CONSTRUCTION

Construction Degrees

The Charles W. Durham School of Architectural Engineering and Construction offers students an education that opens up a full range of professional opportunities in the construction industry. The two bachelor's degree options, Construction Engineering and Construction Management, are found under the Majors tab.

Degrees Offered

- Construction Engineering, Bachelor of Science (http://catalog.unomaha.edu/undergraduate/college-engineering/construction/construction-engineering-bs/)
- Construction Management, Bachelor of Science (http://catalog.unomaha.edu/undergraduate/college-engineering/construction/construction-management-bs/)

CNST 1120 CONSTRUCTION COMMUNICATIONS (3 credits)
Development of communication skills including understanding of contract documents, working drawings, technical terminology, graphic symbols, and abbreviations. Fundamentals of drafting principles, sketching, and dimensioning techniques.

CNST 1310 INTRODUCTION TO THE CONSTRUCTION INDUSTRY (1 credit)
Introduction to basic management principles and practices for labor, materials, machinery, and budgets.

CNST 2250 INTRODUCTION TO BUILDING INFORMATION MODELING (3 credits)
Introduction to Building Information Modeling (BIM) concepts and techniques. Explore the use of the Revit Architecture platform to create detailed 3D models of construction projects and other BIM-related topics such as clash detection and point-cloud models.
Prerequisite(s)/Corequisite(s): CNST 1120

CNST 2410 HORIZONTAL CONSTRUCTION (3 credits)
Introduction to earthmoving equipment and methods, labor, productivity, and economic aspects of excavation, material transportation, and fill work. Introduction to the financial principles of equipment ownership and operation.
Prerequisite(s)/Corequisite(s): MATH 1950

CNST 2420 VERTICAL CONSTRUCTION (3 credits)
Focus on vertical structures, from grade to topping out, with an emphasis on materials and material handling equipment. Includes the assembly process for a variety of applications including cast-in-place concrete, steel erection, wood framing, precast concrete, masonry structural elements, and material finishing.
Prerequisite(s)/Corequisite(s): MATH 1950

CNST 2510 CONSTRUCTION MATERIALS AND SPECIFICATIONS (3 credits)
Introduction to construction materials and proper methods of specifying to achieve design and construction goals, safety and inspection, and to meet zoning code and environmental requirements. Physical, mechanical and aesthetic properties of soils, concrete, masonry, metals, plastics and other materials will be studied as they relate to in-service conditions, acceptability, and performance.
Prerequisite(s)/Corequisite(s): MATH 1950

CNST 2520 CONSTRUCTION MATERIALS AND TESTING (3 credits)
Introduction to basic materials used in construction. Laboratory testing and evaluation of material properties of soil, aggregate, and concrete.
Prerequisite(s)/Corequisite(s): MATH 1950; parallel registration in CNST 2410 is recommended. Laboratory testing procedures emphasizing testing of aggregates, soil, and concrete.

CNST 3050 BUILDING ENVIRONMENTAL TECHNICAL SYSTEMS I (3 credits)
Characteristics and performance of buildings with respect to thermal and psychometric environment in buildings related to human comfort, heat gain/heat loss, ventilation, natural energy systems and sustainable design principles, and plumbing and life safety systems in the built environment.
Prerequisite(s)/Corequisite(s): PHYS 1050

CNST 3060 ELECTRICAL SYSTEMS (3 credits)
Fundamentals of electric power generation and distribution, service, and circuits in buildings with an emphasis on electrical equipment and systems, lighting principles and applications, and fire protection systems. Review of National Electric Code.
Prerequisite(s)/Corequisite(s): MATH 1950, PHYS 1050.

CNST 3310 STRUCTURAL MECHANICS (3 credits)
Introduction to various external force systems, and their resulting internal forces and deformations, which act on structural elements.
Prerequisite(s)/Corequisite(s): Not open to non-degree graduate students.

CNST 3320 STRUCTURAL OPTIMIZATION (3 credits)
Optimization of key properties of elements and systems of building structures: force, geometric, and material.
Prerequisite(s)/Corequisite(s): CNST 3310. Not open to non-degree graduate students.

