ECIV - Civil Engineering

ECIV 101. Intro To Civil Engineering. 1 Credit. (1 Lec) F
PREREQUISITE: Must be taken within your freshman year. This course is optional for students entering civil engineering but is encouraged for freshmen wanting to learn about the breadth of the discipline. Students choosing to take the course will be introduced to civil engineering, including department programs and areas of specialty, civil engineering career options, professionalism, history, and ethics.

ECIV 202. Applied Analysis. 1 Credit. (1 Lab) F,S
PREREQUISITE: M 165Q or M 171Q or M 181Q. Computer applications in civil engineering using M-based software and a programming language.

ECIV 220CS. Civil Engineering and Construction - from the Ancient to the Modern. 3 Credits. (3 Lec) Su On Demand
Through the lenses of civil engineering and construction, follow the advancement of civilizations. Assess and evaluate decisions that we must make as a society with respect to protecting the health of the public and the environment with our finite resources.

ECIV 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ECIV 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECIV 307. Construction Estimating and Bidding. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ECIV 202 or ETCC 204, and ECIV 308. Preparation of cost estimates and bids for construction projects. Introduction of computer estimating software and procedures.

ECIV 308. Construction Practice. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: BMGT 205 and EGEN 116 or DDSN 101. Contract documents, insurance, bonding, specifications, drawings, labor and labor law, estimating, bidding and scheduling, business organizations, leadership, and ethics. Significant technical and business writing required.

ECIV 309. Building Information Modeling in Construction. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: EGEN 115, DDSN 101 or EGEN 116, ARCH 241 or consent of instructor. CO-REQUISITE: ECIV 308. Introduction to the use of Building Information Modeling (BIM) in the Construction Industry. Instruction in BIM basics using contemporary software, with hands-on exercises in typical construction applications.

ECIV 312. Structures I. 3 Credits. (3 Lec) F,S

ECIV 315. Structures II. 3 Credits. (2 Lec, 1 Lab) F,S

ECIV 320. Geotechnical Engineering. 3 Credits. (2 Lec, 1 Lab) F,S

ECIV 331. Engineering Hydrology. 2 Credits. (2 Lec) F,S
PREREQUISITE: EGEN 350 or STAT 332. Descriptive and quantitative hydrology with applications to water resources engineering.

ECIV 332. Engineering Hydraulics. 2 Credits. (1 Lec, 1 Lab) F,S
PREREQUISITE: EGEN 335. Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

ECIV 350. Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing. Introduction to vehicle operating characteristics, geometric and pavement design, traffic flow theory, signal design and analysis, capacity analysis and planning. Laboratory work will introduce various in-practice software packages.

ECIV 401. Civil Eng Practice and Ethics. 1 Credit. (1 Ret) F
PREREQUISITE: Concurrent registration with ECIV 489R required. Professional ethics, social responsibility, public policy, and leadership.

ECIV 404. Heavy Const Equip and Methods. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: STAT 216Q, EGEN 325, and ETCC 302 or ECIV 320. CORREQUISITE: ECIV 307. Construction equipment operating characteristics, economics, and production rate estimation. Heavy construction methods associated with tunneling, aggregate production, and mass earthwork operations.

ECIV 405. Construction Project Planning and Scheduling. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ECIV 307. Project planning and scheduling procedures involving both network (CPM) and non-network techniques. Introduction to computer scheduling software.

ECIV 414. Steel Design. 3 Credits. (3 Lec) F alternate years
PREREQUISITE: ECIV 315. Design of structural steel members and systems.

ECIV 415. Design of Masonry Structures. 3 Credits. (3 Lec) S alternate years
PREREQUISITE: ECIV 315. Introduction to masonry design. Integrated with building design, including load calculations, design of foundations, structural elements and connections. Emphasis on low-rise buildings.

ECIV 416. Design of Wood and Timber Structures. 3 Credits. (3 Lec) S alternate years
PREREQUISITE: ECIV 315. Students will be exposed to the basic behavior of wood and timber structures. They will also be exposed to the current building codes and methodology for the design of wood and timber structures.

ECIV 420. Earth and Foundation Engr. 3 Credits. (3 Lec) F
PREREQUISITE: ECIV 320. Application of soil mechanics principles to the engineering of shallow and deep foundations, analysis of lateral earth pressures and design of retaining walls, and the stability of natural and engineered slopes.

