CIVIL ENGINEERING (C E)

C E 100 - Introduction to Civil Engineering (1.0 hour)
Introduction to the civil engineering professions. Introduction to fundamental engineering concepts; engineering design; engineering ethics; professional societies; introduction to computers and computer applications.

C E 150 - Statics (3.0 hours)
Analysis of two- and three-dimensional force systems by vector algebra. Applications of principles of equilibrium to particles, rigid bodies, and simple structures. Friction, distributed forces, center of gravity, centroids, moments of inertia. U.S. and SI systems of units and applications.
Prerequisite: MTH 121 or MTH 115 or MTH 119

C E 200 - Engineering Co-Op (0.0 hours)
Core Curriculum: EL
Full-time cooperative education assignment for civil engineering students who alternate periods of full-time school with periods of full-time academic or career-related work in industry. Satisfactory/Unsatisfactory.
Prerequisite: Sophomore standing in the College of Engineering and Technology, 2.0 overall grade point average at Bradley, approval of engineering and technology Co-op coordinator and Co-op faculty advisor.

C E 210 - Numerical Methods in Civil Engineering (3.0 hours)
Introduction to numerical methods commonly needed to solve complex problems and work with datasets in civil engineering. Software skill development through application; including arrays, programming basics, analysis and visualization of numeric data, and development of mathematical models in spreadsheets and scripts.
Prerequisite: MTH 223.

C E 224 - CADD (3.0 hours)
Examinations of graphical capabilities of current computer-aided design and drafting (CADD) systems. Theoretical and hands-on applications of the most widely used CADD systems available for Civil Engineering and Construction students.
Prerequisite: CON 132.

C E 250 - Dynamics (3.0 hours)
Kinematics and kinetics of particles and rigid bodies using vector analysis. Kinetics includes principles of force-mass-acceleration, work-energy, and impulse-momentum.
Prerequisite: C E 150.

C E 260 - Fluid Mechanics (2.0 hours)
Fluid properties and fluid motion: basic laws of motion in integral form; applications of basic laws in solving fluid flow problems. Hydrostatics, dimensional analysis, similitude, and incompressible viscous flow (both laminar and turbulent) in conduits. Introduction to open channel flow; culverts, sewers, and streams.
Prerequisite: C E 250.

C E 261 - Fluid Mechanics Lab (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in C E 260. Lab topics include: Bourdon Pressure Gage, Center of Pressure, Stability of a Floating Object, Flow Measurement, Energy Loss, and Linear Impulse Momentum.
Prerequisite: C E 260 or concurrent enrollment.

C E 270 - Mechanics of Materials (3.0 hours)
Internal forces; stress, strain, and their relations; stresses and deformations in axial and torsional loading; indeterminate problems; stresses and deformations in flexural members; transformation of stresses; introduction to member design; column buckling analysis.
Prerequisite: CE 150.

C E 310 - Probability, Statistics and Decision Making in Civil Engineering (3.0 hours)
Basic probabilistic and statistical decision making principles used in civil engineering design and practice. Probabilistics models and decision theory.
Prerequisite: MTH 121

C E 350 - Geotechnical Engineering (3.0 hours)
Physical properties of soils, soil profiles, and deposits. Soil strength determination. Flow of water through soil masses.
Prerequisite: C E 260, C E 270.

C E 356 - Pavement Design (3.0 hours)
Pavement engineering and design considering materials, traffic and climate. Structural properties of asphalt (flexible) and concrete (rigid) pavements.
Prerequisite: C E 350.

C E 359 - Structural Analysis (4.0 hours)
Analysis of statically determinate structures including influence lines. Deflections by area-moment, conjugate beam, and Castigliano's theorem. Analysis of statically indeterminate structures including influence lines. Classical solutions by consistent displacements, three-moment theorem, moment distribution, and slope deflection methods. Matrix methods for structural analysis by stiffness approach.
Prerequisite: CE 270.

C E 360 - Introduction to Environmental Engineering (3.0 hours)
Analysis techniques and design procedures for unit operations and unit processes for water and waste water treatment. Techniques for the examination of water and waste water quality.
Prerequisite: CHM 110.

C E 361 - Environmental Engineering Lab (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in C E 360. Techniques for the examination of water and wastewater quality. Testing water treatment unit operations.
Prerequisite: C E 360 or concurrent enrollment, and CHM 111.

C E 365 - Reinforced Concrete Design (3.0 hours)
Theory and design of reinforced concrete structures: beams, columns, slabs, walls, and buildings. Current ACI Code provisions for elastic and ultimate design.
Prerequisite: C E 359.