CNST 3780 CONSTRUCTION ESTIMATING I (3 credits)
Preparation of detailed cost estimates based on contract documents. Identify and analyze cost components of building and site scopes of work to perform detailed quantity take-offs. Apply labor, material, and equipment pricing from RS Means. Use production rates and quantity takeoffs to prepare a preliminary construction schedule. Complete quantity takeoffs from 2D plans and from 3D BIM software models. (Cross-listed with CONE 3780).
Prerequisite(s)/Corequisite(s): CNST 1120.

CNST 3790 CONSTRUCTION ESTIMATING II (3 credits)
Continuation of CNST 3780 with emphasis on the determination of total project cost and preparation of complete bid proposals for self-performed and subcontracted commercial projects. Evaluation and analysis of subcontractor bids to determine overall project costs by completing a hard bid simulation scenario. Exploration of contract delivery methods and their effect on overall project cost.
Prerequisite(s)/Corequisite(s): CNST 3780

CNST 4050 MECHANICAL ESTIMATING (3 credits)
Application of estimating principles, quantity take-off, bidding strategies, and computerization to the specialty field of mechanical construction.
Prerequisite(s)/Corequisite(s): CNST3050 and CNST3060 and CNST3790

CNST 4060 ELECTRICAL ESTIMATING (3 credits)
Application of estimating principles, quantity take-off, bidding strategies, and computerization to the specialty field of electrical construction.
Prerequisite(s)/Corequisite(s): CNST 3050, CNST 3060 and 3790.

CNST 4110 PROJECT ADMINISTRATION (3 credits)
Ownership and administration of companies focusing on documentation and specifications, contracts, take-offs, estimating, bidding, bonds, insurance, project management and administration, scheduling, time and cost management, labor law and labor relations, and project safety. (Crosslisted with CNST 8116).
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4150 MECHANICAL/ELECTRICAL PROJECT MANAGEMENT (3 credits)
Fundamentals of project management within the mechanical and electrical contracting industry. Codes, contract documents, productivity, coordination, project control and administration, scheduling, safety, and project closeout, from a specialty contracting perspective. (Cross-listed with CNST8156)
Prerequisite(s)/Corequisite(s): CNST 3050, CNST 3060 and CNST 3790. CNST 4050 and CNST 4060 are recommended.

CNST 4200 PROFESSIONAL PRACTICE AND ETHICS (3 credits)
Examination of professional practice considering the perspectives of designers and the contractors and their respective relationships to society, specific client types, and other collaborators in the design and construction fields. Focus on ethics, professional communication and responsibility, professional organization, office management, environmental stewardship, professional registration, and owner-designer-contractor relationships. (Cross-listed with CNST 8206).
Prerequisite(s)/Corequisite(s): CNST 3790, LAWS 3930. Not open to non-degree graduate students.

CNST 4250 ALTERNATIVE PROJECT DELIVERY METHODS (3 credits)
Historical and current project delivery methods (PDM) are explored. Procurement strategies, contractual arrangements, and compensation methods are also discussed in conjunction with risks, costs, and legal and ethical issues that need to be considered when determining which system is best for a particular project. (Cross-listed with CNST 8256)
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4340 THE DESIGN-BUILD PROJECT DELIVERY SYSTEM (3 credits)
The organizational, managerial, ethical and legal principles involved in design-build as a project delivery system. Advantages and disadvantages, growth, merits, and criticism of the design-build system. (Cross-listed with CNST 8346)
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4360 INTENT AND APPLICATION OF INTERNATIONAL BUILDING CODE (3 credits)
Fundamentals of how to research, interpret, and apply building code requirements to the design and construction of both new and renovated structures. (Cross-listed with CNST 8366)
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4400 BUILDING INFORMATION MODELING (BIM) II (3 credits)
Advance topics in building information modeling, including structural and MEP modeling, 4/5 dimensional construction animations and visualization. Good knowledge of Revit Architectural Modeling and knowledge of construction estimating and scheduling is required before registering in this class. (Cross-listed with CNST 8406)
Prerequisite(s)/Corequisite(s): CNST 2250 and CNST 3780.