ECIV 425. Geotechnical Structures. 3 Credits. (3 Lec) F

ECIV 431. Open Channel Hydraulics. 3 Credits. (3 Lec) F
PREREQUISITE: ECIV 332 or consent of the instructor. Principles of open channel flow; hydraulic design of open channel structures.

ECIV 435. Closed-Conduit Hydraulics. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 332. Advanced topics in hydraulic engineering, with emphasis on analysis and design of pipe transmission lines, pumps, and pipe distribution networks.

ECIV 450. Public Transit System Design. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ECIV 350, and EGEN 350 or STAT 332. Design, implementation and management of public transit systems including paratransit, bus and light rail; including an overview of funding sources, legislation, public relations and other issues with coverage or route optimization strategies and demand estimation techniques. CE 450 is co-convened with CE 450. Students enrolled in CE 450 will not be able to take CE 550 and have it count toward degree requirements.

ECIV 451. Highway Pavements. 3 Credits. (2 Lec, 1 Lab) S alternate years
PREREQUISITE: ECIV 320, ECIV 350. Design of highway pavements including drainage and base/subbase/subgrade preparation. Laboratory in bituminous materials.

ECIV 452. Traffic Engineering and ITS. 3 Credits. (2 Lec, 1 Lab) F, alternate years
PREREQUISITE: ECIV 350, EGEN 350 or STAT 332. Application of driver, vehicle, and roadway characteristics to principles of traffic control, operations, and safety. Traditional and advanced technology solutions will be explored.

ECIV 454. Transportation Planning. 3 Credits. (2 Lec, 1 Lab) S alternate years
PREREQUISITE: ECIV 350 and EGEN 350 or STAT 332. Transportation planning process and travel demand forecasting including trip generation, trip distribution, mode split and traffic assignment. Laboratory work will introduce TransCADm software.

ECIV 456. Highway Geometric Design. 3 Credits. (3 Lec) F
PREREQUISITE: SRVY 230, ECIV 350. Advanced geometric design of highway systems including two-lane and interstate roadways and intersection design and traffic control.

