

Department of Construction Management & Civil and Construction Engineering

ETAS, Room 203 | (501) 569-8133 | ualr.edu/constructionmanagement

**Chairperson and Coordinator
of Undergraduate Construction
Management Programs:**

Tramel, Michael

**Coordinator of Graduate Construction
Management Programs:**

Carr, Jim

**Coordinator of Architectural, Civil,
and Construction Engineering
Programs:**

Jovanovic, Nickolas

**Coordinator of Environmental
Engineering Programs:**

Thomas, Lashun

Course Schedule Coordinator:

Ray, Chris

Professors:

Blacklock, James

Carr, James K.

Tramel, Michael

Associate Professors:

Akhnoukh, Amin

Bray, Hollis

Jovanovic, Nickolas

Ray, Chris

Assistant Professors:

Thomas, Lashun

Senior Instructor:

Woodard, John

Advanced Instructor:

Squires, Mark

Adjunct Instructors:

Gram, Robert

Gursoy, Gozde

Hart, Robert

Mantione, Donna

McKenney, Christopher

Murray, James

Wright, Teresa

Laboratory Specialist and Lecturer:

Blackmon, Larry

Administrative Assistant:

Bates Slaughter, Sandra

Construction, our nation's largest industry, encompasses the residential sector, commercial and retail buildings, office and high-rise structures, major industrial and process complexes, and engineering infrastructure such as highways, dams, bridges, airports, and seaports. The complexity of projects demands that professional constructors and engineers possess detailed knowledge of the many aspects of the industry to effectively lead and manage the design and construction processes.

UALR's construction-related programs provide curricula that equip for a wide range of design, managerial, and supervisory roles within this multi-faceted, dynamic industry. Technological, computer, and software orientation assist our graduates to develop into contributing members of the architectural, engineering, and construction industry with high paying entry level jobs. There are substantial opportunities for rapid advancement and salary increases with experience in the industry. Career opportunities for our graduates can be found with general and specialty contractors, architectural and engineering design firms, testing laboratories, government agencies, financial institutions, insurance and surety companies, and manufacturers of construction equipment and products. The courses provide an in-depth study of construction management, construction science, engineering, business, mathematics, and sciences. Extensive applications with construction and engineering computer software and hardware emphasize the most current technologies used by industry.



General Information

Degrees Offered

- Associate of Science in Construction Science
- Bachelor of Science in Construction Management
- Bachelor of Science in Civil and Construction Engineering
- Bachelor of Science in Architectural and Construction Engineering
- Bachelor of Science in Environmental Engineering
- Master of Science in Construction Management

Minor in Construction Management

The minor in construction management is available to all UALR students who want to learn about construction materials, methods, and management. Students are required to take eighteen credit hours of approved CNMG courses.

Admission Policy

After admission to UALR, any student may declare a major or minor in construction management. Admission to one of the department's engineering majors requires readiness to take Calculus I and General Chemistry. Students may be provisionally admitted into one of the engineering majors before this, but they may require more than four years to complete the degree requirements.

Contact Information

To discuss the construction management programs, students should visit Mike Tramel in ETAS 203, call (501) 569-8133, or send e-mail to jmtramel@ualr.edu.

To discuss either of the construction engineering programs, students should visit Nick Jovanovic in ETAS 202F, call (501) 569-8226, or send e-mail to nsjovanovic@ualr.edu.

To discuss the environmental engineering program, students should visit Lashun Thomas in ETAS 202I, call (501) 569-8296, or send e-mail to lkthomas2@ualr.edu.

To discuss the graduate program in construction management, students should visit Jim Carr in ETAS 202G, call (501) 569-8065, or send e-mail to jkcarr1@ualr.edu.

Work Experience Requirement

All students in the department are required to complete a minimum of 800 contact hours of practical work experience in an approved construction- or engineering-related activity. This stipulation provides the graduate with valuable industry experience and insights.

