

CIVIL ENGINEERING (CVEN)

CVEN 1025 - Civil Engineering Graphics and Computer Aided Design (3 Credits)

Introduces microcomputer-based, menu-driven, 2-D and 3-D computer-aided design systems; standard Civil Engineering industry details and some three-dimensional modeling of solid objects; principles on engineering drawing and descriptive geometry with applications specifically geared for civil engineers. Prereq: High School Geometry and Algebra. Max Hours: 3 Credits.

Grading Basis: Letter Grade

CVEN 1067 - Introduction to Civil Engineering (1 Credit)

Introduces civil engineering and the many career choices in this broad field. Covers the history of the profession, current civil engineering projects, societal and global implications, technologies used, professional ethics, sustainability, and licensure. Max hours: 1 Credit.

Grading Basis: Letter Grade

CVEN 1200 - Fundamentals of Engineering Design Innovation (3 Credits)

This course introduces concepts of engineering design innovation at a variety of scales and disciplines. Participants will experience and explore core technology and design themes including design principles, processes, methods, modes of thinking, and social and cultural aspects or design. Cross-listed with CSCI 1200, ENGR 1200, MECH 1200, ELEC 1201 and IWKS 2100. Max hours: 3 Credits.

Grading Basis: Letter Grade

CVEN 2121 - Analytical Mechanics I (3 Credits)

A vector treatment of force systems and their resultants; equilibrium of trusses, beams, frames, and machines, including internal forces and three-dimensional configurations, static friction, properties of areas, distributed loads and hydrostatics. Prereq: PHYS 2311 with a C- or higher and Prereq/Coreq: MATH 2411. Cross-listed with MECH 2023. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: PHYS 2311 with a C- or higher. Prereq/Coreq: MATH 2411.

CVEN 2212 - Surveying for Construction and Engineering (2 Credits)

Survey observations used by engineers and surveyors using levels and total stations to make sure things are put in the right place and leveled; analysis and adjustment of measured loops, traverses; areas and volumes; methods used in construction; analysis of error sources; and presentation of results. Course includes a required lab section. Max hours: 2 Credits.

Grading Basis: Letter Grade

CVEN 2214 - Surveying for Engineering (1 Credit)

Survey observations used by engineers and surveyors using levels and total stations to make sure things are put in the right place and leveled; analysis and adjustment of measured loops, traverses; areas and volumes; methods used in construction; analysis of error sources; and presentation of results. This course does not include a lab. Max hours: 1 Credit.

Grading Basis: Letter Grade

CVEN 2215 - Surveying Lab (1 Credit)

For those students in CVEN 2214 who wish to experience hands-on use of the principal survey equipment they see in the lectures. Provides access to levels and theodolites to perform measurements, record, check, and adjust them. Prereq or Coreq: CVEN 2214. Max hours: 1 Credit.

Grading Basis: Letter Grade

Prereq or Coreq: CVEN 2214.

Typically Offered: Fall, Spring.

CVEN 3111 - Analytical Mechanics II (3 Credits)

A vector treatment of dynamics of particles and rigid bodies, including rectilinear translation, central-force, general motion of particles, kinematics of rigid bodies, the inertia tensor, plane motion of rigid bodies; energy and momentum methods for particles, systems of particles and rigid bodies. Prereq: CVEN 2121 or MECH 2023 and MATH 2411 with a C- or better. Cross-listed with MECH 2033. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 2121 or MECH 2023 and MATH 2411 with a C- or better.

CVEN 3121 - Mechanics of Materials (3 Credits)

Mechanical properties of materials, stresses and strains in members subjected to tension, compression and shear, combined stresses, flexural and shearing stresses in beams, deflections of beams, column analysis, principal stresses. Prereq: CVEN 2121 or MECH 2023 and MATH 2411 with a C- or better. Cross-listed with MECH 3043. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 2121 or MECH 2023 and MATH 2411 with a C- or better.

