CIVIL ENGINEERING (CE)

CE 1110 Civil Engineering Drafting (3 credits)
Freehand and computer aided drawing in pictorial and orthographic projection; section and auxiliary views; descriptive geometry; graphical presentation of data; scales, dimensioning, and measurements. Two lectures and one 2-hour lab per week. Typically Offered: Varies.

CE 1150 Introduction to Civil Engineering (1 credit)
Introduction to civil engineering problem solving skills, development of software use skills, graphical analysis, data analysis, and oral and written communication skills. One weekly two hour laboratory with up to 3 out-of-class activities.
Prereqs: Major in civil engineering

CE 2000 (s) Seminar (1-16 credits, max 99)
Credit arranged

CE 2030 (s) Workshop (1-16 credits, max 99)

CE 2040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

CE 2110 Engineering Surveying (3 credits)
Theory of measurements, basic equations for survey computations, types of distribution of errors, topographical and land surveying introduction to geographic information systems and global positioning systems, coordinate geometry and coordinate transformations, site engineering projects using land development software, application of surveying methods to construction, site engineering, and civil engineering projects surveying instruments. Two lecture and one 3-hour lab per week; periodic field data collection and one or two field trips. Typically Offered: Varies.
Prereqs: C or better in CE 1110 and MATH 1170

CE 2150 Civil Engineering Analysis and Design (3 credits)
Application of basic science, mathematics, and fundamental engineering principles to solution of civil engineering design problems; use of structured programming concepts in design; develop oral and written communication skills. Typically Offered: Varies.
Prereqs: ENGR 1230 and MATH 1170. A minimum grade of C or better is required for all prereqs.

CE 2980 (s) Internship (1-16 credits, max 99)
Credit arranged

CE 2990 (s) Directed Study (1-16 credits, max 99)
Credit arranged

CE 3220 Hydraulics (4 credits)
Applied principles of fluid mechanics; closed conduit flow, hydraulic machinery, open channel flow; design of hydraulic systems. Laboratory exercises on closed conduit flow, hydraulic machinery, open channel flow and mixing process. Three lec a week and 4-6 labs a semester. Typically Offered: Varies.
Prereqs: CE 2150, MATH 3100, PHYS 2110, ENGR 2200 and ENGR 3350. A minimum grade of C or better is required for all pre/coreqs.

CE 3250 Fundamentals of Hydrologic Engineering (3 credits)
Principles of hydrologic science and their application to the solution of hydraulic, hydrologic, environmental, and water resources engineering problems. Typically Offered: Varies.
Prereqs: MATH 3100, STAT 3010, and ENGR 3350. A minimum grade of C or better is required for all pre/coreqs.

CE 3300 Fundamentals of Environmental Engineering (3 credits)
This course provides an introduction to environmental engineering. Focus areas include water sources and drinking water treatment, wastewater treatment and water reuse, and solid and hazardous waste management. Quantitative aspects and engineering solutions to environmental problems are emphasized. Typically Offered: Varies.
Prereqs: CHEM 1111, CE 2150, and MATH 3100. A minimum grade of C or better is required for all pre/corequisites.

CE 3420 Theory of Structures (3 credits)
Stresses and strains in statically determinate and indeterminate beam, truss, and rigid frame structures; effects of moving loads; matrix displacement method. Two lectures and one 2-hour lab per wk. Typically Offered: Varies.
Prereqs: ENGR 3500, MATH 2750, MATH 3100, and PHYS 2110/PHYS 2110L. A minimum grade of C or better is required for all pre/corequisites.

CE 3570 Properties of Construction Materials (4 credits)
Principles of construction materials, composition, physical and mechanical properties, test methods, data analysis and interpretations, and report writing; materials covered are aggregates, cements, concretes, metals, wood, and composites. Three lectures and two hours of lab. Typically Offered: Varies.
Prereqs: CE 2150, ENGR 3500, MATH 3100. A minimum grade of C or better is required for all pre/corequisites. A minimum grade of C or better is required for all pre/corequisites.
Coreqs: STAT 3010

CE 3600 Fundamentals of Geotechnical Engineering (4 credits)
Soil composition, descriptions, and classification systems; permeability and seepage; capillarity and suction; total, effective, and neutral stresses, compression and volume changes; shear strength; compaction. Three lectures and 2 hours of lab per week. Typically Offered: Varies.
Prereqs: CE 2150, ENGR 3350, ENGR 3500, and MATH 3100. A minimum grade of C or better is required for all pre/corequisites.

