SCHOOL OF CIVIL AND CONSTRUCTION ENGINEERING

The mission of the School of Civil and Construction Engineering is that of the College of Engineering (see college statement on mission and goals), as well as providing a comprehensive, state-of-the-art education to prepare students for professional and responsible engineering and constructor positions with business, industry, consulting firms, or government.

Education in the basic sciences occurs primarily in the freshman and sophomore years. Engineering science is introduced at the sophomore year and continues through to graduation with a combination of required courses and technical electives. Completion of the OSU Baccalaureate Core provides experience in the humanities, social sciences, and other nontechnical areas as additional preparation for a student’s profession and life.

The CCE School offers an undergraduate option in environmental engineering that provides education in water pollution, air pollution, solid wastes, and hazardous wastes.

The growing complexity of modern engineering practice requires further specialization in one or more engineering disciplines. This is generally attained through postgraduate study. The CCE School offers MEng, MS, and PhD programs with concentrations in civil engineering, coastal and ocean engineering, construction engineering management, geomatics, geotechnical engineering, infrastructure materials, structural engineering, transportation engineering, and water resources engineering.

Areas of concentration may be combined to form an integrated civil engineering MS program, MEng program, or MEng, MS, and PhD minors.

The school also participates in the Master of Arts in Interdisciplinary Studies program.

Undergraduate Programs

Majors

• Civil Engineering (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/civil-engineering-ba-bs-hba-hbs)

Pre-Civil Engineering (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/pre-civil-engineering)

• Construction Engineering Management (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/construction-engineering-management-ba-bs-hba-hbs)

Pre-Construction Engineering Management (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/pre-construction-engineering-management)

Graduate Programs

Major

• Civil Engineering (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/civil-engineering-meng-ms-phd-mais)

Minor

• Civil Engineering (http://catalog.oregonstate.edu/college-departments/engineering/school-civil-construction-engineering/civil-engineering-graduate-minor)

W. Jason Weiss, School Head
Shane Brown, Associate Head for Undergraduate Affairs
Merrick Haller, Associate Head for Graduate Affairs

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Faculty

Professors
Ashford\(^1\), Bell\(^1\), Cox, Gambatese\(^1\), Higgins\(^1\), Istok\(^1\), Liu, Ozkan-Haller, Schultz\(^1\), Trejo\(^1\), Yeh\(^1\), Weiss, Yim\(^1\)

Associate Professors
Brown\(^1\), Evans, Haller, Hill, Hunter-Zaworski\(^1\), Isgor\(^1\), Lundy\(^1\), Miller\(^1\), Ozkan-Haller, Parrish, Scott, Sillars\(^1\)

Assistant Professors
Arocho, Babbar-Sebens, Barbosa\(^1\), Coleri, Borello, Gillins, Hernandez, Hurwitz, Ideker, Lee, Leon, Mason, Olsen, Park\(^1\), Stuedlein\(^1\), Wang

Adjuncts
Gupta, Sinha

Senior Instructors
Arras, Fradella\(^1\)

Instructors
Berger\(^1\), Martin

Academic Advisors
Nave-Abele, Whitehead

Emeritus
Bell\(^1\), Bella\(^1\), Huber\(^1\), Hudspeth\(^1\), Klingeman\(^1\), Layton\(^1\), Pritchett\(^1\), Rogge\(^1\), Schroeder\(^1\), Sollitt

\(^1\) Licensed Professional Engineer

Civil and Construction Engineering

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.

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.
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 251 (may be taken concurrently) with C or better

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 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

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

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.

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.

CCE 524. ASPHALT FUNDAMENTALS. (3 Credits)
Characterization of asphalt materials and mixes, 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 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

CCE 623. CORROSION OF METALS AND CORROSION CONTROL. (4 Credits)

Construction Engineering Management

CEM 263. PLANE SURVEYING. (3 Credits)
Use of field surveying equipment; error analysis; plane surveying methods applied to construction; plane coordinate computations; topographic mapping; and introduction to GPS. Lec/lab.
Prerequisites: ENGR 211 with C or better or ENGR 211H with C or better

CEM 311. HYDRAULICS. (4 Credits)
Pressure and energy concepts of fluids, fluid measurements, flow in pipes and open channels.
Prerequisites: ENGR 211 with C or better or ENGR 211H with C or better

CEM 326. CONSTRUCTION SAFETY. (3 Credits)
Training in construction safety with emphasis on hazard identification, avoidance, control, and prevention. Lec/rec.

CEM 341. CONSTRUCTION ESTIMATING I. (4 Credits)
Fundamentals of estimating and bidding construction projects; plan reading, specification interpretation; quantity take-off; types of estimates; estimating and methods of construction for sitework, concrete, and carpentry; estimating subcontracts, estimating job overhead and home office overhead; estimating profit, and computer-aided estimating.