Accreditation

The four-year baccalaureate, construction management program is accredited by the American Council for Construction Education (ACCE). The ACCE is recognized by the Council for Higher Education Accreditation as the national accrediting agency for four-year baccalaureate programs in construction education. Accreditation is a means for recognizing educational institutions that achieve and maintain a level of performance, integrity, and quality that entitles them to the confidence of the educational community and the public they serve. The UALR construction management program is the only such accredited program in the University of Arkansas system.

The civil and construction engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

A new engineering program cannot seek accreditation until at least one student has graduated from the program. As new programs, the architectural and construction engineering program and the environmental engineering program are not accredited.

Student Activities

The UALR construction management program has five student chapters and one honor society for student involvement. The student chapters are affiliated with the Associated General Contractors (AGC), the Associated Builders and Contractors (ABC), the National Association of Home Builders (NAHB). The Arkansas chapter of each association sponsors the student chapters and provides opportunities for students to interact and network with members of their organizations. Special student membership is also available with the American Concrete Institute (ACI), American Society of Professional Estimators (ASPE), National Association of Women in Construction (NAWIC), and the International Code Council (ICC). Students who meet the requirements can become members of Sigma Lambda Chi, the International Honor Society for Leaders in Construction. The UALR construction management program is a member of the Associated Schools of Construction (ASC) and participates in the ASC regional construction

management competitions. Selected students can also compete in the sponsoring student chapter construction management competitions for ABC, AGC, and FPS.

Engineering students have the opportunity to become involved with several engineering organizations, including the American Society of Civil Engineers (ASCE), the American Society of Mechanical Engineers (ASME), the American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE), the Society of Women Engineers (SWE), and Engineers Without Borders (EWB). Engineering students can participate in regional and national student competitions, such as the Steel Bridge Competition, the Concrete Canoe Competition, the Big Beam Contest, and the Charles Pankow Foundation Annual Architectural Engineering Student Design Competition.

Degree Requirements

Associate of Science in Construction Science

The associate of science construction science program prepares students to work in the construction industry and continue their studies seamlessly in the baccalaureate construction management program.

A minor is not required. Students seeking an Associate of Science in Construction Science degree must pass each CNMG course with a grade of C or greater.

Associate of Science in Construction Science

General: 63 total hours, including 20 hours above the freshman level, and 15 hours in residence

First-Year Colloquium (0-1 hour)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)

CNMG 1101 First Year Colloquium in Construction

UALR General Education Requirements (35 credit hours)

UALR Standard Core (21 hours)

Communication-Written (6 hours)
History of Civilization (3 hours)
U.S. Traditions (3 hours)
Fine Arts (3 hours)
Humanities (3 hours)
Social Sciences (3 hours)

EIT College Core (14 hours)

Mathematics (3 hours)
Science (8 hours)
Humanities, Social Sciences, Oral Communication, or Interdisciplinary (3 hours)

Major Requirements (28 credit hours)

Communications (9 hours—0 hours beyond the UALR General Education Requirements)

RHET 1311 Composition I
RHET 1312 Composition II
SPCH 1300 Speech Communication

Business (6 hours—3 hours beyond the UALR General Education Requirements)**

**ACCT 2310 Principles of Accounting I

ECON 2301 Survey of Economics

or ECON 2322 Principles of Microeconomics

Mathematics and Science (15 hours—4 hours beyond the EIT College Core)**

MATH 1451 Calculus I (**1 hour exceeds EIT College Core)

ERSC 1302 Physical Geology

ERSC 1102 Physical Geology Lab

PHYS 1321 College Physics I

PHYS 1121 College Physics I Lab

**CPSC 1370 Computer Literacy

or BINS 1310 Fundamentals of Information Technology

Construction and Engineering (21 credit hours)

CNMG 1101 First-Year Colloquium in Construction

CNMG 1201 The Construction Industry

CNMG 1305 Drawings and Specifications

CNMG 2313 Construction Materials and Methods

CNMG 2314 Mechanical, Electrical, and Plumbing (MEP) Systems

CNMG 2316 Construction Surveying with Lab

CNMG 2318 Building Information Modeling (BIM)

CNMG 2333 Statics and Strength of Materials

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 60 minimum total hours, 20 hours above the freshman level, and 15 hours in residence.

