

CIVIL ENGINEERING (CE)

CE 105 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.

CE 115 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 200 (s) Seminar (1-16 credits)

Credit arranged

CE 203 (s) Workshop (1-16 credits)

CE 204 (s) Special Topics (1-16 credits)

Credit arranged

CE 211 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.

Prereqs: 'C' or better in CE 105 and MATH 170

CE 215 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 123 and MATH 170. A minimum grade of 'C' or better is required for all prereqs.

CE 298 (s) Internship (1-16 credits)

Credit arranged

CE 299 (s) Directed Study (1-16 credits)

Credit arranged

CE 322 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.

Prereqs: CE 215, MATH 310, PHYS 211, ENGR 220 and ENGR 335. A minimum grade of 'C' or better is required for all pre/coreqs.

CE 325 Fundamentals of Hydrologic Engineering (3 credits)

Cross-listed with BE 355

Principles of hydrologic science and their application to the solution of hydraulic, hydrologic, environmental, and water resources engineering problems.

Prereqs: MATH 310, STAT 301, and ENGR 335. A minimum grade of 'C' or better is required for all pre/coreqs.

CE 330 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.

Prereqs: CHEM 111, CE 215 and MATH 310. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 342 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.

Prereqs: ENGR 350, MATH 275, MATH 310, and PHYS 211/PHYS 211L. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 357 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.

Prereqs: CE 215, ENGR 350, MATH 310. 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 301

CE 360 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.

Prereqs: CE 215, ENGR 335, ENGR 350, and MATH 310. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 372 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.

Prereqs: STAT 301 and CE 211. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 398 (s) Internship (1-16 credits)

Credit arranged

CE 400 (s) Seminar (1-16 credits)

Credit arranged

CE 403 (s) Workshop (1-16 credits)

Credit arranged

CE 404 (s) Special Topics (1-16 credits)

Credit arranged

CE 408 Advanced Engineering Computer-Aided Design and Drafting (3 credits)

Joint-listed with CE 508

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 105 or Equivalent

CE 411 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 P/F.

Prereqs: Senior standing or Permission

CE 413 Bridge Design (3 credits)

Joint-listed with CE 513

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.

Prereqs: CE 441 or CE 444

CE 415 Timber Design (3 credits)

Joint-listed with CE 515

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 342.

CE 417 River Restoration (3 credits)

Joint-listed with CE 507

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. Recommended classes to take prior to this include at least one of the following: CE 535, CE 322, CE 428, or CE 520. Typically Offered: Spring (Odd Years).

Prereqs: ENGR 335 or Instructor Permission

CE 421 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 325 with a C or better Cooperative: open to WSU degree-seeking students.

CE 422 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 322 or Equivalent, ENGR 360, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 428 Open Channel Hydraulics (3 credits)

Hydraulics of uniform and varied flow in open channels with fixed and movable beds. Recommended Preparation: CE 322. Cooperative: open to WSU degree-seeking students.

CE 431 Design of Water and Wastewater Systems I (3 credits)

Joint-listed with CE 511

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.

Prereqs: CE 322, CE 330, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 432 Design of Water and Wastewater Systems II (3 credits)

Joint-listed with CE 532

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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 431. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 441 Reinforced Concrete Design (3 credits)

Strength design method in accordance with latest ACI code. Two lectures and one 2-hour lab per week.

Prereqs: CE 342. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 444 Steel Design (3 credits)

Structural steel design using latest AISC specifications. Two lectures and one 2-hour lab per week, possible field trip.

Prereqs: 'C' or better in CE 342

CE 445 Matrix Structural Analysis (3 credits)

Joint-listed with CE 545

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.

Prereqs: CE 342 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 460 Geotechnical Engineering Design (3 credits)

Applications of soil mechanics in design of shallow and deep foundations, earth retaining structures, excavations, and soil exploration.

Prereqs: CE 360 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 473 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 211. 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 372

CE 474 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 lec and one 3-hr lab a wk; field data collection and field site visits. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 372 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 475 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.

Prereqs: CE 357 or Equivalent, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 476 Traffic Safety (3 credits)

Joint-listed with CE 576

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 301 or Permission

Coreqs: ENGR 360 or Permission

CE 484 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.

Prereqs: Senior standing in engineering

CE 491 Civil Engineering Professional Seminar (2 credits)

Employment and technical topics; professional writing; ethics; preparation for Senior Design Project.

Prereqs: Senior standing in Civil Engineering

CE 493 Senior Design I (2 credits)

General Education: Senior 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 494 Senior Design II (3 credits)

General Education: Senior 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 493; Senior standing in Civil Engineering; and Permission

CE 498 (s) Internship (1-16 credits)**CE 499 (s) Directed Study (1-16 credits)**

Credit arranged

CE 500 Master's Research and Thesis (1-16 credits)

Credits arranged

CE 501 (s) Seminar (1-16 credits, max arranged)

Credit arranged. Conferences and reports on current developments.

CE 502 (s) Directed Study (1-16 credits)

Credits arranged

CE 503 (s) Workshop (1-16 credits)

Credit arranged

CE 504 (s) Special Topics (1-16 credits)

Credit arranged

CE 505 (s) Professional Development (1-16 credits)**CE 507 River Restoration (3 credits)**

Joint-listed with CE 417

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. Recommended classes to take prior to this include at least one of the following: CE 535, CE 322, CE 428, or CE 520. Typically Offered: Spring (Odd Years).