CVEN 3141 - Introduction to Structural Materials (2 Credits)

To learn the fundamental characteristics of structural materials, including steel, concrete, masonry, timber, and composites; to learn how to test structural materials in the laboratory; and to learn how to interpret test data for engineering applications. After completing this course, students are expected to understand the behavior of structural materials and establish necessary background for structural design courses. Prereq or Coreq: CVEN 3121 or MECH 3043. Max Hours: 2 Credits.

Grading Basis: Letter Grade

Prereq or Coreq: CVEN 3121 or MECH 3043.

CVEN 3200 - Computational Methods for Civil Engineers (3 Credits)

This course introduces advanced programming and data analysis skills pertinent to the range of civil engineering disciplines. Topics will include numerical methods, statistical analysis, and programming techniques for measurements and data collection. Languages and tools may include Excel, Matlab, Python, and Arduino. Prereq: (IWKS 2300 or ENGR 1100) and (MATH 3800 or CVEN 3611) with a C- or higher. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: (IWKS 2300 or ENGR 1100) and (MATH 3800 or CVEN 3611) with a C- or higher.

CVEN 3313 - Fluid Mechanics (3 Credits)

Fundamentals of fluid mechanics. Topics include fluid properties, hydrostatics, the continuity principle, the energy principle, the momentum principle, similitude and dimensional analysis, drag, and friction for laminar and turbulent flow in closed conduits. Prereq: CVEN 2121 or MECH 2023 with a C- or higher. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: MECH 2023 or CVEN 2121 with a C- or higher

CVEN 3323 - Hydrosystems Engineering (3 Credits)

Civil engineering hydraulics applied to the hydrologic cycle; surface- and groundwater resources; precipitation, streamflow, and groundwater measurements; and basics of reservoir operation, open channel hydraulics, and storm water design. Prereq: CVEN 3313 and ENGR 1100 or IWKS 2300 with a C- or higher. Restriction: Restricted to Civil Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3313 and ENGR 1100 or IWKS 2300 with a C- or higher.

Restriction: Restricted to Civil Engineering majors.

CVEN 3401 - Introduction to Environmental Engineering (3 Credits)

Introduces students to the broad field of environmental engineering. Topics include essential chemical, biological, and risk assessment concepts needed for addressing environmental problems. Major unit operations and processes used for treating wastewater and potable drinking water. An overview of technologies used for treating particulate and gaseous air pollutants, managing solid wastes, and remediating hazardous wastes. The course also introduces environmental sustainability, green engineering, life cycle assessment and other systems oriented concepts. Prereq: CHEM 1130 or CHEM 2031 or ENGR 1130 with a C- or better. Cross-listed with CVEN 5401. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CHEM 1130 or CHEM 2031 or ENGR 1130 with a C- or better.

CVEN 3505 - Structural Analysis (3 Credits)

The focus of this course is on the understanding of structural analysis principles and application of techniques. We will build upon topics initiated in prerequisite courses. Topics include: Introduction to loads, structural idealization, analysis of trusses, arches, beams and frames, cables, influence lines, beam deflections, and introductions to matrix analysis and computer-assisted analysis. The course will be fast-paced and mathematically rigorous. Prereq: CVEN 3121 or MECH 3043 with a C- or higher. Restriction: Restricted to Civil or Construction Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3121 or MECH 3043 with a C- or higher Restriction: Restricted to Civil or Construction Engineering majors.

CVEN 3602 - Transportation Engineering (3 Credits)

This course will introduce you to the concepts and methods of transportation engineering, planning and management. This course will emphasize traffic engineering. Topics will include vehicle dynamics, traffic flow fundamentals, accident analysis, signal timing, highway capacity analysis, level of service analysis, freeway operations, and evaluation procedures for alternative transportation projects. Prereq: C- or better in MATH 1401 or Junior Standing or instructor permission. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: C- or better in MATH 1401 or Junior Standing or instructor permission

CVEN 3611 - Engineering Statistics (3 Credits)

Covers statistical methods for engineering studies. Topics include common probability distributions, sample design, descriptive statistics, hypothesis testing of one or two populations, tests of discrete versus continuous random variables, analysis of variance, linear and non-linear multiple regression models, non-parametric tests of fit. Prereq: MATH 2411 with a C- or better. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: MATH 2411 with a C- or better.