ECIV 484. Reinforced Concrete Design. 3 Credits. (3 Lec) F alternate years
PREREQUISITE: ECIV 315. Design of reinforced concrete members and systems.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Prerequisites and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 489R</td>
<td>Civil Engineering Design I 2 Credits.</td>
<td>(1 Rct, 1 Lab)</td>
<td>F PREREQUISITE: EGEN 310R and a student must be within two semesters of graduation. COREQUISITE: EGEN 325 and ECIV 308. Concurrent registration with ECIV 401 is required. Senior capstone course. Discussion of the design process from conceptual/preliminary design to final design, plans, and specifications. Develop proposal for engineering services, including scope of work, data acquisition, and organization of design team.</td>
</tr>
<tr>
<td>ECIV 490R</td>
<td>Undergraduate Research. 1-4 Credits.</td>
<td>(1 Ind; 12 cr max)</td>
<td>F,S,Su Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.</td>
</tr>
<tr>
<td>ECIV 491</td>
<td>Special Topics. 1-4 Credits.</td>
<td>(1 Lec; 12 cr max)</td>
<td>On Demand PREREQUISITE: ECIV 320 or ETCC 302, EGEN 331 or EGEN 335. CO-REQUISITE: ECIV 308. This course explores the challenges of cold regions infrastructure engineering. Design/construction/performance problems specific to cold climates are identified, and the manner of their solution is discussed.</td>
</tr>
<tr>
<td>ECIV 492</td>
<td>Independent Study. 1-3 Credits.</td>
<td>(1-3 Ind; 4 cr max)</td>
<td>On Demand PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.</td>
</tr>
<tr>
<td>ECIV 498R</td>
<td>Internship. 2 Credits.</td>
<td>(2 Ind; 12 cr max)</td>
<td>On Demand PREREQUISITE: Junior standing, consent of instructor and approval of Department Head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.</td>
</tr>
<tr>
<td>ECIV 499R</td>
<td>Capstone Civil Eng Design II 2 Credits.</td>
<td>(1 Rct; 1 Lab) F</td>
<td>S PREREQUISITE: ECIV 489R. Senior capstone course. Design of an engineering project. Evaluation of design alternatives and design recommendations. Development of construction documents. Discussion of project management, cost estimates, and engineering services during construction.</td>
</tr>
<tr>
<td>ECIV 504</td>
<td>Construction Productivity. 3 Credits.</td>
<td>(3 Lec) Su</td>
<td>PREREQUISITE: One year of experience or one internship (ECIV 498 or ETCC 498). COREQUISITE: ETCC 499 or equivalent. PMASEM-CM option requirement. ONLINE ONLY. Management concepts will include human factors as well as enlightened leadership and advanced management concepts. Productivity improvement data collection, analysis, and solutions to include the construction work force and cost.</td>
</tr>
<tr>
<td>ECIV 505</td>
<td>Quality Assurance/Risk Management. 3 Credits.</td>
<td>(3 Lec) Su</td>
<td>PREREQUISITE: Either EGEN 350, EIND 354 or STAT 352 and ECIV 308 or equivalent plus one year of industrial experience or one internship (ECIV 498 or ETCC 498). PMASEM-CM option requirement. ONLINE ONLY. Analysis of quality assurance and control concepts to include utilization of statistical analysis. Application of risk analysis principles to the construction process to minimize liability and project costs.</td>
</tr>
<tr>
<td>ECIV 506</td>
<td>Ad Construction Management. 3 Credits.</td>
<td>(3 Lec) F</td>
<td>S; Lec 3 PREREQUISITE: One year of industrial experience or one internship (ECIV 498 or ETCC 498). COREQUISITE: ETCC 499 or equivalent. PMASEM-CM option requirement. ONLINE ONLY. Broad issues of construction sustainability (LEED, Lean Construction, Environmental requirements, etc.) and how the construction industry needs to manage this process.</td>
</tr>
<tr>
<td>ECIV 507</td>
<td>Law of the Construction Industry. 3 Credits.</td>
<td>(3 Lec) F</td>
<td>Lec 3 PREREQUISITE: BGEN 361. PMASEM-CM option requirement. ONLINE ONLY. This class exposes engineers to the effect of law, rules and regulations on their work both from a practical perspective, for example, what engineers should know about basic concepts of contract law, to more abstract concepts like whether, and in what manner, government should mandate green construction practices. It is about understanding how the construction industry works within a framework of rules and regulations, critically considering whether the rules help or hinder the construction process and most importantly, how you as future leaders in the engineering profession are going to make the process better.</td>
</tr>
<tr>
<td>ECIV 511</td>
<td>Building Structural Systems. 2 Credits.</td>
<td>(2 Lec)</td>
<td>F alternate years, to be offered even years. Lec 2 PREREQUISITE: ECIV 484 or ECIV 414 or ECIV 415 or ECIV 416. COREQUISITE: ECIV 512. Analysis of multistory structural systems. Emphasis on lateral force resisting systems in buildings.</td>
</tr>
<tr>
<td>ECIV 512</td>
<td>Structural Dynamics. 2 Credits.</td>
<td>(2 Lec)</td>
<td>F alternate years, to be offered even years. Lec 2. PREREQUISITE: ECIV 312. Response of structures to dynamic loads, including seismic loads.</td>
</tr>
<tr>
<td>ECIV 513</td>
<td>Behavior Concrete Structures. 3 Credits.</td>
<td>(3 Lec) S alternate years</td>
<td>to be offered odd years 3 cr. LEC 3 PREREQUISITE: ECIV 484. Behavior of reinforced concrete members, frames, and shear wall systems. Significance of behavior in design of reinforced concrete structures.</td>
</tr>
<tr>
<td>ECIV 514</td>
<td>Behavior of Steel Structures. 3 Credits.</td>