Bachelor of Science in Construction Management

The construction management program is an interdisciplinary baccalaureate degree program that builds upon construction methods, engineering techniques, and business courses offered in the Donaghey College of Engineering and Information Technology and the College of Business. The integrated curriculum provides a foundation for the capstone courses offered in the senior year and the required passage of the Associate Constructor (AC) examination.

A minor is not required. Students seeking a Bachelor of Science degree in Construction Management degree must pass each CNMG course with a grade of C or greater.

Bachelor of Science in Construction Management

General: 125 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-1 hour)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)

CNMG 1101 First Year Colloquium in Construction

UALR General Education Requirements (35 credit hours)

UALR Standard Core (21 hours)

Communication-Written (6 hours)

History of Civilization (3 hours)

U.S. Traditions (3 hours)

Fine Arts (3 hours)

Humanities (3 hours)

Social Sciences (3 hours)

EIT College Core (14 hours)

Mathematics (3 hours)

Science (8 hours)

Humanities, Social Sciences, Oral Communication, or Interdisciplinary (3 hours)

Major (90 hours)

Communications (9 hours—0 hours beyond the UALR General Education Requirements)

RHET 1311 Composition I

RHET 1312 Composition II

SPCH 1300 Speech Communication

Business (12 hours—9 hours beyond the UALR General Education Requirements)**

**ACCT 2310 Principles of Accounting I

ECON 2301 Survey of Economics

or ECON 2322 Principles of Microeconomics

**MGMT 3300 Principles of Management

**MGMT 4391 Employment Law

or MKTG 2380 Legal Environment of Business

Mathematics and Science (15 hours—4 hours beyond the EIT College Core)**

MATH 1451 Calculus I (**1 hour exceeds EIT College Core)

ERSC 1302 Physical Geology

ERSC 1102 Physical Geology Lab

PHYS 1321 College Physics I

PHYS 1121 College Physics I Lab

**CPSC 1370 Computer Literacy

or BINS 1310 Fundamentals of Information Technology

Construction and Engineering (77 credit hours)

CNMG 1101 First-Year Colloquium in Construction

CNMG 1201 The Construction Industry

CNMG 1305 Drawings and Specifications

CNMG 2313 Construction Materials and Methods
 CNMG 2314 Mechanical, Electrical, and Plumbing (MEP) Systems
 CNMG 2316 Construction Surveying with Lab
 CNMG 2318 Building Information Modeling (BIM)
 CNMG 2333 Statics and Strength of Materials
 CNMG 3195 Community Service Projects
 CNMG 3321 Steel Construction
 CNMG 3322 Concrete Construction
 CNMG 3327 Field Engineering and Construction Equipment
 CNMG 3339 Estimating I
 CNMG 3347 Engineering Soil Mechanics with Lab
 CNMG 4144 Construction Project Acquisition
 CNMG 4310 Construction Financial Management
 CNMG 4311 Estimating II
 CNMG 4315 Construction Business Operations
 CNMG 4318 Advanced BIM
 CNMG 4323 Construction Administration
 CNMG 4325 Project Quality Control (QC) and Submittals
 CNMG 4327 Temporary Structures
 CNMG 4329 Construction Planning and Scheduling
 CNMG 4334 Construction Contracts and Law
 CNMG 4342 Construction Safety
 CNMG 4361 Green Construction
 CNMG 4145 Professional Constructor Certification
 CNMG 4245 Construction Management Capstone

Approved Electives (3 hours)

CNMG 2330 Introduction to Sustainability
 CNMG 2199/2299/2399 Special Topics in Construction
 CNMG 3324 Heavy Civil Construction
 CNMG 4354 Highway Engineering
 CNMG 4391 Cooperative Education
 CNMG 4395 Professional Development
 CNMG 4199/4299/4399 Special Topics in Construction
 CNMG 4100/4200/4300 Independent Study
 SPCH 3316 Interviewing

Professional Requirements

- Pass the American Institute of Construction (AIC) Associate Constructor (AC) Examination.
- Document at least 800 hours of practical work experience in approved engineering- or construction-related activities, such as student competitions, part-time or full-time employment, internships, cooperative education, community service learning projects, or prior experience.