CNST 4440 CONSTRUCTION SITE SAFETY MANAGEMENT (3 credits)
Introduction to safety management for project engineers, project managers, safety teams, and company safety officers. Addresses basic accident and injury models, human accident costs, safety behavior, ethical issues in safety, workers' compensation and EMR, job safety analysis (JSA), project site safety audits, safety promotion and training, emergency planning and response, safety management programs and training, and OSHA record-keeping and reporting. (Cross-listed with CNST 8446).
Prerequisite(s)/Corequisite(s): CNST 2410 or CONE 3190. Not open to non-degree graduate students.

CNST 4760 PROJECT BUDGETS AND CONTROLS (3 credits)
The basic systems related to revenues and expenses associated with record keeping of construction contracts. Managerial accounting related to planning and control of construction projects.
Prerequisite(s)/Corequisite(s): CNST 3780 and CONE 2060.

CNST 4800 PRODUCTIVITY AND HUMAN FACTORS IN CONSTRUCTION (3 credits)
Motivation and productivity improvement methods for management in typical job environments. Methods to improve working environments in the field and office. Procedures and mechanisms to implement human behavior and ergonomics concepts for enhanced productivity and safety. (Cross-listed with CNST 8806).
Prerequisite(s)/Corequisite(s): CNST 3780, MGMT 3490. Not open to non-degree graduate students.

CNST 4820 HEAVY AND/OR CIVIL CONSTRUCTION (3 credits)
History, theory, methods, and management principles of planning and executing heavy and/or civil projects. Emerging and new equipment capabilities. Economical use of equipment and management of costs associated with production. (Cross-listed with CNST 8826, CONE 4820, CONE 8826).
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4850 CONSTRUCTION PLANNING, SCHEDULING, AND CONTROLS (3 credits)
Planning and scheduling a project using the critical path methods (CPM) with computer applications. Project pre-planning, logic networks, precedence diagrams, time estimates, critical path, float time, crash programs, scheduling, short interval schedules, pull planning, and monitoring project activities. (Cross-listed with CNST 8856, CONE 4850, CONE 8856)
Prerequisite(s)/Corequisite(s): CNST 3780. Not open to non-degree graduate students.

CNST 4860 CONSTRUCTION MANAGEMENT SYSTEMS (3 credits)
Application of selected topics in systems analysis (operations research). Simulation, mathematical optimization, queuing theory, Markov decision processes, econometric modeling, neural networks, data envelopment analysis, decision analysis, and analytic hierarchy processes as used in the industry. (Cross-listed with CNST 8866).
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CNST 4880 RESIDENTIAL CONSTRUCTION AND REAL ESTATE DEVELOPMENT (3 credits)
Application of various strategies to real estate development including community and residential design, planning, site selection, land development, marketing and customer service. Methods used by construction companies to analyze, bid, and market their developments to customers through the preconstruction and bidding process. (Cross-listed with CNST 8886)
Prerequisite(s)/Corequisite(s): CNST 3790.

CNST 4890 SENIOR CONSTRUCTION PROJECT (3 credits)
Execution of a project from conceptual design and location through estimating, bidding, site layout, planning and scheduling, cost control, records management, and project completion and documentation. Capstone course.
Prerequisite(s)/Corequisite(s): CNST 3790; CNST 4200; CNST 4760 ; CNST 4850. Pre/Coreq: CNST 4800.

CNST 4950 INTERNSHIP (3 credits)
Participation in a full-time summer internship associated with a construction-related entity. Includes weekly assignments and a final presentation designed to foster interactions between the intern and the business side of the entity. General topics include personnel and time management, structuring business plans, scheduling work, finance and budgets, marketing plans, contracts, risk analysis, and communication and leadership. (Cross-listed with CONE 4950).
Prerequisite(s)/Corequisite(s): Permission of instructor, Letter of application, Letter of agreement from industry mentor. Not open to non-degree graduate students.

CNST 4980 SPECIAL TOPICS IN CONSTRUCTION MANAGEMENT (1-6 credits)
Individual or small group study of special topics in construction management. Topic varies. A signed student-instructor learning contract is required. (Cross-listed with CNST 8986, CONE 4980).

