ECIV 308. Construction Practice. 3 Credits.

ECIV 309. Building Information Modeling in Construction. 3 Credits.
PREREQUISITE: EGEN 115 and DDSN 101 or DDSN 131. 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 311. Construction Project Documentation. 2 Credits.
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.

ECIV 315. Structures II. 3 Credits.

ECIV 316. Geotechnical Engineering. 3 Credits.

ECIV 317. Engineering Hydrology. 2 Credits.
PREREQUISITE: EGEN 350 or STAT 332. Descriptive and quantitative hydrology with applications in water resources engineering.

ECIV 332. Engineering Hydraulics. 2 Credits.
PREREQUISITE: EGEN 355. Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

ECIV 333. Water Resources Engineering. 1-4 Credits.
PREREQUISITES: EGEN 350 or STAT 332 and EGEN 335 or ECIV 337. 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.
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 337. Civil Engineering Fluid Mechanics. 3 Credits.
PREREQUISITES: EGEN 201 Fundamental concepts developed in the course include fluid statics, conservation of mass, energy and momentum using Reynolds Transport Theorem, kinematics, plane potential flow, lift and drag. Applications focus on civil engineering problems including closed conduit and open channel hydraulics.

ECIV 350. Transportation Engineering. 3 Credits.
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.
PREREQUISITE: Concurrent registration with ECV 408R required. Professional ethics, social responsibility, public policy, and leadership.

ECIV 404. Heavy Const Equip and Methods. 3 Credits.
PREREQUISITES: 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.
PREREQUISITE: ECIV 308. 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.
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.
PREREQUISITE: EGEN 355, Pipe flow, open channel flow, hydraulic machines with applications in water resources engineering.

ECIV 415. Design of Masonry Structures. 3 Credits.
PREREQUISITE: EGEN 355, Pipe flow, open channel flow, hydraulic machines with applications in water resources engineering.

ECIV 489R. Senior Engineering Research. 1-4 Credits.
PREREQUISITE: Senior standing. Independent study or research in an area of civil engineering.

EDDN 131. Introduction to Business Information Systems. 3 Credits.

EC 202. Applied Analysis. 1 Credit.
PREREQUISITE: M 150Q or M 171Q or M 181Q. Civil Engineering or CE/Bio-Resources Option Engineering or Environmental Engineering majors only. Computer applications in civil engineering using M-based software and a programming language.

EC 220CS. Civil Engineering and Construction - from the Ancient to the Modern. 3 Credits.
PREREQUISITE: On Demand. Study of the development and use of construction engineering in the ancient world and modern times. Focus on the impact of construction engineering on society and the environment.
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) S
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 well as look at professional management practices for heavy civil projects.

ECIV 420. Earth and Foundation Engr. 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) F
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 TransCAD software.

ECIV 455. Survey Data Collection & Analysis for Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) On Demand PREREQUISITES: 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 w/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
PREREQUISITES: ECIV 320 or ETCC 302, EGEN 331 or EGEN 335. COREQUISITE: ECIV 308. This course explores the challenges of cold regions infrastructure engineering. Design, construction and performance issues specific to cold climates are identified, and methods to overcome them are developed and demonstrated.

ECIV 484. Reinforced Concrete Design. 3 Credits. (3 Lec) F
Alternate even years. PREREQUISITE: ECIV 315. Design of reinforced concrete members and systems.

ECIV 489R. Civil Engineering Design I. 2 Credits. (1 Lec, 1 Lab) F,S
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. Develop 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) 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.

ECIV 491. Special Topics. 1-4 Credits. (1 Ind; 12 cr max) F,S,Su
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) F,S
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) F

ECIV 504. Construction Productivity. 3 Credits. (3 Lec) On Demand PREREQUISITE: Two years of construction field experience. Course covers productivity and efficiency 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 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)
PREREQUISITE: ECIV 484 or ECIV 414 or ECIV 415 or ECIV 416. COREQUISITE: ECIV 512. Analysis of multi-storey structural systems. Emphasis on lateral force resisting systems in steel framed buildings.

ECIV 512. Structural Dynamics. 3 Credits. (3 Lec)
PREREQUISITE: ECIV 512. 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 413 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. (Lec)
PREREQUISITES: ECIV 320. Principles of engineering seismology and
tectonic earthquakes engineering. Focus is on advanced principles, evaluation
procedures, and design methods.

ECIV 529. Groundwater Contamination. 3 Credits. (3 Lec)
PREREQUISITE: EGEN 335 or ECIV 337. 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 531. River Modelling. 3 Credits. (3 Lec)
Theory and practice of multi-dimensional open channel modelling including theory,
field data collection, data management, modelling best practices, verification and
validation.

ECIV 544. 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, On
Demand 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, queueing
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 advisor and graduate committee.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Times was used instead of Adobe Garamond Pro.

The editor may contact Leepfrog for a draft with the correct fonts in place.