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 120. Infrastructure & Society. 3 Credits. (3 Lec) F
Physical infrastructure is a critical element in the foundation of our society, being both shaped by our societal values, goals and technical abilities and simultaneously shaping our social and economic landscape. Our federal, state and local governments spend hundreds of billions of dollars on infrastructure each year (over $400 billion, for example, in 2014). Despite the importance of this infrastructure in our daily lives and the magnitude of our investment in it, most individuals lack a basic understanding of how infrastructure systems work, how they are paid for, and the consequences of our individual and societal choices relative to the built environment. One result of this situation is that America’s basic infrastructure is deteriorating with major long term impacts to our safety, health and economic prosperity. This course will provide a basic understanding of how the nation’s water, wastewater, solid waste, transportation, electrical power and communications systems are designed and operated. The decision making processes through which infrastructure projects are initiated and funded will be described and discussed. The manner in which individual choices and actions impact basic infrastructure systems will be explored and discussed. Development of more sustainable systems will be researched.

ECIV 202. Applied Analysis. 1 Credit. (1 Lab) ES
PREREQUISITE: M 165Q or M 171Q or M 181Q. Civil Engineering or CE/Bio-Resources Engineering majors only. 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 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) ES
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) FS
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) FS
PREREQUISITE: BMGT 205 or WRIT 201 or WRIT 221 or HONR 201HP and EGEN 116 or DDSN 101 or DDSN 131. 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) ES
PREREQUISITE: EGEN 115, DDSN 101 or EGEN 116 or DDSN 131. Introduction to the use of Building Information Modeling (BIM) in the Construction Industry. Introduction to BIM basics using contemporary software, with hands-on exercises in typical construction applications.

ECIV 311. Construction Project Documentation. 2 Credits. (2 Lec) ES
PREREQUISITE: ECIV 308 and student must be within two semesters of graduation. Review and development of various administrative instruments required for project management, including plans and specifications, business communications, submittals, contracts, financial reports, contract risk and pass through clauses, labor issues and legislation, submittals, claims and disputes, change orders, quality control plans and reports, project close outs and productivity analyses.

ECIV 312. Structures I. 3 Credits. (3 Lec) ES

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

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

ECIV 331. Engineering Hydrology. 2 Credits. (2 Lec) On Demand
PREREQUISITE: EGEN 350 or STAT 332. Descriptive and quantitative hydrology with applications in water resources engineering.

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

ECIV 333. Water Resources Engineering. 4 Credits. (3 Lec. 1 Lab) FS
PREREQUISITES: EGEN 350 or STAT 332 CO-REQUISITES: EGEN 335 Descriptive and quantitative hydrology with applications in water resources engineering. Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

ECIV 334. Heavy Civil Construction Planning & Estimating. 3 Credits. (3 Lec) F
PREREQUISITES: ECIV 308 Construction Practices This course will cover planning and cost estimation for construction of highways, bridges, tunnels, dams and other heavy civil projects including fleet management.

ECIV 350. Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) FS
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 Rct) ES
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) FS
PREREQUISITE: EGEN 325 or EGEN 330, and ETCC 302 or ECIV 320. 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) FS
PREREQUISITE: ECIV 307. Project planning and scheduling procedures involving both network (CPM) and non-network techniques. Introduction to computer scheduling software.

ECIV 406. Sustainability Issues in Construction. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 308. Review sustainability issues in the construction industry, including LEED, green practices, energy systems and renewable energy; water resources; storm and waste water; life cycle assessment; building health issues.

ECIV 414. Steel Design. 3 Credits. (3 Lec) F Alternate years; to be offered odd years PREREQUISITE: ECIV 315. Design of structural steel members and systems.

ECIV 415. Design of Masonry Structures. 3 Credits. (3 Lec) S Alternate Even Years. PREREQUISITE: ECIV 315. Introduction to masonry design. Integrated building design from the roof to the foundation. Including load calculations, structural roof and floor elements and connections. Emphasis on low-rise buildings.

ECIV 416. Design of Wood and Timber Structures. 3 Credits. (3 Lec) S
Alternate Odd Years. PREREQUISITE: ECIV 315. Introduction to the basic behavior of wood and timber structures. Design of wood and timber components and structures using contemporary building codes.

