CIVIL ENGINEERING

Civil engineering is a people-oriented profession that has long been in existence to serve the needs of mankind. It evolved as a formal discipline at the start of the 19th century with the advent of society's need for increased mobility and convenience. The role of the civil engineer has always been one that deals primarily with public works: the planning, design, and construction of airports, bridges, buildings, roadway, irrigation, flood control, water supply and waste disposal systems. These civil engineering works not only manage our environment, but are part of the environment itself and, by their very nature, have important social and economic impacts.

The civil engineering curriculum is designed to give the student a sound education in preparation for this role. The first two years include courses that deal with the principles of mathematics, physical and engineering sciences on which engineering concepts are based, as well as courses in humanities and social sciences and introductory courses in engineering and design. The last two years are devoted to developing the necessary technical competence, as well as the ability to apply the knowledge that the student has acquired to the design and synthesis of complex civil engineering projects. Project-based learning is an essential ingredient, and a year-long, client-based capstone design project highlights the senior year.

The entire curriculum is oriented to develop a student's ability to think critically and logically. Upon graduation the student will be able to adapt this ability to the engineering environment of his or her choice. The curriculum in civil engineering will provide the student with the capacity for professional growth, either by advanced study or as a practicing professional engineer. A student may also use this academic background as a stepping stone to a position in management, administration, law, or some other non-engineering field.

Civil Engineering Department's Mission Statement

To provide an excellent civil engineering education that prepares graduates to develop into professionals who will exceed the needs of their employers, clients, and community in a continually changing world.

Consulting Engineering Program

If interested in the Consulting Engineering Program, refer to these requirements (https://www.rose-hulman.edu/academics/degrees-and-programs/minors-and-certificates.html#certificates).

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		
MA 111	Calculus I	5
PH 111	Physics I	4
HUM H190	First-Year Writing Seminar	4
RHIT 100	Foundations for Rose-Hulman Success	1
CE 101	Engineering Surveying	2
	Hours	**16**
Winter		
MA 112	Calculus II	5
PH 112	Physics II	4
HUM H190	First-Year Writing Seminar	4
CE 111	Geographical Information Systems	2
EM 102	Graphical Communications for Civil Engineers	2
	Hours	**17**
Spring		
MA 113	Calculus III	5
EM 103	Introduction to Design	2
EM 120	Engineering Statics	4
HSSA Elective		4
	Hours	**15**
Sophomore		
Fall		
MA 221	Matrix Algebra & Differential Equations I	4
EM 202	Dynamics	4
CHEM 111	General Chemistry I	3
CHEM 111L	General Chemistry I Lab	1
HSSA Elective		4
	Hours	**16**
Winter		
MA 222	Matrix Algebra & Differential Equations II	4
EM 203	Mechanics of Materials	4
CE 250	Sustainable Civil Engineering Design	2
CHEM 113	General Chemistry II	3
CHEM 113L	General Chemistry II Laboratory	1
Elective (Science) [1]		4
	Hours	**18**
Spring		
MA 223	Engineering Statistics	4
EM 301	Fluid Mechanics	4
CE 310	Computer Applications in Civil Engineering	2
CE 320	Civil Engineering Materials	4
CE 380	Introduction to Transportation Engineering	4
	Hours	**18**
Junior		
Fall		
CE 321	Structural Mechanics I	4
CE 336	Soil Mechanics	4
CE 205 or CHE 201	Thermodynamics or Conservation Principles and Balances	4
CE 371	Hydraulic Engineering	4
	Hours	**16**
Winter		
ES 213 & 213L or CHE 202	Electrical Systems or Basic Chemical Process Calculations	4
CE 441	Construction Engineering	2
CE 432	Structural Design in Concrete I	3
CE 471	Water Resources Engineering	4
Elective (Science)		4
	Hours	**17**
Spring		
HSSA Elective		4
CE 431	Structural Design In Steel I	3
CE 460	Introduction to Environmental Engineering	4
ENGL H290	Technical & Professional Communication	4
CE 461	Environmental Engineering Laboratory	2
	Hours	**17**