CONE 1030 INTRODUCTION TO CONSTRUCTION ENGINEERING (1 credit)
Introduction to the organization and terminology of construction engineering. Overview of technical and management skills required to succeed in the construction engineering profession.

CONE 2060 ENGINEERING ECONOMICS (3 credits)
Introduction to methods of economics comparisons of engineering alternatives: time value of money, depreciation, taxes, concepts of accounting, activity-based costing, ethical principles, civics and stewardship, and the importance to society.
Prerequisite(s)/Corequisite(s): Sophomore Standing.

CONE 2110 CONSTRUCTION BUSINESS METHODS (3 credits)
Business concepts and practices used by construction contractors. The construction industry, management principles, forms of business ownership, company organization, construction contracts, estimating and bidding, business ethics, bonds and insurance, financial statements, cost accounting, equipment management, planning and scheduling, labor relations and personnel management.
Prerequisite(s)/Corequisite(s): CONE 1030 or CNST 1310 or AE 1010

CONE 2210 GEOMETRIC CONTROL SYSTEMS (3 credits)
Introduction to the theory and application of mensuration and geometric information processing in civil engineering. Measurement of distance, direction, elevation and location using mechanical, electronic and satellite systems. Collection of field data and error propagation. Elementary geometric data bases for design, construction, operation and control of civil works.
Prerequisite(s)/Corequisite(s): MATH 1950

CONE 3190 CONSTRUCTION METHODS AND EQUIPMENT (3 credits)
Characteristics, capabilities and selection of equipment and methods used in the building construction industry. Estimating job production, equipment production rates, machine operating costs, earth-moving equipment, hoisting equipment, operations analysis, and use of various other construction methods and equipment.
Prerequisite(s)/Corequisite(s): CONE 2060

CONE 3780 CONSTRUCTION ESTIMATING I (3 credits)
Preparation of detailed cost estimates based on contract documents. Identify and analyze cost components of building and site scopes of work to perform detailed quantity take-offs. Apply labor, material, and equipment pricing from RS Means. Use production rates and quantity takeoffs to prepare a preliminary construction schedule. Complete quantity takeoffs from 2D plans and from 3D BIM software models. (Cross-listed with CNST 3780).
Prerequisite(s)/Corequisite(s): CNST 1120.

CONE 4140 ACCIDENT PREVENTION IN CONSTRUCTION (3 credits)
Safety practices in the construction industry and the national safety and health standards of the Occupational Safety and Health Administration (OSHA). The theory of accidents; personal attitudes; statistics and environment; accident occurrence; prevention and inspection in connection with the construction of buildings, highways, and associated heavy facilities. Nationally accepted safety codes and their relationship to accepted practices in the industry.
Prerequisite(s)/Corequisite(s): Senior standing and CONE 2110 and CONE 3190

CONE 4160 WOOD/CONTEMPORARY MATERIALS DESIGN (3 credits)
Design of structural timber, beams, columns, and connections. Introduction to applicable design philosophies and codes. Overview of materials design. Masonry, aluminum, and contemporary materials such as plastics and fiber reinforced systems and composite material groups. Design considerations, cost and constructability analysis. (Cross-listed with CONE 8166)
Prerequisite(s)/Corequisite(s): CIVE 341

CONE 4170 FORMWORK SYSTEMS (3 credits)
Design of structural timber, beams, columns, and connections. Introduction to applicable design philosphies and codes. Overview of materials design, masonry, aluminum, and contemporary materials such as plastics and fiber reinforced systems and composite material groups. Design considerations, cost and constructability analysis. (Cross-listed with CONE 8176)
Prerequisite(s)/Corequisite(s): CONE 4160; Pre/Co-req.: CIVE 441

CONE 4500 SUSTAINABLE CONSTRUCTION (3 credits)
Sustainable construction and its application to the green building industry. Topics include: the LEED certification process, sustainable building site management, efficient wastewater applications, optimizing energy performance, indoor environmental issues, performance measurement/verification, recycled content and certified renewable materials. (Cross-listed with CONE 8506.)
Prerequisite(s)/Corequisite(s): Senior standing

CONE 4590 INTRODUCTION TO BUILDING INFORMATION MODELING (3 credits)
This course instructs CAD users on the effective use of Building Information Model (BIM) for integration of design, document and construction estimate. Topics include: model-based 3D design, file formats, interoperability, and MEP modeling. (Cross-listed with CONE 8596)
Prerequisite(s)/Corequisite(s): CNST 1120, or Graduate standing in AE, CIVE, CNST or CONE.