ECIV 417. Heavy Civil Construction Practices. 3 Credits. (3 Lec) F
PREREQUISITE: ECIV 308 Construction Practices. Heavy Civil Construction Practices will cover project management methods, environmental mitigation practices, safety and trenchless and other current heavy civil technologies and as well as professional management practices for heavy civil projects.

ECIV 420. Earth and Foundation Engin. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 320. Application of soil mechanics principles to the analysis and design of conventional shallow foundations, mat foundations, and deep foundation systems.
ECIV 425. Geotechnical Structures. 3 Credits. (3 Lec) F

ECIV 431. Open Channel Hydraulics. 3 Credits. (3 Lec) F
PREREQUISITE: ECIV 332 or ECIV 333. Principles of open channel flow; hydraulic design of open channel structures.

ECIV 435. Closed-Conduit Hydraulics. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 332 or ECIV 333. 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.

ECIV 451. Highway Pavements. 3 Credits. (2 Lec, 1 Lab) S
Alternate Even Years. PREREQUISITE: ECIV 350 and ECIV 320. 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 Odd Years. PREREQUISITE: ECIV 350. 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 Odd 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 TransCADtm software.

ECIV 455. Survey Data Collection & Analysis for Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) S
Alternate Even Years. PREREQUISITE: EGEN 350 or EIND 354 or consent of instructor. Course introduces students to the principles and practice of survey and data analysis for transportation engineering and elevates students' ability to design and apply scalable approaches to analyze transportation-related data. Transportation survey design, implementation and analysis are covered. Methods and techniques for anticipating traffic events (crashes, congestion, etc.) are studied. Co-convened with ECIV 555.

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

ECIV 461. Cold Regions Infrastructure Engineering. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EGEN 350 or EIND 354 or consent of instructor. Course introduces students to the principles and practice of survey and data analysis for infrastructure engineering and elevates students' ability to design and apply scalable approaches to analyze transportation-related data. Transportation survey design, implementation and analysis are covered. Methods and techniques for anticipating traffic events (crashes, congestion, etc.) are studied. Co-convened with ECIV 555.

ECIV 484. Reinforced Concrete Design. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: ECIV 315. Design of reinforced concrete members and systems.

ECIV 489R. Civil Engineering Design I. 2 Credits. (1 Lec, 1 Lab) ES
PREREQUISITE: EGEN 310R and a student must be within two semesters of graduation. COREQUISITE: EGEN 325 or EGEN 330 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. Development proposal for engineering services, including scope of work, data acquisition, and organization of design team.

ECIV 490R. Undergraduate Research. 1-4 Credits. (1 Ind; 12 cr max) ES,Su,F
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.

ECIV 491. 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.

ECIV 492. Independent Study. 1-3 Credits. (1-3 Ind; 4 cr max) S,Su,F
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.

ECIV 498. Internship. 3 Credits. (3 Ind; 12 cr max) ES
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.

ECIV 499R. Capstone: Civil Eng Design II. 2 Credits. (1 Lec, 1 Lab) ES

ECIV 504. Construction Productivity. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Two years of construction field experience required. 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.

ECIV 505. Quality Assurance and Risk Management. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Either EGEN 350, EIND 354 or STAT 332 and ECIV 308 or equivalent plus one year of industrial experience or one internship (ECIV 498 or ETCC 498). 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.

ECIV 506. Ad Construction Management. 3 Credits. (3 Lec) On Demand
PREREQUISITE: One year of industrial experience or one internship (ECIV 498 or ETCC 498). COREQUISITE: ETCC 499 or equivalent. Broad issues of construction sustainability (LEED, Lean Construction, Environmental requirements, etc.) and how the construction industry needs to manage this process.

ECIV 507. Law of the Construction Industry. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EGEN 361 or consent of instructor. 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.

ECIV 511. Building Structural Systems. 2 Credits. (2 Lec) F
alternate even years 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 steel framed buildings.

ECIV 512. Structural Dynamics. 2 Credits. (2 Lec) F
alternate even years. PREREQUISITE: ECIV 312. Response of structures to dynamic loads, including seismic loads.