CE 3720 Fundamentals of Transportation Engineering (3 credits)
Intro to planning, design, and operation of highway and traffic, public transportation, and airport systems. Three lectures a week; periodic field data collection and one or two field trips. Typically Offered: Varies.
Prereqs: STAT 3010 and CE 2110. A minimum grade of C or better is required for all pre/corequisites.

CE 3980 (s) Internship (1-16 credits, max 99)
Credit arranged

CE 4000 (s) Seminar (1-16 credits, max 99)
Credit arranged

CE 4030 (s) Workshop (1-16 credits, max 99)
Credit arranged

CE 4040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

CE 4100 Engineering Fundamentals (1 credit)
Review of basic engineering and science material covered in Fundamentals of Engineering exam. Offered for the nine to ten week period prior to the exam date. Graded Pass/Fail.
Prereqs: Senior standing or Permission

CE 4110 Advanced Engineering Computer-Aided Design and Drafting (3 credits)
Joint-listed with CE 5110
Applications of Autodesk Civil 3D for advanced computer-aided design and drafting. Comprehensive review of features and capabilities to organize project data, work with points, analyze surfaces, design road alignments, create parcel maps, design grading, and layout pipe networks. Additional projects/assignments are required for graduate credit. Typically Offered: Fall.
Prereqs: Junior/Senior standing, CE 1110 or Equivalent

CE 4220 Hydraulic Structures Analysis and Design (3 credits)
Hydraulic design and stability analysis of hydraulic structures, such as dams, weirs, spillways, stilling basins, culverts, levees, fish ladders etc. Project oriented problems. Extra design projects or different design projects for graduate credit. One field trip. Typically Offered: Varies.
Prereqs: CE 3220 or Equivalent, ENGR 3600, or Permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 4250 Engineering Hydrology (3 credits)
Hydrologic design including: statistical methods, rainfall analysis and design storm development, frequency analysis, peak discharge estimation, hydrograph analysis and synthesis, flow routing, and risk analysis. Typically Offered: Varies.
Prereqs: CE 3250 with a C or better Cooperative: open to WSU degree-seeking students.

CE 4280 Open Channel Hydraulics (3 credits)
Hydraulics of uniform and varied flow in open channels with fixed and movable beds. Recommended Preparation: CE 3220 Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

CE 4290 River Restoration (3 credits)
Joint-listed with CE 5290
This course focuses on the principles and practices used in river restoration. The potential assumptions and errors with common restoration methodologies and possible ways to improve such channel designs are discussed. A number of case studies are used to evaluate the success of various restoration techniques. The course includes homework sets and individual projects and has a mandatory field trip to a local restored site near the student. Additional projects/assignments are required for graduate credit. Typically Offered: Spring (Odd Years).
Prereqs: ENGR 3350 and CE 4280 or Instructor Permission

CE 4310 Design of Water and Wastewater Systems I (3 credits)
Joint-listed with CE 5310
Application of fundamental engineering science to the design of systems for the treatment of domestic and industrial water supplies; treatment and re-use of domestic sewage and industrial wastes. Additional projects/assignments required for graduate credit. Typically Offered: Varies.
Prereqs: CE 3220, CE 3300, or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 4320 Design of Water and Wastewater Systems II (3 credits)
Joint-listed with CE 5320
Application of unit operations and processes to design of integrated wastewater treatment systems; critical analysis of existing designs. Additional projects/assignments required for grad credit. Typically Offered: Varies.
Prereqs: CE 4310. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 4410 Reinforced Concrete Design (3 credits)
Strength design method in accordance with latest ACI code. Two lectures and one 2-hour lab per week. Typically Offered: Varies.
Prereqs: CE 3420. A minimum grade of C or better is required for all pre/corequisites.