C E 380 - Civil Engineering Materials (2.0 hours)
Study the physical and mechanical properties of civil engineering materials used in constructing and maintaining civil infrastructure, such as soil, aggregates, metals, concrete, and asphalt. Emphasis will be placed on selection criteria, mix design, and applications of these materials. Laboratory experiments.
Prerequisite: C E 270

C E 383 - Ethics and Sustainability (1.0 hour)
Engineering ethics with applications to sustainable civil infrastructure. Ethical responsibilities to public, clients, and employers. Social responsibility and public participation for civil infrastructure.

C E 393 - Sustainability and Public Policy (2.0 hours)
Introduction to engineering economics with applications to assessment of sustainable alternatives in infrastructure, ability to engage in life-long learning, knowledge of contemporary issues, understanding professional and ethical responsibility, and ability to function on multi-disciplinary teams. Applications of systems engineering concepts including optimization.
Prerequisite: Junior standing or consent of instructor

C E 394 - Sustainable Infrastructure & Ethics (3.0 hours)
Engineering ethics with applications to sustainable infrastructure and case studies. Ethical frameworks, responsibilities, codes, and importance to the civil engineering profession. Role of licensure, lifelong learning, and public service. Sustainability, environmental ethics, the need for and role of public policy and sustainable design. Engineering economics with applications to assessment of sustainable alternatives and projects. Contemporary issues in sustainable infrastructure and the engineering profession including ENVISION & LEED.
Prerequisite: Junior standing or consent of instructor.

C E 400 - FE Review (0.0 hours)
To review Civil Engineering topics in preparation for the Fundamentals of Engineering (FE) Examination offered through the National Council of Examiners for Engineering and Surveying (NCEES). Satisfactory/ Unsatisfactory.
Prerequisite: Senior standing

C E 422 - Foundation Analysis and Design (3.0 hours)
Analysis and design of footings, raft foundations, retaining walls, piles, and caissons, based on current theories and design considerations in soil mechanics, concrete, and steel.
Prerequisite: CE 350, CE 365.

C E 430 - Water Supply & Hydraulic Engineering (3.0 hours)
Water use and wastewater generation. Conveying and distributing water. Wastewater and stormwater conveyance system design. Design of storage structures and other systems for water conservation and water use; open channel flow, closed conduit flow, hydraulic structures, hydraulic power conversion.
Prerequisite: CE 260.

C E 442 - Design of Steel Structures (3.0 hours)
Design of steel structural members. Behavior of members and connections. Theoretical and practical considerations in member selection and joint design.
Prerequisite: CE 359.

C E 465 - Surface Water Hydrology (3.0 hours)
Introduction to hydrological cycle. Hydrologic measurements and monitoring. Surface water hydrology: runoff and the catchment, hydrographs, unit hydrographs, hydrograph routing, urban and small watershed hydrology, hydrologic design, synthetic streamflows, simulation models, applications of probability and statistics to surface water hydrology.
Prerequisite: C E 260

C E 480 - Transportation Engineering (3.0 hours)
Introduction to transportation engineering and planning as it relates to highways. Characteristics of highway systems: the driver, vehicle and roadway, traffic engineering studies, highway safety, traffic flow fundamentals, capacity and level of service concepts, intersection traffic control, transportation planning and site impact analysis, geometric design of highways.
Prerequisite: Junior standing or consent of Instructor

C E 491 - Special Topics I (1.0-3.0 hours)
Topics of special interest which may vary each time course is offered. Topics are stated in the current Schedule of Classes.
Prerequisite: consent of advisor.

C E 492 - Special Topics II (1.0-3.0 hours)
Topics of special interest which may vary each time course is offered. Topics stated in current Schedule of Classes.
Prerequisite: consent of advisor.

C E 493 - Civil Engineering Design Project I (3.0 hours)
Core Curriculum: EL,WI
First of a two-semester course design project sequence. Discussions of the relationship between the owner, architect, consultant, superintendent, construction manager, general contractor and subcontractors. Methods of project delivery, Project concepts through construction, design phases, and project challenges. Leadership, ethics, public policy issues, LEED, and basic business management practices. Oral and written report of preliminary plan.
Prerequisite: C E 394

C E 498 - Civil Engineering Design Project II (3.0 hours)
Core Curriculum: WI,EL
Detailed design of systems. Application of engineering design principles to realistic projects in structural engineering, environmental engineering, site development. Codes and standards, feasibility studies, consideration of design alternatives, selection criteria including systems sustainability, and aesthetics. Oral and written report of final design with specifications, engineering drawings, and project cost estimates.
Prerequisite: C E 493. Advisor consent may be required.