<td>(3 Lec) S alternate years</td>
<td>to be offered even years. Lec 3 PREREQUISITE: ECIV 414 and EGEN 415. Behavior of steel members and frames. Significance of behavior in design of steel structures.</td>
</tr>
<tr>
<td>ECIV 515</td>
<td>Adv Structural Analysis. 2 Credits.</td>
<td>(2 Lec)</td>
<td>S alternate years, to be offered odd years. Lec 2. PREREQUISITE: EGEN 415. This course will present the theoretical background behind common solid mechanics finite elements used by structural engineers. Elasticity, energy methods, dynamics, buckling, nonlinear materials and large rotation topics will be addressed. These topics will allow students to utilize advanced finite element software in an informed manner.</td>
</tr>
<tr>
<td>ECIV 519</td>
<td>Bridge and Prestressed Concrete Design. 3 Credits.</td>
<td>(3 Lec) F alternate years</td>
<td>to be offered odd years. Lec 3 PREREQUISITE: ECIV 315. Design of concrete structures utilizing pre- and post-tensioned concrete elements. Introduction to bridge analysis and design.</td>
</tr>
<tr>
<td>ECIV 521</td>
<td>Applied Geotechnical Engin. 3 Credits.</td>
<td>(2 Lec, 1 Lab)</td>
<td>F alternate years, to be offered even years. Lec 2, Lab 1 PREREQUISITE: ECIV 320. Principles of advanced geotechnical laboratory testing and field investigative techniques. Application of laboratory and field test results to the geotechnical design of soil-supported structures.</td>
</tr>
<tr>
<td>ECIV 524</td>
<td>Advanced Soil Mechanics. 3 Credits.</td>
<td>(3 Lec) F alternate years</td>
<td>to be offered odd years. Lec 3 PREREQUISITE: ECIV 320. Topics leading to an advanced understanding of the engineering behavior of soils with an emphasis on settlement and shear strength.</td>
</tr>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination. 3 Credits.</td>
<td>(3 Lec)</td>
<td>S Lec 3. PREREQUISITE: EENV 434. Subsurface mass transport and microbial processes and their effect on fate and transport of organic and inorganic contaminates. Bioremediation and other contemporary remediation technologies will be emphasized.</td>
</tr>
<tr>
<td>ECIV 530</td>
<td>Ad Hydraulic Investigations. 3 Credits.</td>
<td>(3 Lec) S alternate years</td>
<td>to be offered even years. Lec 3 PREREQUISITE: ECIV 431. Advanced topics in open channel flow.</td>
</tr>
<tr>
<td>ECIV 554</td>
<td>Transportation Safety. 3 Credits.</td>
<td>(3 Lec) S alternate years</td>
<td>to be offered odd years. PREREQUISITE: ECIV 350 or consent of instructor. This course addresses safety of the highway system as related to design, construction, and operations. The course provides an overview of the various elements of the highway system namely, road users, vehicles, roads, and environment as related to safety. Apart from the introduction, the course is structured in three distinct components that represent the sequential stages in highway life; i.e. design, construction, and operations.</td>
</tr>
<tr>
<td>ECIV 555</td>
<td>Survey Data Collection &amp; Analysis. 3 Credits.</td>
<td>(2 Lec, 1 Lab)</td>
<td>S Even Years PREREQUISITE: EGEN 350 or EIND 354 or permission of instructor. This course introduces students to the principles and practice of survey data collection and analysis. The survey portion focuses on survey methods and sampling techniques. Sampling and survey techniques are crucial to collecting quality data and lays a solid foundation for robust data analysis. The analysis portion centers on various statistical models and tools, with an emphasis on identifying and applying appropriate models for different types of data. Students will also gain hands-on experience with statistical models and optimization methods that are critical in data-driven decision making.</td>
</tr>
<tr>
<td>ECIV 556</td>
<td>Traffic Flow Fundamentals. 3 Credits.</td>
<td>(3 Lec)</td>
<td>S alternate years to be offered even years PREREQUISITE: ECIV 350 or consent of instructor. This course covers traffic stream parameters, their relationships, and important analytical techniques in traffic engineering such as capacity analysis, queueing analysis, shockwave analysis, and traffic simulation. Topics covered are essential in understanding the behavior of vehicular traffic as a complex system.</td>
</tr>
<tr>
<td>ECIV 575</td>
<td>Research or Prof Paper/Project. 1-4 Credits.</td>
<td>(1 Ind; 6 cr max)</td>
<td>F,S,Su PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.</td>
</tr>
<tr>
<td>ECIV 589</td>
<td>Graduate Consultation. 1-3 Credits.</td>
<td>(3 Ind; 3 cr max)</td>
<td>F,S PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.</td>
</tr>
<tr>
<td>ECIV 590</td>
<td>Master’s Thesis. 1-10 Credits.</td>
<td>(1 Ind; max unlimited)</td>
<td>F,S,Su PREREQUISITE: Master’s standing.</td>
</tr>
</tbody>
</table>
ECTIV 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECTIV 592. Independent Study. 1-9 Credits. (1-9 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

ECTIV 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F S, Sem 1 Maximum 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. May be repeated.

ECTIV 598. Internship. 2 Credits. (2 Ind; 12 cr max) On Demand
Graduate standing, consent of instructor and approval of Department Head. An individual assignment arranged with an agency, business or other organizations to provide guided experience in the field.

ECTIV 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.