CE 4440 Steel Design (3 credits)
Structural steel design using latest AISC specifications. Two lectures and one 2-hour lab per week, possible field trip. Typically Offered: Varies.
Prereqs: C or better in CE 3420

CE 4450 Matrix Structural Analysis (3 credits)
Joint-listed with CE 5450
Formulation of the analysis of trusses, beams, and frames using the stiffness method of matrix structural analysis; development of element properties, coordinate transformations, and global analysis theory; special topics such as initial loads, member and joint constraints, and nonlinear analysis. Special project demonstrating mature understanding of materials required for graduate credit. Typically Offered: Varies.
Prereqs: CE 3420 or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 4480 Bridge Design (3 credits)
Joint-listed with CE 5480
Structural systems for bridges, loading analysis by influence lines, slab and girder bridges, composite design, pre-stressed concrete, rating of existing bridges, specifications, and economic factors. Typically Offered: Varies.
Prereqs: CE 4410 or CE 4440

CE 4490 Timber Design (3 credits)
Joint-listed with CE 5490
Design and detailing of wood structural components. Application to industry problems. Additional work required for graduate level credit. Typically Offered: Fall (Even Years).
Prereqs: A minimum grade of C or better in CE 3420.

CE 4550 Pavement Design and Evaluation (3 credits)
Pavement design processes; stress-strain analysis in multi-layer elastic system; materials selection and characterization methods; traffic loads, design methods for flexible and rigid pavements; performance evaluation of existing pavements; condition survey and ratings; introduction to pavement maintenance and rehabilitation techniques. Typically Offered: Varies.
Prereqs: CE 3570 or equivalent, or permission. A minimum grade of C or better is required for all pre/corequisites.

CE 4600 Geotechnical Engineering Design (3 credits)
Applications of soil mechanics in design of shallow and deep foundations, earth retaining structures, excavations, and soil exploration. Typically Offered: Varies.
Prereqs: CE 3600 or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 4730 Highway Design (3 credits)
Theory and practice in highway design, highway functional classification concepts, design controls and criteria, geometric design of highways and streets, cross section and roadside design, and highway safety manual applications.
Prereqs: CE 2110. A minimum grade of C or better is required for all pre/corequisites. A minimum grade of C or better is required for all pre/corequisites.
Coreqs: CE 3720

CE 4740 Traffic Systems Design (3 credits)
Analysis and design of network traffic systems; system evaluation using computer optimization and simulation; development and testing of alternative system design. Two lecture and one 3-hr lab a week; field data collection and field site visits. Typically Offered: Varies.
Prereqs: CE 3720 or Permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 4760 Traffic Safety (3 credits)
Joint-listed with CE 5760
Analysis of roadway design alternatives and control strategies with respect to crash probabilities. Statistical models for safety analysis. Crash countermeasure selection and evaluation methodology. Risk management. Additional projects/assignments are required for graduate credit. Typically Offered: Spring.
Prereqs: STAT 3010 or Permission
Coreqs: ENGR 3600 or Permission

CE 4840 Engineering Law and Contracts (3 credits)
Project engineering techniques for planning, scheduling, and controlling typical engineering and construction projects. Contract law and application to engineering services agreements and construction contracts; preparing technical specifications, torts, professional liability, and alternate dispute resolution. Typically Offered: Varies.
Prereqs: Senior standing in engineering

CE 4910 Civil Engineering Professional Seminar (2 credits)
Employment and technical topics; professional writing; ethics; preparation for Senior Design Project. Typically Offered: Varies.
Prereqs: Senior standing in Civil Engineering

CE 4930 Senior Design I (2 credits)
General Education: Capstone Experience
This course focuses on professional and leadership skills, including career pathways, oral and written communication, participatory methods, ethics, and sustainability. Typically Offered: Fall.
Prereqs: Senior standing in Civil Engineering; and Permission

CE 4940 Senior Design II (3 credits)
General Education: Capstone Experience
Comprehensive civil engineering design project. Requires integration of skills acquired in civil engineering elective courses, written reports, and oral presentations. Typically Offered: Spring.
Prereqs: CE 4930; Senior standing in Civil Engineering; and Permission

CE 4980 (s) Internship (1-16 credits, max 99)

CE 4990 (s) Directed Study (1-16 credits, max 99)
Credit arranged

CE 5000 Master's Research and Thesis (1-16 credits, max 99)
Credits arranged

CE 5010 (s) Seminar (1-16 credits, max 99)
Credit arranged. Conferences and reports on current developments.