CONE 4660 HEAVY AND/OR CIVIL ESTIMATING (3 credits)
Estimating techniques and strategies for heavy and/or civil construction. Unit pricing, heavy and civil construction takeoffs and estimating, equipment analysis, overhead cost and allocations, estimating software and government contracts. (Cross-listed with CONE 8666).
Prerequisite(s)/Corequisite(s): CONE 3190 and CONE 3780 and CONE 4850

CONE 4760 PROJECT BUDGETS AND CONTROLS (3 credits)
The basic systems related to revenues and expenses associated with record keeping of construction contracts. Managerial accounting related to planning and control of construction projects.
Prerequisite(s)/Corequisite(s): CNST 3780 and CONE 2060.

CONE 4810 HIGHWAY & BRIDGE CONSTRUCTION (3 credits)
The methods and equipment required in the construction of roads and bridges. Methods and equipment necessary for roads and bridges. Substructure and superstructures, precast and cast-in-place segments, and standard and specialized equipment. (Cross-listed with CONE 8816)
Prerequisite(s)/Corequisite(s): CONE 3190 or CNST 2410

CONE 4820 HEAVY AND/OR CIVIL CONSTRUCTION (3 credits)
History, theory, methods, and management principles of planning and executing heavy and/or civil projects. Emerging and new equipment capabilities. Economical use of equipment and management of costs associated with production. (Cross-listed with CNST 4820, CNST 8826, CONE 8826).
Prerequisite(s)/Corequisite(s): CNST 3790. Not open to non-degree graduate students.

CONE 4830 SUPPORT OF EXCAVATION (3 credits)
The design and placement of excavation supports according to OSHA requirements and industry standards. A variety of routine to moderately complex support systems. Open excavations, heet piling and cofferdams. Soil mechanics, lateral loads, hydrology, and pumping methods. (Cross-listed with CONE 8836)
Prerequisite(s)/Corequisite(s): CET 2180 and CET 3290

CONE 4850 CONSTRUCTION PLANNING, SCHEDULING, AND CONTROLS (3 credits)
Planning and scheduling a project using the critical path methods (CPM) with computer applications. Project pre-planning, logic networks, precedence diagrams, time estimates, critical path, float time, crash programs, scheduling, short interval schedules, pull planning, and monitoring project activities. (Cross-listed with CNST 4850, CNST 8856, CONE 8856)
Prerequisite(s)/Corequisite(s): CNST 3780. Not open to non-degree graduate students.

CONE 4890 CONSTRUCTION ENGINEERING CAPSTONE (3 credits)
CONE 4890 embodies the cumulative CONE experience in a project format and uses teams to simulate actual construction enterprises operating in cooperative and competitive situations which replicate the construction industry. An integrated, comprehensive project; to be taken in the term prior to graduation.
Prerequisite(s)/Corequisite(s): Senior standing

CONE 4950 INTERNSHIP (3 credits)
Participation in a full-time summer internship associated with a construction-related entity. Includes weekly assignments and a final presentation designed to foster interactions between the intern and the business side of the entity. General topics include personnel and time management, structuring business plans, scheduling work, finance and budgets, marketing plans, contracts, risk analysis, and communication and leadership. (Cross-listed with CNST 4950).
Prerequisite(s)/Corequisite(s): Permission of instructor, Letter of application, Letter of agreement from industry mentor. Not open to non-degree graduate students.

CONE 4980 SPECIAL TOPICS IN CONSTRUCTION MANAGEMENT (1-6 credits)
Individual or small group study of special topics in construction management. Topic varies. A signed student-instructor learning contract is required. (Cross-listed with CNST 4980, CNST 8986)