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours, 45 hours of upper-level courses (3000-4000 level), or 30 hours in residence.

Bachelor of Science in Civil and Construction Engineering

The civil and construction engineering program focuses on structural engineering, geotechnical engineering, environmental engineering, and construction engineering. However, the program also exposes students to other major areas of civil engineering, including materials engineering, water resources engineering, highway engineering, and surveying.

A minor is not required. Students seeking a Bachelor of Science in Civil and Construction Engineering degree must pass each CNMG course with a grade of C or greater, must achieve at least a 2.00 grade point average (GPA) in the major (all required MATH, STAT, CHEM, ERSC, PHYS, CNMG and SYEN courses), and also must pass both the Fundamentals of Engineering (FE) and the Associate Constructor (AC) examinations.

Bachelor of Science in Civil and Construction Engineering

General: 128 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-3 hours)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 36 for details)

CNMG 1101 First-Year Colloquium in Construction or any other FYC course

UALR General Education Requirements (35 credit hours)

UALR Standard Core (21 hours)

Communication-Written (6 hours)
 History of Civilization (3 hours)
 U.S. Traditions (3 hours)
 Fine Arts (3 hours)
 Humanities (3 hours)
 Social Sciences (3 hours)

EIT College Core (14 hours)

Mathematics (3 hours)
 Science (8 hours)
 Additional Mathematics/Sciences (3 hours)

Second Language Proficiency (none required) Major (93 hours)

Humanities and Social Science (0 hours beyond the UALR General Education Requirements)

ECON 2301 Survey of Economics
 or ECON 2322 Principles of Microeconomics
 PHIL 2320 Ethics and Society
 POLS 1310 American National Government

Mathematics and Science (32 credit hours—18 hours beyond the EIT College Core**)

CHEM 1406 General Chemistry for Engineers
 or CHEM 1402 General Chemistry I

**ERSC 4371 Engineering Geology
**ERSC 4372 Surface Water Hydrology
MATH 1451 Calculus I (**1 hour exceeds EIT College Core)
MATH 1452 Calculus II (**1 hour exceeds EIT College Core)
**MATH 2453 Calculus III
**MATH 3322 Introduction to Differential Equations
PHYS 2321 Physics for Scientists and Engineers I
PHYS 2121 Physics for Scientists and Engineers I Lab
**STAT 3352 Applied Statistics I

Engineering and Construction (72 credit hours)

CNMG 1085 Architecture, Engineering, and Construction Seminar (each semester)
CNMG 1305 Drawings and Specifications
CNMG 1313 Civil Engineering Materials with Lab
CNMG 1385 Infrastructure, Environment, and Society
CNMG 2313 Construction Materials and Methods
CNMG 2314 Mechanical, Electrical, and Plumbing (MEP) Systems
CNMG 2316 Construction Surveying with Lab
CNMG 2370 Engineering Statics
CNMG 3302 Engineering Economy
CNMG 3312 Engineering Structural Analysis
CNMG 3324 Heavy Civil Construction
CNMG 3327 Field Engineering and Construction Equipment
CNMG 3339 Estimating I
CNMG 3347 Engineering Soil Mechanics with Lab
CNMG 3357 Introduction to Environmental Engineering with Lab
CNMG 3374 Hydraulic Engineering with Lab
CNMG 3376 Engineering Structural Mechanics
CNMG 4323 Construction Administration
CNMG 4329 Construction Planning and Scheduling
CNMG 4334 Construction Contracts and Law
CNMG 4342 Construction Safety
CNMG 4351 Foundation Design
CNMG 4357 Water and Wastewater Engineering
CNMG 4371 Structural Steel Design
CNMG 4185 Professional Engineering Seminar
CNMG 4285 Engineering Design Project

Civil Engineering Requirement (3 hours)

Choose One:

CNMG 4321 Reinforced Concrete Design or
CNMG 4354 Highway Engineering or
CNMG 4362 Water Resources Engineering

Professional Requirements

- Pass the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Examination.
- Pass the American Institute of Construction (AIC) Associate Constructor (AC) Examination.

