CIVIL AND CONSTRUCTION ENGR (CCE)

CCE 101. CIVIL AND CONSTRUCTION ENGINEERING ORIENTATION. (2 Credits)
Introduction to civil and construction engineering professions; problem solving, communication skills. This course is required by the CE, CEM and FE programs.
Equivalent to: CE 101
Recommended: MTH 111 and completion or concurrent enrollment in MTH 112 or MTH 251

CCE 102. CIVIL AND CONSTRUCTION ENGINEERING: PROBLEM-SOLVING AND TECHNOLOGY. (3 Credits)
A skills-based course that focuses on introducing freshman students to the use of hand calculation and computer technology in solving civil engineering and construction engineering problems. Topics to be covered include structured approach to problem solving, use of Excel for engineering applications, internet tools and data bases, homework professionalism. Opportunities for involvement with ASCE and AGC student chapters. Lec/lab.
Equivalent to: CE 102
Recommended: Completion or concurrent enrollment in MTH 112 or MTH 251

CCE 201. CIVIL AND CONSTRUCTION ENGINEERING GRAPHICS AND DESIGN. (3 Credits)
Introduces the engineering design process and graphic skills that are used by civil and construction engineers. Topics include design process, geometric construction, multiviews, auxiliary views, sections, dimensioning, tolerances and engineering drawing standards. Students participate in team design projects and presentations. Graphic and design projects from the areas of civil and construction engineering. Lec/lab.
Prerequisites: MTH 111 with C or better or MTH 112 (may be taken concurrently) with C or better or MTH 241 (may be taken concurrently) with C or better or MTH 251 (may be taken concurrently) with C or better
Equivalent to: CE 201

CCE 203. INTRODUCTION TO VIRTUAL DESIGN AND CONSTRUCTION. (3 Credits)
Basic principles of virtual design and construction (VDC) focusing on skills required for generating design and construction information models. Parametric modeling and design constraints are introduced. Students will utilize construction drawings and documentation to create accurate 3D models. Use of design and construction information models for making estimates of quantities and cost, and for determination of constructability problems. Lec/lab.
Prerequisites: CCE 201 with C or better or ENGR 248 with C or better

CCE 207. CCE SEMINAR. (1 Credit)
Professional practices of civil and construction engineering.
Recommended: Sophomore standing

CCE 321. CIVIL AND CONSTRUCTION ENGINEERING MATERIALS. (4 Credits)
Highway materials; aggregate, concrete and asphalt. Standard test methods.
Prerequisites: ((ENGR 213 with C or better or ENGR 213H with C or better) and (ST 314 [C] or BA 276 [C]))
Equivalent to: CCE 321H, CE 321

CCE 321H. CIVIL AND CONSTRUCTION ENGINEERING MATERIALS. (4 Credits)
Highway materials; aggregate, concrete and asphalt. Standard test methods.
Attributes: HNRS – Honors Course Designator
Prerequisites: (ENGR 213 with C or better or ENGR 213H with C or better) and (ST 314 [C] or BA 276 [C])
Equivalent to: CCE 321

CCE 421. ADVANCED CONCRETE PROPERTIES AND PERFORMANCE. (4 Credits)
Cement production, hydration, supplementary cementitious materials, mixture design and proportioning, heat of hydration, volume stability, shrinkage, cracking, expansion, creep, relaxation, admixtures, alternative binders, strength gain, durability.
Prerequisites: CCE 321 with C or better

CCE 422. GREEN BUILDING MATERIALS. (3 Credits)
Introduces concepts of construction with green building materials. Specific concepts include evaluation of what truly makes a material "green", long-term performance (e.g., durability) of materials, material production and life cycle cost analysis. Concepts of green building programs, guidelines and specifications will be introduced.
Prerequisites: CE 321 with C or better or CCE 321 with C or better
Recommended: (ECON 201 or ECON 201H or ECON 202 or ECON 202H) and ST 314

CCE 424. ASPHALT FUNDAMENTALS. (3 Credits)
Focuses on characterization of asphalt materials and mixtures, current laboratory testing technology for asphalt binders and mixes, engineering of asphalt mixes to meet design requirements, asphalt recycling process, environmental impacts of asphalt pavements, and recent developments in asphalt technology.
Prerequisites: CCE 321 with C or better

CCE 520. SELECTED TOPICS IN INFRASTRUCTURE MATERIALS. (0-4 Credits)
A critical examination of in-depth topics selected by the instructor from among topics not covered in other infrastructure materials courses.
This course is repeatable for 16 credits.

