ENGINEERING DESIGN

A Bachelor of Science in Engineering Design

An engineering design degree opens the door to various positions in industry and graduate school. Your experience with client-focused design, prototyping, and professional skills will allow you to contribute to companies in any phase of the design process: identification of stakeholder needs, concept generation, feasibility studies, risk analysis, detail design, manufacturing, testing, validation, maintenance, and product lifecycle analysis.

Facilities and Resources

Hands-on learning and prototyping is a key component of engineering design. Engineering design students use prototyping technology in design studios developed to encourage creativity and communication with all stakeholders. Students routinely use tools from a variety of on-campus shops after appropriate instruction.

Laboratories

Design studios include laboratory equipment for design, prototyping, and testing. Students use current technologies to bring their ideas to life. Students also work with external clients starting in their first quarter on campus.

Engineering Design

Engineering design is a human-centered endeavor that grew out of investigations of creativity. While design is an integral part of all engineering fields, design methodology gained more attention during the 1980s as global competition demanded higher quality design and system complexity increased. The role of the designer is to create a system, process, product, or service based on stakeholder needs while considering social, environmental, economic, and safety requirements. The designer must have both a mindset and skillset for improving the impact of design on society. The mindset requires the vision and drive necessary to create value. The skillset includes the tools and techniques critical to realize the design.

The Engineering Design major prepares students by giving them repeated, intensive design experiences with real clients. From the first quarter to the senior year, students participate in authentic design experiences and practice professional skills. The first year gives students a broad understanding of modeling systems across disciplines and repeated practice in prototyping solutions for clients. Students plan their electives and prepare for their practicum as they continue deeper in the design process. Students are required to gain practical experience in the design process. In their third year, the curriculum is structured to allow study-work abroad, internships, and/ or cooperative work experiences. In their fourth year, students complete a year-long, multidisciplinary capstone design experience.

After completion of this curriculum, students will be prepared to enter the engineering profession or advanced study. A student may also use this academic background as a stepping stone to a position in management, administration, or some other non-engineering field.

Engineering Design Mission Statement

Engineering Design employs repeated, immersive design experiences to cultivate students who

- Embrace the ambiguity of design
- Select design processes from multiple disciplines as appropriate to the project
- Tackle projects with gusto
- Commit to professional and ethical responsibilities while remembering global, social, economic, and environmental considerations
- Communicate respectfully and effectively
- Create collaborative and inclusive teams

Requirements

Electives

Engineering Design students have 20 credit-hours of Humanities, Social Sciences, and the Arts electives.

Engineering Design students have 8 credit-hours of free electives.

Engineering Design students have 28 credit-hours for technical electives. Students should use these credits to gain in-depth knowledge of a specific technical area. With careful planning, students may use these technical electives to obtain a minor or concentration in an area of interest.

Technical electives must consist of:

1. At least 12 credit hours of Engineering Design electives. These courses begin with an ENGD prefix and must be 300 level or higher.
2. 16 credit hours of computer science, engineering, or engineering management with an EMGT E prefix. At least eight credit hours must be 300 level or higher.
3. Not include any named required courses

Practicum Courses

All Engineering Design students must take three practicum courses. Enrollment in a practicum course requires professional employment such as an internship or co-op. Professional employment must average a minimum of 25 hours per week of work and have a duration of at least eight weeks. Professional employment must include some aspects of the design process such as commercialization, conceptual design, manufacturing, modeling, process improvement, product design, product improvement, quality methods, testing, or design validation. Each practicum course requires students to reflect on connections between their ongoing employment experience and studio experience, a companion course, or the program's student learning outcomes. See the practicum course descriptions (ENGD 321 , ENGD 322 , and ENGD 323) for more details.

Plan of Study

Below is a sample plan of study that illustrates one way to achieve the program requirements. Any given student's plan of study may differ based on a variety of factors (e.g., advanced credit, placement exams, adding a minor). Enrolled students will work with their academic advisor; utilize the degree audit/planner to create a specific plan of study.

Course	Title	Hours
Freshman		
Fall		
ENGD 100	Design & Communication Studio	8
MA 111	Calculus I	5
RHIT 100	Foundations for Rose-Hulman Success	1
PH 111	Physics I	4
PH 111L	Physics I Lab	0
	Hours	**18**
Winter		
ENGD 110	Static Analysis, Testing, and Sociotechnical Thinking	6
MA 112	Calculus II	5
ENGD 112	DC Circuits	2
ENGD 113	Software Development Principles I	2
	Hours	**15**
Spring		
ENGD 120	Integrating Electrical, Software, and Societal Systems	6
MA 113	Calculus III	5
ENGD 150	Independent Design Project	2
BE 132	Systems Accounting and Modeling II	3
	Hours	**16**
Sophomore		
Fall		
ENGD 260	Product Design Studio	8
BE 211	Circuits, Sensors, and Measurements	3
MA 223	Engineering Statistics	4
	Hours	**15**
Winter		
ENGD 240	User-Experience Design Studio	6
MA 221	Matrix Algebra & Differential Equations I	4
EM 204	Statics & Mechanics of Materials II	4
	Hours	**14**
Spring		
ENGD 250	Human Computer Interfaces Studio	6
ENGD 270	Application of Engineering Ethics	2
MA 222	Matrix Algebra & Differential Equations II	4
Elective		4
	Hours	**16**
Summer		
ENGD 321	Practicum 1	1
	Hours	**1**
Junior		
Fall		
CHEM 111	General Chemistry I	3
CHEM 111L	General Chemistry I Lab	1
BIO with lab		4
Elective		4
HSSA Elective		4
	Hours	**16**
Winter		
PH 112	Physics II	4
PH 112L	Physics II Lab	0
ENGD 271	Vertically Integrated Proj II	2
Elective		4
Elective		4
HSSA Elective		4
	Hours	**18**
Spring		
ENGD 322	Practicum 2	1
Elective		4
	Hours	**5**
Summer		
ENGD 323	Practicum 3	1
	Hours	**1**
Senior		
Fall		
MDS 410	Multidisciplinary Capstone I	4
Elective		4
Elective		4
HSSA Elective		4
HUM H230	Engineering Design Social Capstone	2
	Hours	**18**
Winter		
MDS 420	Multidisciplinary Capstone II	4
Elective		4
HSSA Elective		4
MA/SCI Math/Science Elective		4
	Hours	**16**
Spring		
MDS 430	Multidisciplinary Capstone III	4
Elective		4
HSSA Elective		4
MA/SCI Math/Science Elective		4
	Hours	**16**
	Total Hours	**185**

Students who want to take a foreign language may postpone these courses and graduate on time with careful scheduling.

Program Objectives

Engineering Design Program Educational Objectives

In support of our mission and based on the needs of our constituents, alumni from our program are expected to attain:

- Ethically-minded solutions to open-ended problems using engineering and/or design principles
- Recognition as skilled, innovative engineers and/or designers
- Meaningful, collaborative work
- Active involvement in professional & personal development
- Contributions to society locally, nationally, or globally
- Recognition as facilitators of multidisciplinary teams

Learning Outcomes

Student Outcomes

Attainment of these outcomes prepares graduates to enter the professional practice of engineering.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must

consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

The engineering design program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the commission's General Criteria and Program Criteria with no applicable program criteria.