Senior		
Fall		
CE 486	Civil Engineering Design & Synthesis I	2
C.E. Elective [2]		4
CE 303	Engineering Economy	4
CE 450	Civil Engineering Codes & Regulations	4
	Hours	**14**
Winter		
CE 487	Technical System Design & Synthesis	2
CE 488	Civil Engineering Design & Synthesis II	2
C.E. Elective [2]		4
Elective (Technical) [3]		4
HSSA Elective		4
	Hours	**16**
Spring		
CE 489	Civil Engineering Design & Synthesis III	2
Free Elective [4]		4
HSSA Elective		4
HSSA Elective		4
CE 400	Career Preparation Seminar	0
	Hours	**14**
	Total Hours	**194**

[1] At least 4 hours of science elective must be in a natural science outside Chemistry or Physics.

[2] Student shall choose any 400 or 500 level CE elective course, designated with the"CE" prefix, as a CE Elective, in consultation with their advisor.

[3] Students shall choose, in consultation with their advisor, any four (4) credit course at the 200 level or higher in natural science, computer science, mathematics, biomathematics, engineering, engineering management, or multi-disciplinary studies as the Technical Elective.

[4] Free elective is a total of four credits which can be from a combination of courses.

Program Objectives

Civil Engineering Department's Program Educational Objectives and Student Learning Outcomes

Program Educational Objectives

1. Graduates will demonstrate the ability to perform **essential engineering functions** in the design, management, or construction industry.
2. Graduates will demonstrate the ability to **design/construct complex engineering systems** in the broad-based engineering industry.
3. Graduates will demonstrate their potential for **technical leadership and management.**

The civil engineering program uses the term "educational objective" to describe the expected accomplishments of our students in three to five years following graduation.

Learning Outcomes

Civil Engineering Department's Program Educational Objectives and Student Learning Outcomes

Student Learning Outcomes

1. **Mathematics:** Apply mathematics, including differential equations and numerical methods, to solve engineering problems.
2. **Science:** Apply principles of natural science to solve engineering problems.
3. **Social Sciences and Humanities:** Apply concepts and principles developed from humanities and social sciences to inform engineering design.
4. **Materials Science:** Apply concepts and principles of materials science to solve civil engineering problems.
5. **Engineering Mechanics:** Apply concepts and principles of solid and fluid mechanics to solve engineering problems.
6. **Experimental Methods and Data Analysis:** Develop and conduct civil engineering experiments in at least two technical areas, analyze and interpret experimental data, and use engineering judgement to draw conclusions.
7. **Critical Thinking and Problem Solving:** Use critical thinking to formulate an effective solution to a civil engineering problem.
8. **Project Management:** Apply concepts and principles of project management in the practice of civil engineering.
9. **Engineering Economics:** Apply engineering economics concepts and principles to make engineering decisions.
10. **Risk and Uncertainty:** Apply concepts and principles of probability and statistics to address uncertainty and risk relevant to civil engineering.
11. **Breadth in Civil Engineering Areas:** Apply concepts and principles to solve problems in at least four technical areas appropriate to civil engineering.
12. **Design:** Apply an engineering design process to complex engineering problems in more than one civil engineering technical area.
13. **Technical Depth:** Apply advanced concepts and principles to solve engineering problems.
14. **Sustainability:** Apply principles of sustainability in the solution of civil engineering problems.
15. **Communication:** Prepare and present technical content to both specialized and general audiences in an effective manner within verbal, written, and graphical formats.
16. **Leadership:** Apply leadership concepts and principles to direct the efforts of a small group. (Affective)
17. **Teamwork:** Function effectively as a member of a team. (Affective)
18. **Lifelong Learning:** Acquire and apply new knowledge as needed, using appropriate learning strategies.
19. **Professional Attitudes:** Practice professional attitudes relevant to the practice of engineering. (Affective)
20. **Professional Responsibilities:** Explain professional expectations relevant to the practice of civil engineering.
21. **Ethical Responsibilities:** Analyze ethical dilemmas involving conflicting ethical interests to recommend and justify a course of action.

22. **Service**: Demonstrate a commitment to service to the community as a civil engineer.

The term "student learning outcome" is used to describe knowledge and skills at the time of graduation.

The civil engineering program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the commission's General Criteria and Program Criteria for Civil and Similarly Named Engineering Programs.