CVEN 3718 - Geotechnical Engineering I (3 Credits)

Soil formation, phase diagram, soil constituents and behavior, description of soils, classification, clay minerals, compaction, soil improvement, capillarity, shrinkage, swell, collapsible soil, frost action, flow through porous media, and consolidation. Lab experiments, including specific gravity, grain size analysis, liquid and plastic limits, and consolidation, are to be conducted in concert with the lectures. Prereq: CVEN 3121 or MECH 3043 with a C- or higher. Pre or Coreq: CVEN 3313. Restriction: Restricted to Civil or Construction Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3121 or MECH 3043 with a C- or higher Pre or Coreq:

CVEN 3313 Restriction: Restricted to Civil or Construction Engineering majors

Typically Offered: Fall, Spring.

CVEN 4000 - Senior Seminar (0 Credits)

Required for all Civil Engineering majors. This course is generally taken the semester of graduation. To complete this course one must complete the fundamentals of engineering exam from the national council of examiners for engineering and surveying, attend any required course meetings, and complete an ethics assignment. Failure to attend the required meeting(s) of this course will delay graduation. Prereq or Coreq: CVEN 4067. Max hours: 0 Credits.

Grading Basis: Letter Grade

Prereq or Coreq: CVEN 4067

Typically Offered: Fall, Spring.

CVEN 4025 - Autocad Civil 3d & Advanced Civil Engineering Graphics (3 Credits)

Lectures target civil engineering industry specific site information modeling software and geospatial industry specific geographical information systems software to elevate students' knowledge of each software to an in-depth understanding. Laboratory exercises will focus on civil drafting and design, producing documentation, and general project workflows. Additional laboratory exercises will focus on geospatial data creation, data management, and cartographic display. Prereq: CVEN 1025. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 1025

CVEN 4067 - Senior Design Projects (3 Credits)

Senior civil engineering students, working in teams, are assigned significant open-ended design problems requiring the synthesis of material learned in previous engineering courses for solution. Design teams work independently under the supervision of a civil engineering faculty member. Prereq: Graduation Agreement and one design course. Co-req: A second design course. Restriction: Restricted to Civil Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 4427 or 4565 or 4575 or 4585 or 4602 or 4738 with a C- or higher Coreq: CVEN 4427 or 4565 or 4575 or 4585 or 4602 or 4738

Restrictions: Restricted to Civil Engineering majors.

CVEN 4077 - Engineering Economy (3 Credits)

Applies economic and financial principles to evaluation of engineering alternatives. Calculation of annual costs, present worth and prospective rates of return on investment. Review of systems analysis techniques, including simulation, linear programming, and project scheduling. Prereq: Junior standing. Cross-listed with MECH 4147. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: Restricted to junior standing majors in the College of Engineering, Design and Computing

CVEN 4087 - Engineering Contracts (3 Credits)

Laws met by the practicing engineer, types of contracts, specification writing, laws on contracts, agency, partnership, sales and property, with primary emphasis on rights and duties of the engineer. Prereq: Senior standing. Cross-listed with CVEN 5087. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: Restricted to senior standing majors in the College of Engineering, Design and Computing

CVEN 4426 - Pipe Network and Sewer Design (3 Credits)

Design of pressurized pipe networks for water supply and sanitary sewers for wastewater collection. Topics include the civil engineering design process, estimation of water and wastewater design loads, and design of pressurized pipe networks and sanitary sewers including pump selection, service reservoirs, lift stations, and relevant software. Design project and field trip required. Prereq: CVEN 3313 and Prereq or Coreq: ENGR 1100 or IWKS 2300 with a C- or better. Cross-listed with CVEN 5426. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3313. Prereq or Coreq: ENGR 1100 or IWKS 2300 with a C- or better.

