4300: CIVIL ENGINEERING

Civil Engineers plan, design, build, and operate the infrastructure of modern society. This includes highways, bridges, buildings, power plants, industrial facilities, tunnels, seaports, airports, offshore structures and almost anything else needed as the basis of modern life. Civil engineers are also vigorously engaged in environmental activities, particularly creating safe water supplies and transporting it to where it is needed, collecting and treating wastewaters, cleanup of environmental problems, and insuring the safe disposal of solid wastes.

To achieve the high level of professional competence needed, an extensive study of mathematics, mechanics (both solids and fluids), engineering materials, structural design and environmental reactions is required. The civil engineering sub-topics that utilize these fundamentals are environmental, geotechnical, hydraulic, structural, and transportation engineering. The civil engineering curriculum at The University of Akron insures a firm grounding in all these sub-topic areas, while allowing a specialization, if desired, in the environmental, geotechnical, transportation, and structural areas. Engineering design problems are incorporated into courses in each area. The senior capstone design course presents a problem involving one, or possibly all, of these areas in the design of complex systems.

Most civil engineering graduates work for design consultants, construction companies, or governmental agencies. Others work for industrial firms and utilities. Many civil engineers own their own businesses.

Program Educational Objectives have been established that represent the projected abilities of a program graduate within a few years of graduation. The Civil Engineering Program Educational Objectives are the foundation of the program. The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Program Objective #1: Successfully and accurately complete Civil Engineering projects as part of a team, on time and within budget, in an ethical and professional manner, and using modern engineering tools-software

Program Objective #2: An ability to communicate effectively with written, oral, and visual means in both technical and non-technical settings

Program Objective #3: Professional service as evidenced by participation in a professional society and/or educational outreach activities

Program Objective #4: Engage in lifelong learning as evidenced by participation in continuing education courses, workshops, graduate courses, and by pursuing professional licensure

Program Objective #5: A basic knowledge of the business of engineering including how the private and public sector operate separately and collectively

The curriculum is designed to emphasize the fundamentals which place the graduate in a strong position to pursue further education, formally or informally, and to begin a career in any of the above areas. To meet the curriculum requirements specified by the American Society of Civil Engineers (ASCE), the civil engineering program will prepare students who have the following attributes:

Civil Engineering Student Outcomes

Foundational

• Solve problems in mathematics through differential equations and apply this knowledge to the solution of engineering problems
• Solve problems in calculus-based physics, chemistry, and one additional area of natural science and apply this knowledge to the solution of engineering problems
• Demonstrate the importance of the humanities in the professional practice of engineering
• Demonstrate the incorporation of social sciences knowledge into the professional practice of engineering

Technical

• Use knowledge of materials science to solve problems appropriate to civil engineering
• Analyze and solve problems in solid and fluid mechanics
• Specify an experiment to meet a need, conduct the experiment, and analyze and explain the resulting data
• Formulate and solve an ill-defined engineering problem appropriate to civil engineering by selecting and applying appropriate techniques and tools
• Evaluate the design of a complex system, component, or process and assess compliance with customary standards of practice, user's and project's needs, and relevant constraints
• Analyze systems of engineered works, whether traditional or emergent, for sustainable performance
• Analyze the impact of historical and contemporary issues on the identification, formulation, and solution of engineering problems and analyze the impact of engineering solutions on the economy, environment, political landscape, and society
• Analyze the loading and capacity, and the effects of their respective uncertainties, for a well-defined design and illustrate the underlying probability of failure (or nonperformance) for a specified failure mode
• Formulate documents to be incorporated into the project plan
• Analyze and solve well-defined engineering problems in at least four technical areas appropriate to civil engineering
• Evaluate the design of a complex system or process, or evaluate the validity of newly created knowledge or technologies in a traditional or emerging advanced specialized technical area appropriate to civil engineering

Professional

• Plan, compose, and integrate the verbal, written, virtual, and graphical communication of a project to technical and non-technical audiences
• Apply public policy process techniques to simple public policy problems related to civil engineering works
• Apply business and public administration concepts and processes
• Analyze engineering works and services in order to function at a basic level in a global context
• Organize and direct the efforts of a group
• Function effectively as a member of a multidisciplinary team
• Demonstrate attitudes supportive of the professional practice of civil engineering
• Plan and execute the acquisition of required expertise appropriate for professional practice
• Justify a solution to an engineering problem based on professional and ethical standards and assess personal professional and ethical development