CE 508 Advanced Engineering Computer-Aided Design and Drafting (3 credits)

Joint-listed with CE 408

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 510 Advanced Mechanics of Materials (3 credits)

Cross-listed with ME 539

Limitations of results of elementary mechanics of materials, complex situations of loading and structural geometry, applications to design of machines and structure, introduction to elasticity. Cooperative: open to WSU degree-seeking students.

Prereqs: ME 341 or CE 342

CE 511 Design of Water and Wastewater Systems I (3 credits)

Joint-listed with CE 431

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.

Prereqs: CE 322, CE 330, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 512 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 513 Bridge Design (3 credits)

Joint-listed with CE 413

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. Cooperative: Open to WSU degree-seeking students.

Prereqs: CE 441 or CE 444

CE 515 Timber Design (3 credits)

Joint-listed with CE 415

Design and detailing of wood structural components. Application to industry problems. Additional work required for graduate level credit. Typically Offered: Fall (Even Years).

CE 520 Fluid Dynamics (3 credits)

Cross-listed with ME 520

Joint-listed with ME 420

Credit not granted for both ME 420 and ME 520. 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.

Prereqs: ENGR 335, MATH 310, or Permission

CE 521 Sedimentation Engineering (3 credits)

Intro to river morphology and channel responses; fluvial processes of erosion, entrainment, transportation, and deposition of sediment.

Cooperative: open to WSU degree-seeking students.

Prereqs: CE 428 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 522 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 cr. One field trip. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 322 or Equivalent, ENGR 360, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 526 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 322 and CE 325; or Permission. A minimum grade of C or better is required for all pre/corequisites.

CE 532 Design of Water and Wastewater Systems II (3 credits)

Joint-listed with CE 432

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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 431. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 533 Water Quality Management (3 credits)

Joint-listed with CE 433

Physical, chemical, and biological techniques for analysis of water quality management problems; development of design criteria for corrective systems. Additional projects/assignments required for graduate credit.

CE 535 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. (Alt/ yrs)

Prereqs: CE 428 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 535L Geomorphology Lab (1 credit)

This is the companion laboratory course to CE 535. 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 541 Reliability of Engineering Systems (3 credits)

Cross-listed with ME 583

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. Cooperative: open to WSU degree-seeking students.

Prereqs: Permission

CE 542 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. Cooperative: open to WSU degree-seeking students.

Prereqs: 'C' or better in CE 444 or Permission

CE 543 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 545 Matrix Structural Analysis (3 credits)

Joint-listed with CE 445

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.

Prereqs: CE 342 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 546 Finite Element Analysis (3 credits)

Cross-listed with ME 549

Formulation of theory from basic consideration of mechanics; applications to structural engineering, solid mechanics, soil and rock mechanics; fluid flow. Cooperative: open to WSU degree-seeking students.

Prereqs: ME 341 or CE 342. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 550 Experimental Methods in Fluid Dynamics (3 credits)

Cross-listed with ME 551

Joint-listed with ME 450

The objective of this course is to develop the knowledge and skills to be able to design and perform fluid dynamics experiments (and experiments in related areas) and to interpret and report the results. Learn the words, the concepts, and experimental skills in areas including dimensional analysis and scaling of experiments, flow visualization, velocity and flow rate measurements, turbulence measurements, and sediment sizing and transport measurements. Additional projects/assignments required for graduate credit. One 1-1/2 hr lecture and one 3-hour lab per week.

Recommended Preparation: ENGL 317 and ENGR 335

CE 554 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 428 or permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 555 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.

Prereqs: MATH 175 and PHYS 211

CE 556 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 357 or equivalent, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 561 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 360. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 562 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 360 or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 563 Seepage and Slope Stability (3 credits)

Cross-listed with GEOE 535

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. Cooperative: open to WSU degree-seeking students. (Alt/even years, Spring only)

Prereqs: CE 360 or GEOE 436; or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 566 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 360 or Equivalent, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 571 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. Cooperative: open to WSU degree-seeking students. (Alt/years)

Prereqs: Permission

CE 572 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. Cooperative: open to WSU degree-seeking students. (Alt/years)

Prereqs: Permission

CE 573 Transportation Planning (3 credits)

Concepts and methods of transportation planning, including network modeling, travel demand forecasting, and systems evaluation of multi-modal transportation systems. Cooperative: open to WSU degree-seeking students. (Alt/years)

Prereqs: Permission

CE 574 Public Transportation (3 credits)

Concepts and principles of planning and operations of public transportation systems, including bus transit, rail transit, and paratransit modes. Cooperative: open to WSU degree-seeking students. (Alt/years)

Prereqs: Permission

CE 575 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. Cooperative: open to WSU degree-seeking students.

Prereqs: CE 475 or Equivalent, or Permission. A minimum grade of 'C' or better is required for all pre/corequisites.

CE 576 Traffic Safety (3 credits)

Joint-listed with CE 476

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 360 or Permission

CE 577 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 475 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 585 Rigid and Airport Pavement Design (3 credits)

Design and evaluation of rigid and airport pavement. Cooperative: open to WSU degree-seeking students. Recommended preparation: CE 475 or permission. Typically Offered: Spring (Odd Years).

CE 598 (s) Internship (1-16 credits)

Credit arranged

CE 599 (s) Non-thesis Master's Research (1-16 credits)

Credit arranged. Research not directly related to a thesis or dissertation.

Prereqs: Permission

CE 600 Doctoral Research and Dissertation (1-45 credits)

Credit arranged