CCE 522. GREEN BUILDING MATERIALS. (3 Credits)
Introduces concepts of construction with green building materials. Specific concepts include evaluation of what truly makes a material "green", long-term performance (e.g., durability) of materials, material production and life cycle cost analysis. Concepts of green building programs, guidelines and specifications will be introduced.
Recommended: (CE 321 or CCE 321) and (ECON 201 or ECON 201H or ECON 202 or ECON 202H) and ST 314

CCE 523. CONCRETE DURABILITY. (4 Credits)
Cement production, supplementary cementitious materials, mixture proportioning, concrete durability, freeze-thaw attack, sulfate attack, corrosion, alkali-silica reaction, long-term performance, durability prediction and modeling, durability of alternative cement, multi-scale assessment, dimensional stability.
Recommended: CCE 321 or similar introductory materials course or CCE 421

CCE 524. ASPHALT FUNDAMENTALS. (3 Credits)
Focuses on characterization of asphalt materials and mixtures, current laboratory testing technology for asphalt binders and mixes, engineering of asphalt mixes to meet design requirements, asphalt recycling process, environmental impacts of asphalt pavements, and recent developments in asphalt technology.

CCE 525. CONSTRUCTION SITE SYSTEMS ENGINEERING. (3 Credits)
Design and planning of construction site field operations and engineered systems. Systems analysis and design as it applies to civil engineering projects. Design of construction systems: blasting; rock crushing and conveying; dewatering; cranes, pile driving, and rigging; and concrete pumping and placement. Construction site design and process design.

CCE 526. DESIGN FOR SAFETY. (3 Credits)
Theoretical concepts and industry practices used to model, evaluate, and improve construction worker safety through the design of the project features, construction operations, and site safety program elements. Causes of construction site accidents, hazard recognition and comprehension, safety risk valuation and mitigation, and the true costs of injuries and fatalities.

CCE 528. ADVANCED VIRTUAL DESIGN AND CONSTRUCTION. (4 Credits)
Focusing on the skills and information needed to effectively use an existing Building Information Model (BIM) in plan execution for a building construction project. This is a project based course where students gain knowledge on the implementation of BIM concepts throughout the lifecycle of a building, from planning and design, to construction and operations.
Recommended: CCE 203 [D-]

CCE 529. LEAN CONSTRUCTION. (3 Credits)
Introduction to the basics of lean production management, especially about how they are applied to the AEC industry to improve the operation management and product development. Class topics include theory of manufacturing science, principles of the lean production system, application of production management to project management, variability management in design and construction, improving project performance in the AEC industry, data gathering and process evaluation for productivity improvement.

CCE 552. PROJECT RISK MANAGEMENT. (4 Credits)
An introduction to the concept of project risk in producing constructed engineering projects. Course content includes project baselining, risk definition and identification, risk assessment and management techniques, risk control, risk response, and risk management. CROSSLISTED as IE 586.
Equivalent to: IE 586

CCE 554. PROFESSIONAL RESPONSIBILITY AND ETHICS. (3 Credits)
An in-depth exploration of professional engineering ethics. Course content includes conceptual theoretical basis of ethics, ethics among professional organizations, ethical consideration of design, critical analysis of ethical situations, ethics in the workplace, and ethical considerations regarding the broader environment. CROSSLISTED as IE 589.
Equivalent to: IE 589

CCE 599. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

CCE 621. DURABILITY AND CONDITION ASSESSMENT OF REINFORCED CONCRETE. (4 Credits)
Concrete durability including freeze-thaw attack, sulfate attack, corrosion, alkali-silica reaction, long-term performance, durability modeling, durability of alternative cements. Non-destructive condition assessment; model-assisted testing; corrosion detection and monitoring; multi-scale assessment; service/remaining life predictions.
Prerequisites: CCE 523 with C or better
Recommended: CCE 321

CCE 623. CORROSION OF METALS AND CORROSION CONTROL. (4 Credits)
Corrosion science and corrosion engineering of metals in various environments. Thermodynamics of corrosion. Electrode kinetics and rates of corrosion. Mixed potential theory. Passivity. Measurement of corrosion. Corrosion prevention through materials selection, design, cathodic and anodic protection and coatings. Discussion of critical material-environment combinations such as corrosion of oil/gas pipelines, corrosion of steel in concrete, corrosion in marine environments, microbially induced corrosion (MIC), corrosion of implants in biological media. Cost of corrosion.
Recommended: CH 202 or CH 231 or CH 231H or CCE 321

CCE 624. SERVICE LIFE MODELING OF INFRASTRUCTURE MATERIALS. (4 Credits)
Service life modeling for infrastructure materials. Solution of generic boundary and initial value problems related to material deterioration. Heat and moisture transport modeling in porous media. Multi-species and multi-mechanism ionic transport in porous media. Reactive-transport modeling. Coupled problems. Corrosion modeling. Introduction to non-linear problems. Introduction to thermodynamic modeling.
Recommended: Undergraduate level calculus and chemistry courses