- Document at least 800 hours of practical work experience in approved construction-related activities, such as student competitions, part-time or full-time employment, internships, cooperative education, community service learning projects, or prior experience.

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours, 45 hours of upper-level courses (3000-4000 level), or 30 hours in residence.

Goals, Objectives, and Outcomes for the Civil and Construction Engineering Program

The goals of the civil and construction engineering program are to:

- Prepare students for successful engineering or management careers in the architecture, engineering, and construction (AEC) industry or related fields.
- Provide employers with a well-educated workforce that is ready and able to perform valuable civil and construction engineering and managerial services immediately after graduation.
- Encourage the growth of knowledge-based industry and stimulate economic growth in Arkansas.

Program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. Program educational objectives are based on the needs of the program's constituencies. The educational objectives of the civil and construction engineering program are to produce graduates who:

1. Rapidly become certified Engineer Interns (EI) and Associate Constructors (AC) employed in architecture, engineering, construction, or related fields or pursuing graduate or professional education in engineering, business, law, architecture, etc.
2. Become licensed Professional Engineers (PE) and/or Certified Professional Constructors (CPC) after gaining the required professional experience and the requisite knowledge to pass the licensing and/or certification exams.
3. Engage in lifelong learning, through on-the-job training, participation in professional societies, additional formal education, continuing education and professional development, research, and self-study, in order to use state-of-the-art knowledge to design and build safe and effective buildings and infrastructure and/or provide high quality service to the general public, employers, clients, and other professionals.

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. The civil and construction engineering program will produce graduates who have:

- a. An ability to apply knowledge of mathematics, science, and engineering.
- b. An ability to design and conduct experiments, as well as to analyze and interpret data.
- c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d. An ability to function on multidisciplinary teams.
- e. An ability to identify, formulate, and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i. A recognition of the need for, and an ability to engage in life-long learning.
- j. A knowledge of contemporary issues.
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Bachelor of Science in Architectural and Construction Engineering

The architectural and construction engineering program focuses on structural engineering, mechanical engineering, electrical engineering, and construction engineering, in the context of integrated building system design and construction. The program also introduces students to architectural history and design principles.

A minor is not required. Students seeking a Bachelor of Science in Architectural and Construction Engineering degree must pass each CNMG course with a grade of C or greater, must achieve at least a 2.00 grade point average (GPA) in the major (all required MATH, STAT, CHEM, ERSC, PHYS, CNMG, and SYEN courses), and also must pass both the Fundamentals of Engineering (FE) and the Associate Constructor (AC) examinations.

Bachelor of Science in Architectural and Construction Engineering

General: 127 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-3 hours)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)

CNMG 1101 First-Year Colloquium in Construction
or any other FYC Course

UALR Standard Core (21 hours)

Communication-Written (6 hours)

History of Civilization (3 hours)

U.S. Traditions (3 hours)

Fine Arts (3 hours)

Humanities (3 hours)

Social Sciences (3 hours)

EIT College Core (14 hours)

Mathematics (3 hours)

Science (8 hours)

Additional Math and Science (3 hours)

Major Requirements (93 credit hours)

Humanities and Social Science (0 hours beyond the UALR General Education Requirements)

ARHA 2305 Introduction to Visual Art
ECON 2301 Survey of Economics
or ECON 2322 Principles of Microeconomics
PHIL 2320 Ethics and Society
POLS 1310 American National Government

Mathematics and Science (32 credit hours—18 hours beyond the EIT College Core)**

CHEM 1406 General Chemistry for Engineers
or CHEM 1402 General Chemistry I
**ERSC 4371 Engineering Geology
MATH 1451 Calculus I (**1 hour exceeds EIT College Core)
MATH 1452 Calculus II (**1 hour exceeds EIT College Core)
**MATH 2453 Calculus III
**MATH 3322 Introduction to Differential Equations
PHYS 2321 Physics for Scientists and Engineers I
PHYS 2121 Physics for Scientists and Engineers I Lab
**PHYS 2322 Physics for Scientists and Engineers II
**STAT 3352 Applied Statistics I