ECIV 513. Behavior of Concrete Structure. 3 Credits. (3 Lec) S

ECIV 514. Behavior of Steel Structures. 3 Credits. (3 Lec) S
alternate even years. PREREQUISITE: ECIV 414. Behavior of steel members and frames. Significance of behavior in design of steel structures.

ECIV 515. Adv Structural Analysis. 2 Credits. (2 Lec) S
alternate odd years. PREREQUISITE: EGEN 415. This course presents the theoretical background behind common finite elements used by structural engineers. Elasticity, energy methods, dynamics, buckling, nonlinear materials and large rotation topics are addressed. These topics will allow students to utilize finite element structural engineering software in an informed manner.

ECIV 519. Bridge and Prestressed Concrete Design. 3 Credits. (3 Lec) F
alternate odd years. PREREQUISITE: ECIV 315. Design of concrete structures utilizing pre- and post-tensioned concrete elements. Introduction to bridge analysis and design.

ECIV 521. Applied Geotechnical Engin. 3 Credits. (2 Lec, 1 Lab) F
alternate even years PREREQUISITE: ECIV 320. Principles of geotechnical site investigations and advanced laboratory testing for the purpose of characterizing soils and the determination of engineering soil properties used in the design of soil structures.
ECIV 524. Advanced Soil Mechanics. 3 Credits. (3 Lec) F alternate odd years. PREREQUISITE: ECIV 320. Topics leading to an advanced understanding of the engineering behavior of soils with an emphasis on settlement and shear strength.

ECIV 526. Geotechnical Aspects of Earthquake Engineering. 3 Credits. (3 Lec) PREREQUISITES: ECIV 320. Principles of engineering seismology and geotechnical earthquake engineering. Focus is on advanced principles, evaluation procedures, and design methods.

ECIV 529. Groundwater Contamination. 3 Credits. (3 Lec) S. PREREQUISITE: EGEN 335. Contemporary groundwater topics including water supply, contaminant transport, and remediation technologies. Subsurface mass transport and microbial processes and their effect on fate and transport of organic and inorganic contaminants in the context of bioremediation and other remediation technologies will be emphasized.

ECIV 530. Adv Hydraulic Investigations. 3 Credits. (3 Lec) S alternate even years. Advanced topics in hydraulics and fluid mechanics.

ECIV 554. Transportation Safety. 3 Credits. (3 Lec) S alternate odd years. PREREQUISITE: ECIV 350. 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, roadways, 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.

ECIV 555. Survey Data Collection & Analysis. 3 Credits. (2 Lec, 1 Lab) S Alternate Even Year PREREQUISITES: EGEN 350 or EIND 354. This course introduces students to the principles and practice of survey data collection and analysis for transportation engineering and elevates students' ability to design and apply scalable approaches to analyze transportation-related data. Transportation survey design, implementation and analysis are covered. Methods and techniques for anticipating traffic events (crashes, congestion, etc.) are studied. Co-convened with ECIV 455.

ECIV 556. Traffic Flow Fundamentals. 3 Credits. (3 Lec) S alternate even years. PREREQUISITE: ECIV 350, EGEN 350 or STAT 332. This course covers traffic stream parameters, their relationships, and important analytical techniques in traffic engineering such as capacity analysis, queuing analysis, shockwave analysis, and traffic simulation. Topics covered are essential in understanding the behavior of vehicular traffic as a complex system.

ECIV 562. Snow and Avalanche Physics for Teachers. 3 Credits. (1 Lec, 1 Lab, 1 Rec) S PREREQUISITES: A minimum of 2 years science teaching experience. Snow and Avalanche Engineering for Teachers provides student with the knowledge necessary to implement snow and avalanche related lessons into their respective math and science lessons.

ECIV 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind; 6 cr max) 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.

ECIV 589, Graduate Consultation. 1-3 Credits. (3 Ind; 3 cr max) F,S,Su 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.

ECIV 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing.

ECIV 591. Special Topics. 1-4 Credits. (1-4 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.

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

ECIV 594. Seminar. 1 Credit. (1 Sem) F S PREREQUISITE: Final semester of MS program. Students participate in preparing and presenting discussion material.

ECIV 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.

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