CVEN 4427 - Storm Water System Design (3 Credits)

This course covers urban watershed analysis, design rainfall and hydrologic losses, flood frequency and design event, rational method for peak runoff prediction, street hydraulic capacity and safety, culvert hydraulics, street inlet collection system, and storm sewer system design and flow analysis. Prereq: CVEN 3323 and senior standing. Restriction: Restricted to Civil Engineering majors. Cross-listed with CVEN 5427. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3323 with a C- or higher Restriction: Restricted to Civil Engineering majors

CVEN 4520 - Structural Engineering and the Ocean Environment (3 Credits)

This course explores the design of structures for coastal and ocean resilience within the broader context of climate change adaptation. The following subjects will be introduced: coastal and oceanic wave dynamics; hydrodynamic forces on coastal structures and methods for attenuation; analysis and design of floating structures. Prereq: MATH 2421 with a C- or better and CVEN 3121 or MECH 3043 with a C- or better. Cross-listed with CVEN 5520. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: MATH 2421 with a C- or better and CVEN 3121 or MECH 3043 with a C- or better.

CVEN 4565 - Timber Structure Design (3 Credits)

Design of wood roof, wall, and floor systems including beams, columns, trusses, diaphragms and shear walls for vertical and lateral loads. Connection design, glued-laminated members, plywood, and engineered lumber are incorporated. Prereq: CVEN 3505 and CVEN 3141 with a C- or higher. Restriction: Restricted to Civil or Construction Engineering majors. Cross-listed with CVEN 5565. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3505 and 3141 with a C- or higher Restriction: Restricted to Civil or Construction Engineering majors

CVEN 4575 - Structural Steel Design (3 Credits)

Design of structural steel members and their connections. Prereq: CVEN 3505 and 3141 with a C- or higher. Restriction: Restricted to Civil or Construction Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3505 and 3141 with a C- or higher Restriction: Restricted to Civil or Construction Engineering majors

CVEN 4585 - Reinforced Concrete Design (3 Credits)

The course objective is to introduce the students to the principles of structural design in reinforced concrete. The course emphasizes determining loads for structural design and using these loads to design reinforced concrete members. Prereq: CVEN 3505 and 3141 with a C- or higher. Restriction: Restricted to Civil or Construction Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3505 and 3141 with a C- or higher Restriction: Restricted to Civil or Construction Engineering majors

CVEN 4590 - Design of Prestressed Concrete (3 Credits)

To learn the basic concepts of analysis and design of prestressed concrete, which is reinforced concrete in which steel is tensioned against the concrete, thereby introducing compression in concrete and hence overcoming the tensile weakness of concrete relative to its compressive strength. Cross-listed with CVEN 5590. Prereq: CVEN 4585 with a C- or better. Restriction: Restricted to Civil or Construction Engineering majors. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 4585 with a C- or better. Restriction: Restricted to Civil or Construction Engineering majors.

CVEN 4591 - Design of Composite Structures (3 Credits)

The objective of this course is to provide engineering students with an overall awareness of the application and design of composite structures. Practical examples are discussed based on theory. Prereq: CVEN 4585 with a C- or better. Restriction: Restricted to Civil or Construction Engineering majors. Cross-listed with CVEN 5591. Max hours: 3 Credits

Grading Basis: Letter Grade

Prereq: CVEN 4585 with a C- or better. Restriction: Restricted to Civil or Construction Engineering majors.

CVEN 4592 - Computer-Aided Structural Analysis and Design (3 Credits)

The objective of this course is to introduce students to the fundamentals of computer-aided structural analysis and design. The course emphasizes different theoretical formulations of computational mechanics and the practical use of computer programs used worldwide in the structural engineering profession. Emphasis is also placed on techniques to check the reliability and quality of solutions. Prereq: CVEN 3505 with a C- or better or graduate standing. Cross-listed with CVEN 5592. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3505 with a C- or higher or graduate standing (GRAD or NDGR).

CVEN 4602 - Advanced Highway Design (3 Credits)

This course delves into the art and science of designing sustainable and context sensitive street and highway facilities. Topics include road classification, transportation planning, road alignments, cross-section design, bicycle and pedestrian facilities, intersections, and street network design. Such details are a focus of the course; however, the overarching theme reflects upon the social, economic, and environmental implications of highways and as well as proper integration into the overall transportation system. Prereq: CVEN 3602 and CVEN 3718 with a C- or better; Restriction: Restricted to Civil or Construction Engineering majors. Cross-listed with CVEN 5602. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3602 and CVEN 3718 with a C- or better. Restriction: Restricted to Civil or Construction Engineering majors.