CEM 342. CONSTRUCTION ESTIMATING II. (4 Credits)
Fundamentals of estimating and bidding construction projects; plan reading, specification interpretation; quantity take-off; types of estimates; estimating and methods of construction for sitework, concrete, and carpentry; estimating subcontracts, estimating job overhead and home office overhead; estimating profit, and computer-aided estimating.
Prerequisites: CEM 341 with C or better

CEM 343. CONSTRUCTION PLANNING AND SCHEDULING. (4 Credits)
Principles of construction planning, scheduling, and resource optimization; scheduling techniques and calculations; methods for integrating project resources (materials, equipment, personnel, and money) into the schedule.
Prerequisites: CEM 342 (may be taken concurrently) with C or better

CEM 381. STRUCTURES I. (4 Credits)
Introduction to statically determinate analysis and design of steel structures. Lec/rec.
Prerequisites: ENGR 213 with C or better or ENGR 213H with C or better

CEM 383. STRUCTURES II. (4 Credits)
Analysis and design of building elements of concrete and timber; detailing and fabrication. Lec/rec.
Prerequisites: CCE 321 (may be taken concurrently) with C or better and CEM 381 [C]

CEM 403. THESIS. (1-16 Credits)
This course is repeatable for 16 credits.

CEM 405. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

CEM 406. PROJECTS. (1-16 Credits)
This course is repeatable for 16 credits.

CEM 407. SEMINAR. (1 Credit)
Professional practices of construction engineering management.

CEM 431. OBTAINING CONSTRUCTION CONTRACTS. (4 Credits)
Preparing and effectively presenting detailed and complete proposals for the execution of construction projects.
Prerequisites: CEM 341 with C or better
Equivalent to: CEM 432

CEM 432. CONSTRUCTION PROJECT PLANNING. (3 Credits)
Planning and preparing cost estimates, schedules, site logistics plans for executing construction projects; presenting written and oral construction proposals.
Prerequisites: CEM 341 with C or better
Equivalent to: CEM 431

CEM 441. HEAVY CIVIL CONSTRUCTION MANAGEMENT. (4 Credits)
Heavy civil construction management methods. Construction equipment types, capabilities, costs, productivity, and the selection and planning of equipment needed for a project. Soil characteristics, quantity analysis, and movement on construction sites.
Prerequisites: FE 315 with C or better or CE 372 with C or better

CEM 442. BUILDING CONSTRUCTION MANAGEMENT. (4 Credits)
Building construction management and methods.

CEM 443. *PROJECT MANAGEMENT FOR CONSTRUCTION. (4 Credits)
Project management concepts for construction; concepts, roles and responsibilities, labor relations and supervision, administrative systems, documentation, quality management, and process improvement. (Writing Intensive Course)
Attributes: CWIC – Core, Skills, WIC

CEM 471. ELECTRICAL FACILITIES. (4 Credits)
Principles and applications of electrical components of constructed facilities; basic electrical circuit theory; power, motors, controls, codes, and building distribution systems. Lec/lab.

CEM 472. MECHANICAL FACILITIES. (3 Credits)
Principles and applications of mechanical components of constructed facilities; heating, ventilating, air conditioning, plumbing, fire protection, and other mechanical construction.

CEM 541. HEAVY CIVIL CONSTRUCTION MANAGEMENT. (4 Credits)
Heavy civil construction management methods. Construction equipment types, capabilities, costs, productivity, and the selection and planning of equipment needed for a project. Soil characteristics, quantity analysis, and movement on construction sites.

CEM 543. PROJECT MANAGEMENT FOR CONSTRUCTION. (4 Credits)
Project management concepts for construction; concepts, roles and responsibilities, labor relations and supervision, administrative systems, documentation, quality management, and process improvement.
CEM 550. CONTEMPORARY TOPICS IN CONSTRUCTION ENGINEERING MANAGEMENT. (4 Credits)
Contemporary topics of emerging technologies and processes, construction engineering and management, how industry environmental change causes development of new technologies, and the applications of the technologies in the field.

CEM 551. PROJECT CONTROLS. (4 Credits)
Advanced methods of project controls including advanced technologies and methodologies for quality, time, and cost management; project management organization models, and intra-organizational relationships.

CEM 552. RISK MANAGEMENT IN CONSTRUCTION. (4 Credits)
An introduction to the concept of risk in construction projects and construction firms, including risk definition, identification, assessment and management techniques; contractual risk control, sharing and shedding; and contingency management.

CEM 553. CONSTRUCTION BUSINESS MANAGEMENT. (4 Credits)
Introduction to concepts of business structures associated with the construction industry; enterprise-level management techniques; extra-organizational risk management; and operational management structuring.