Engineering and Construction (75 credit hours)

CNMG 1085 Architecture, Engineering, and Construction Seminar (each semester)
CNMG 1305 Drawings and Specifications
CNMG 1313 Civil Engineering Materials with Lab
CNMG 1385 Infrastructure, Environment, and Society

CNMG 2313 Construction Materials and Methods
 CNMG 2314 Mechanical, Electrical, and Plumbing (MEP) Systems
 CNMG 2370 Engineering Statics
 CNMG 2385 Architectural History and Design
 CNMG 3302 Engineering Economy
 CNMG 3312 Engineering Structural Analysis
 CNMG 3327 Field Engineering and Construction Equipment
 CNMG 3339 Estimating I
 CNMG 3347 Engineering Soil Mechanics with Lab
 CNMG 3374 Hydraulic Engineering with Lab
 CNMG 3376 Engineering Structural Mechanics
 CNMG 3378 Engineering Thermodynamics
 CNMG 4321 Reinforced Concrete Design
 CNMG 4323 Construction Administration
 CNMG 4329 Construction Planning and Scheduling
 CNMG 4334 Construction Contracts and Law
 CNMG 4342 Construction Safety
 CNMG 4351 Foundation Design
 CNMG 4371 Structural Steel Design
 CNMG 4380 HVACR Engineering Fundamentals
 CNMG 4185 Professional Engineering Seminar
 CNMG 4285 Engineering Design Project
 SYEN 2315 Circuits and Systems

Professional Requirements

- Pass the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Examination.
- Pass the American Institute of Construction (AIC) Associate Constructor (AC) Examination.
- Document at least 800 hours of practical work experience in approved engineering- or construction-related activities, such as student competitions, part-time or full-time employment, internships, cooperative education, community service learning projects, or prior experience.

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours, 45 hours of upper-level courses (3000-4000 level), or 30 hours in residence.

Goals, Objectives, and Outcomes for the Architectural and Construction Engineering Program

The goals of the architectural and construction engineering program are to:

- Prepare students for successful engineering or management careers in the architecture, engineering, and construction (AEC) industry or related fields.

- Provide employers with a well-educated workforce that is ready and able to perform valuable architectural and construction engineering and managerial services immediately after graduation.
- Encourage the growth of knowledge-based industry and stimulate economic growth in Arkansas.

Program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. Program educational objectives are based on the needs of the program's constituencies. The educational objectives of the architectural and construction engineering program are to produce graduates who:

1. Rapidly become certified Engineer Interns (EI) and Associate Constructors (AC) employed in architecture, engineering, construction, or related fields or pursuing graduate or professional education in engineering, business, law, architecture, etc.
2. Become licensed Professional Engineers (PE) and/or Certified Professional Constructors (CPC) after gaining the required professional experience and the requisite knowledge to pass the licensing and/or certification exams.
3. Engage in lifelong learning, through on-the-job training, participation in professional societies, additional formal education, continuing education and professional development, research, and self-study, in order to use state-of-the-art knowledge to design and build safe and effective buildings and/or provide high quality service to the general public, employers, clients, and other professionals.

Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. The architectural and construction engineering program will produce graduates who have:

- a. An ability to design and conduct experiments, as well as to analyze and interpret data.
- b. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- c. An ability to apply knowledge of mathematics, science, and
- d. An ability to function on multidisciplinary teams.
- e. An ability to identify, formulate, and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i. A recognition of the need for, and an ability to engage in life-long learning.

- j. A knowledge of contemporary issues.
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Bachelor of Science in Environmental Engineering

The environmental engineering program focuses on the transport and fate of chemical species in air, water, and soil. For example, environmental engineers design air pollution control devices, water and wastewater treatment plants, and solid waste management systems.