CE 5020 (s) Directed Study (1-16 credits, max 99)
Credits arranged

CE 5030 (s) Workshop (1-16 credits, max 99)
Credit arranged

CE 5040 (s) Special Topics (1-16 credits, max 99)
Credit arranged

CE 5050 (s) Professional Development (1-16 credits, max 99)

CE 5110 Advanced Engineering Computer-Aided Design and Drafting (3 credits)
Joint-listed with CE 4110
Applications of Autodesk Civil 3D for advanced computer-aided design and drafting. Comprehensive review of features and capabilities to organize project data, work with points, analyze surfaces, design road alignments, create parcel maps, design grading, and layout pipe networks. Additional projects/assignments are required for graduate credit. Typically Offered: Fall.

CE 5200 Fluid Dynamics (3 credits)
Cross-listed with ME 5200
Joint-listed with ME 4200
Credit not granted for both ME 4200 and ME 5200. A second fluid dynamics course featuring vector calculus and integral and differential forms of the conservation laws. Topics include fluid properties, fluid statistics, inviscid flow; conservation of mass, momentum, and energy; and turbulence. Other topics may be covered. Additional projects/assignments required for graduate credit.

CE 5210 Sedimentation Engineering (3 credits)
Intro to river morphology and channel responses; fluvial processes of erosion, entrainment, transportation, and deposition of sediment.
Prereqs: CE 4280 or Permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5220 Hydraulic Structures Analysis and Design (3 credits)
Hydraulic design and stability analysis of hydraulic structures, such as dams, weirs, spillways, stilling basins, culverts, levees, fish ladders etc. Project oriented problems. Extra design projects or different design projects for grad credit. One field trip.
Prereqs: CE 3220 or Equivalent, ENGR 3600, or Permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5230 Fluid Transients (3 credits)
Development of concepts and modeling techniques for unsteady flow of liquid and gas in piping systems; extensive computer programming used to develop tools for analysis, design, and control of transients. (Alt/years)
Prereqs: MATH 3100 and ENGR 3350. A minimum grade of C or better is required for all pre/corequisites.

CE 5260 Aquatic Habitat Modeling (3 credits, max 6)
The course objective is to learn the underlying principles of all components required for aquatic habitat modeling, to be able to perform such projects in riverine ecosystems including project design, data collection, data analysis and interpretation of the results and to learn the use of computational aquatic habitat models. Students will be working on their own modeling projects using the simulation model CASiMiR.
Prereqs: CE 3220 and CE 3250; or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 5270 Environmental Hydrodynamics (3 credits)
The course analyzes solute transport and mixing in rivers. It provides the derivation and analysis of the equations governing solute mixing and transport and shows the connection between mixing and flow field. It presents molecular and turbulent diffusion, dispersion, vertical, lateral, and longitudinal mixing, and the effects of river irregularities and curved channels. The course includes individual projects.
Prereqs: CE 4280 or permission. A minimum grade of C or better is required for all pre/corequisites.

CE 5280 Fluvial Geomorphology and River Mechanics (3 credits)
Hydraulic and morphologic processes of rivers. Drainage network development, channel hydraulics and shear stress partitioning via boundary layer theory, hydraulic geometry and cross-sectional form, sediment transport and bed material sampling, reach-scale morphologies and processes from headwater streams to lowland rivers, physical processes of forest rivers, sediment budgets, and river valley evolution. Field exercises emphasize quantitative analysis of fluvial processes and channel form, acquisition of field skills (measuring hydraulic and geomorphic variables, topographic surveying), and scientific writing. Typically Offered: Fall.
Prereqs: CE 4280 or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 5280L Geomorphology Lab (1 credit)
This is the companion laboratory course to CE 5280. Two to three 1-day field trips to local rivers for measurement of channel conditions and assessment of river history. Students will gain hands-on experience in commonly used instrumentation and methods for quantifying river processes. Typically Offered: Fall.
Prereqs: Instructor permission

CE 5290 River Restoration (3 credits)
Joint-listed with CE 4290
This course focuses on the principles and practices used in river restoration. The potential assumptions and errors with common restoration methodologies and possible ways to improve such channel designs are discussed. A number of case studies are used to evaluate the success of various restoration techniques. The course includes homework sets and individual projects and has a mandatory field trip to a local restored site near the student. Additional projects/assignments are required for graduate credit. Typically Offered: Spring (Odd Years).