Typically Offered: Fall.

CVEN 4612 - Traffic Impact Assessment (3 Credits)

Covers (1) procedures to satisfy state and local requirements for transportation impact studies, (2) methods to perform trip generation, distribution, and traffic assignment for impact analyses, and (3) analysis of transportation impacts on residential communities, mode choice, regional business (downtown or suburban), peak and off-peak travel times, noise, safety, parking and pedestrians. A course project requires students to develop an application of analysis software to a case study area. Prereq: CVEN 3602 with a C- or better. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3602 with a C- or better.

CVEN 4621 - Highway Capacity Analysis (3 Credits)

Covers the principles and applications of highway capacity analysis for freeways and arterials, ramps and interchanges, weave and merge sections, signalized and unsignalized intersections, roundabouts, pedestrian areas and transit. Emphasis is on level-of-service analysis procedures in the Highway Capacity Manual, although other approaches are also discussed. Additional topics include roadway characteristics, vehicle dynamics, human factors, speed and volume studies, travel time surveys and traffic flow characteristics. Prereq: CVEN 3602 with a C- or better. Max Hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3602 with a C- or better.

CVEN 4631 - Transport Modeling and Big Data (3 Credits)

This course is an introduction to the models, frameworks and techniques used in estimating demand for passenger travel across modes and regions. The goal is to provide you an overview of the different steps involved in traditional travel demand forecasting methods and then delve into newer "big" data sources and methods that will allow us to observe and analyze travel in completely new ways. We will also briefly cover sampling techniques and survey design as part of data collection for estimation of travel demand. Prereq: Any statistics course with a C- or better (MATH 2830, 3800, CVEN 3611, ELEC 3817, or BANA 2010). Cross-listed with CVEN 5631. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: MATH 2830, MATH 3800, CVEN 3611, ELEC 3817, or BANA 2010 with a C- or higher.

Typically Offered: Spring.

CVEN 4650 - Urban Street Design (3 Credits)

This course delves into the art and science of designing sustainable and context sensitive street and highway facilities. This course is intended to intersect with CVEN 4602/5602 – Advanced Highway Design, which covers rural highway design. Topics for this course will focus on urban street design principles, including transportation planning, bicycle and pedestrian facilities, intersections, and street network design, as well as techniques and software for coordinated signal timing. Such details are a focus of the course; however, the overarching theme reflects upon the social, economic, and environmental implications of highways and as well as proper integration into the overall transportation system. Prereq: CVEN 3602 with a C- or higher, recommend B- or higher. Prereq or coreq: CVEN 4602 or CVEN 5602. Cross-listed with CVEN 5650. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3602 with a C- or higher. Coreq or prereq: CVEN 4602 or CVEN 5602.

Typically Offered: Summer.

CVEN 4738 - Intermediate Foundation Engineering (3 Credits)

Applies principles of soil mechanics to the analysis and design of foundations and earth structure. Theories of consolidation, earth pressure, slope stability, and bearing capacity. Studies settlement of structures, shallow and deep foundations, retaining walls and excavations. Cross-listed with CVEN 5738. Prereq: CVEN 3141 and 3718 with a C- or higher. Restriction: Restricted to Civil or Construction Engineering majors. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: CVEN 3141 and 3718 with a C- or higher Restriction: Restricted to Civil or Construction Engineering majors.

CVEN 4800 - Special Topics (3 Credits)

Supervised study of special topics of interest to students under guidance of instructor. Prereq: Permission of instructor. Repeatable. Max hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

Restrictions: Restricted to majors within the College of Engineering, Design and Computing.

CVEN 4840 - Independent Study (1-6 Credits)

This category is intended for topics which students may wish to pursue on their own initiative, with guidance from a professor who agrees to limited consultation on the work and to award credit when the project is completed. Departmental approval is required. Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

Restrictions: Restricted to majors within the College of Engineering, Design and Computing.

CVEN 4939 - Internship (1-3 Credits)

Civil Engineering undergraduate internship. Department consent required. Max hours: 6 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 6.