineering practice. The course promotes student learning both in the classroom as well as through immersive engagement with a community partner organization. These partnerships will help students look beyond the traditional engineering methods of problem identification and solution development as students learn to value different forms of knowledge produced within the communities that are impacted by real inequities. In doing so, students will come to understand the importance of engaging with problems in ways that stretch beyond technical approaches and keep socio-cultural-historical context as central to working for the common good as engineers. Students will learn to recognize the socio-cultural-historical nature of problems and then approach solutions to these problems in ways that prioritize social justice, with an understanding of both the possibilities and limitations of technically-based engineering solutions. Topics covered will include human-centered and equity-centered design approaches, appropriate technology, social justice; identity, positionality, and privilege; human rights framework; ethical community engagement, entrepreneurial mindset, systems thinking, sociotechnical strategies and tools, and sustainable development goals. Prerequisites: EGR 103.

EGR 351. By Design. 3 Hours
This is a course about design as a philosophy for living. The point of crossover between ethics and engineering design is the word “good.” The term “good” has an ethical valence dating back to Aristotle and it has a practical valence related to the skills necessary for doing design. Thus the course has two instructors, one whose expertise is in design process and the other whose expertise is in ethics. The course engages students in 10 small-scope, non-technical projects in which teams seek solutions to proposed real-world problems of varying complexity and varying ethical density in a semi-competitive environment. “Non-technical” means that non-engineers are expected to participate and contribute to the design process. And “10 small projects” (rather than one or two large design projects) means that learning is focused on the design methodology rather than artifacts generated. We do not aim to teach for the right answer but the skills in the design process. Prerequisite(s): REL 103 or ASI 110 or equivalent; junior standing.

EGR 374. Sustainable Energy Analysis and Economics. 3 Hours
This course provides an introduction to technical analysis of the sustainability of products and processes. Technical topics are to include energy and exergy consumption, return on investment, renewability, life cycle analysis, and environmental economics. Throughout the course, students will reflect on the increased effects of climate change on marginalized groups in society, as well as constructive and imaginative responses to dealing with such injustice at multiple levels. The course culminates in a team-based project, evaluating a system using the preceding techniques on a system of the students’ choosing. Prerequisite(s): MTH 129 or MTH 138 or MTH 148 or MTH 168.

EGR 392. Engineering Research Ethics. 3 Hours
This experiential learning course introduces students to ethical theory in the context of engineering research. Students will examine and apply these theories through an engineering research project with a faculty mentor. Students will be exposed to a variety of topics related to research ethics including ethical treatment of data, human subject research, conflicts of interest and objectivity, mentoring and collaboration, publications, presentation and authorship, laboratory safety, etc. Additionally, they will be exposed to engineering research topics through hands-on research, and through formal instruction.

EGR 398. Multidisciplinary Research & Innovation Laboratory. 0-3 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 401. ETHOS Center Internship. 12 Hours
Full time domestic or international technical internship with a non-profit or international non-governmental agency. Permission only.

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 430. Appropriate Technology and Design II. 0-3 Hours
An experiential, case-based course in appropriate technology and engineering design. Case studies focus on international standards and specifications for appropriate technologies; global protocols for needs assessment and engineering impact evaluation; and social science research methods for well being assessment. The course also includes an intensive ETHOS service-learning immersion experience focused on technical or engineering design work in a developing country. Prerequisites: Senior or graduate status, permission of instructor.

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 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.