CE 5295 Center for Ecohydraulics Research Keystone Course (3 credits)
This class prepares students to independently conduct their own research project. Students apply fundamental knowledge in biology, engineering, and/or geomorphology to solve an applied research problem. Students will work in interdisciplinary teams to conduct a research project from beginning to end. To test their hypotheses, students will conduct laboratory flume measurements and use applied statistics. Techniques in scientific writing, scientific presentations, and literature review will also be taught over the semester. Students will write the results of their investigations into a scientific research paper. Typically Offered: Spring.
Prereqs: MATH 1750 and PHYS 2110

CE 5300 Advanced Topics in Waste Management and Treatment (3 credits)
Modeling, analysis, and design of advanced and emerging engineering technologies and processes for waste management/treatment and resource recovery.
Prereqs: Instructor Permission

CE 5310 Design of Water and Wastewater Systems I (3 credits)
Joint-listed with CE 4310
Application of fundamental engineering science to the design of systems for the treatment of domestic and industrial water supplies; treatment and re-use of domestic sewage and industrial wastes. Additional projects/assignments required for graduate credit. Typically Offered: Varies.

CE 5320 Design of Water and Wastewater Systems II (3 credits)
Joint-listed with CE 4320
Application of unit operations and processes to design of integrated wastewater treatment systems; critical analysis of existing designs. Additional projects/assignments required for grad credit. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

CE 5430 Dynamics of Structures (3 credits)
Equations of motion, free vibration, damping mechanisms, harmonic, impulse, and seismic loading; shock and seismic response spectra, time and frequency domain analysis, modal analysis, structural dynamics in building codes. Cooperative: open to WSU degree-seeking students.

CE 5440 Advanced Design of Steel Structures (3 credits)
Plate girder design; local and global buckling; plastic collapse analysis; shear and moment-resisting connections; eccentrically-loaded connections. Possible field trip. Typically Offered: Fall.
Prereqs: C or better in CE 4440 or Permission Cooperative: open to WSU degree-seeking students.

CE 5450 Matrix Structural Analysis (3 credits)
Joint-listed with CE 4450
Formulation of the analysis of trusses, beams, and frames using the stiffness method of matrix structural analysis; development of element properties, coordinate transformations, and global analysis theory; special topics such as initial loads, member and joint constraints, and nonlinear analysis. Special project demonstrating mature understanding of materials required for graduate credit. Typically Offered: Varies.

CE 5460 Finite Element Analysis (3 credits)
Cross-listed with ME 5490
Formulation of theory from basic consideration of mechanics; applications to structural engineering, solid mechanics, soil and rock mechanics; fluid flow.
Prereqs: ME 3410 or CE 3420. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5470 Reliability of Engineering Systems (3 credits)
Cross-listed with ME 5830
Fundamentals of reliability theory, system reliability analysis including common-mode failures and fault tree and event tree analysis, time-dependent reliability including testing and maintenance, propagation of uncertainty, human reliability analysis, practical applications in component and system design throughout the semester.
Prereqs: Permission Cooperative: open to WSU degree-seeking students.

CE 5480 Bridge Design (3 credits)
Joint-listed with CE 4480
Structural systems for bridges, loading analysis by influence lines, slab and girder bridges, composite design, pre-stressed concrete, rating of existing bridges, specifications, and economic factors. Typically Offered: Varies.

CE 5490 Timber Design (3 credits)
Joint-listed with CE 4490
Design and detailing of wood structural components. Application to industry problems. Additional work required for graduate level credit. Typically Offered: Fall (Even Years).

CE 5550 Advanced Pavement Design and Analysis (3 credits)
Design of new and rehabilitated asphalt and Portland cement concrete pavements; mechanistic-empirical design procedures; performance models; deflection-based structural analysis, overlay design, environmental effects; long-term pavement performance (LTPP), and introduction to research topics in pavement engineering.
Prereqs: CE 4550 or equivalent, or permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5560 Properties of Highway Pavement Materials (3 credits)
Physical and mechanical properties of asphalt and Portland cement concrete materials; design of asphalt concrete mixes; introduction to viscoelastic theory; characterization methods, emphasizing fatigue, rutting and thermal cracking; modification and upgrading techniques. Three 1-hour lectures per week and variable number of lab hours for demonstration.
Prereqs: CE 3570 or equivalent, or permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5580 Rigid and Airport Pavement Design (3 credits)
Design and evaluation of rigid and airport pavement. Recommended preparation: CE 4550 or permission. Typically Offered: Spring (Odd Years). Cooperative: open to WSU degree-seeking students.

CE 5610 Engineering Properties of Soils (3 credits)
Physical properties, compressibility and consolidation, shear strength, compaction, saturated and unsaturated soils, laboratory and field methods of measurement, relations of physical and engineering properties, introduction to critical-state soil mechanics.
Prereqs: CE 3600. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5620 Advanced Foundation Engineering (3 credits)
Interpretation of in-situ tests for foundation design parameters, bearing capacity and settlement of axially loaded piles, pile groups, and drilled shafts, pile dynamics, laterally loaded deep foundations, downdrag and uplift of deep foundations, foundation load and integrity testing methods and data interpretation, mat foundations.
Prereqs: CE 3600 or Permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5630 Seepage and Slope Stability (3 credits)
Cross-listed with GEOE 5350
Principles governing the flow of water through soils; mechanics of stability analysis of slopes, landslides, and embankments for soil and rock masses; probabilistic analyses; stabilization methods. Typically Offered: Spring (Even Years).
Prereqs: CE 3600 or Permission. A minimum grade of C or better is required for prerequisite Cooperative: open to WSU degree-seeking students.

CE 5660 Geotechnical Earthquake Engineering (3 credits)
Faulting and seismicity; site response analysis; probabilistic seismic hazard assessment; dynamic soil properties; influence of soil on ground shaking; response spectra; soil liquefaction; seismic earth pressures; seismic slope stability; earthquake resistant design.
Prereqs: CE 3600 or equivalent, or permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5710 Traffic Flow Theory (3 credits)
Introduction to elements of traffic flow theory including principles of traffic stream characteristics, capacity, queuing theory, and shock waves; application of traffic flow theory to freeway and arterial traffic flow problems. Typically Offered: Spring.
Prereqs: Permission Cooperative: open to WSU degree-seeking students.

CE 5720 Transportation Planning (3 credits)
Concepts and methods of transportation planning, including network modeling, travel demand forecasting, and systems evaluation of multi-modal transportation systems. Typically Offered: Fall.
Prereqs: Permission Cooperative: open to WSU degree-seeking students.

CE 5740 Intersection Traffic Operations (3 credits)
Application of traffic simulation models to the design and operations of traffic facilities, including intersection, arterials; assessment and design of traffic signal timing strategies. Typically Offered: Spring.
Prereqs: Permission Cooperative: open to WSU degree-seeking students.

CE 5750 Public Transportation (3 credits)
Concepts and principles of planning and operations of public transportation systems, including bus transit, rail transit, and paratransit modes.
Prereqs: Permission Cooperative: open to WSU degree-seeking students.

CE 5760 Traffic Safety (3 credits)
Joint-listed with CE 4760
Analysis of roadway design alternatives and control strategies with respect to crash probabilities. Statistical models for safety analysis. Crash countermeasure selection and evaluation methodology. Risk management. Additional projects/assignments are required for graduate credit. Typically Offered: Spring.
Coreqs: ENGR 3600 or Permission

CE 5770 Pavement Preservation and Management (3 credits)
This course addresses several aspects of pavement evaluation, preservation, rehabilitation, and management. The primary objective of this course is to provide the civil engineering graduate students with state-of-the-art knowledge needed to maintain our roadways in serviceable condition. The course covers different methods used to evaluate the performance of pavements, distresses in flexible and rigid pavements, project and network level pavement management, various preservation and rehabilitation techniques and selection of the appropriate approaches for preservation and rehabilitation.
Prereqs: CE 4550 or equivalent, or permission. A minimum grade of C or better is required for all pre/corequisites. Cooperative: open to WSU degree-seeking students.

CE 5980 (s) Internship (1-16 credits, max 99)
Credit arranged

CE 5990 (s) Non-thesis Master's Research (1-16 credits, max 99)
Credit arranged. Research not directly related to a thesis or dissertation.
Prereqs: Permission

CE 6000 Doctoral Research and Dissertation (1-45 credits, max 99)
Credit arranged