A minor is not required. Students seeking a Bachelor of Science in Environmental Engineering degree must pass each CNMG course with a grade of C or greater, must achieve at least a 2.00 grade point average (GPA) in the major (all required MATH, STAT, BIOL, CHEM, ERSC, PHYS, and CNMG courses), and also must pass the Fundamentals of Engineering (FE) examination.

Bachelor of Science in Environmental Engineering

General: 128 total hours, including 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence

First-Year Colloquium (0-1 hour)

Required of full-time freshmen entering college for the first time and transfer students with less than 12 hours of credit. (See page 19 for details)

CNMG 1101 First Year Colloquium in Construction

UALR General Education Requirements (35 credit hours)

UALR Standard Core (21 hours)

- Communication-Written (6 hours)
- History of Civilization (3 hours)
- U.S. Traditions (3 hours)
- Fine Arts (3 hours)
- Humanities (3 hours)
- Social Sciences (3 hours)

EIT College Core (14 hours)

- Mathematics (3 hours)
- Science (8 hours)
- Additional Mathematics/Sciences (3 hours)

Major Requirements (93 credit hours)

Humanities and Social Science (0 hours beyond the UALR General Education Requirements)

- ECON 2301 Survey of Economics or ECON 2322 Principles of Microeconomics
- PHIL 2320 Ethics and Society
- POLS 1310 American National Government

Mathematics and Science (59 credit hours—45 hours beyond the EIT College Core)**

- BIOL 1400 Evolutionary and Environmental Biology
- **BIOL 2401 Microbiology

- CHEM 1402 General Chemistry I
- **CHEM 1403 General Chemistry II
- **CHEM 2310 Analytical Chemistry I
- **CHEM 3150 General Organic Chemistry I Lab
- **CHEM 3350 General Organic Chemistry I
- **ERSC 1102 Physical Geology Lab
- ERSC 1302 Physical Geology
- **ERSC 4372 Surface Water Hydrology
- **ERSC 4473 Hydrogeology
- MATH 1451 Calculus I (**1 hour exceeds EIT College Core)
- **MATH 1452 Calculus II
- **MATH 2453 Calculus III
- **MATH 3322 Introduction to Differential Equations
- **PHYS 2321 Physics for Scientists and Engineers I
- **PHYS 2121 Physics for Scientists and Engineers I Lab
- **STAT 3352 Applied Statistics I

**Environmental Science Requirement

1. **CHEM 4342 Environmental Chemistry
2. or **ERSC 4322 Environmental Geology

Engineering (48 credit hours)

- CNMG 1085 Architecture, Engineering, and Construction Seminar (each semester)
- CNMG 1313 Civil Engineering Materials with Lab
- CNMG 1385 Infrastructure, Environment, and Society
- CNMG 2370 Engineering Statics
- CNMG 3302 Engineering Economy
- CNMG 3347 Engineering Soil Mechanics with Lab
- CNMG 3357 Introduction to Environmental Engineering with Lab
- CNMG 3374 Hydraulic Engineering with Lab
- CNMG 3376 Engineering Structural Mechanics
- CNMG 3378 Engineering Thermodynamics
- CNMG 4357 Water and Wastewater Engineering
- CNMG 4362 Water Resources Engineering
- CNMG 4364 Air Pollution Engineering
- CNMG 4366 Solid and Hazardous Waste Management
- CNMG 4368 Environmental Risk Assessment
- CNMG 4369 Soil and Groundwater Remediation
- CNMG 4185 Professional Engineering Seminar
- CNMG 4285 Engineering Design Project

Professional Requirements

- Pass the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Examination.
- Document at least 800 hours of practical work experience in approved engineering- or construction-related activities, such as student competitions, part-time or full-time employment, internships, cooperative education, community service learning projects, or prior experience.

Minor (none required)

Unrestricted General Electives

Remaining hours, if any, to reach 120 minimum total hours, 45 hours of upper-level courses (3000-4000 level), and 30 hours in residence.

Goals, Objectives, and Outcomes for the Environmental Engineering Program

The goals of the program are to:

1. Prepare students for successful careers in environmental engineering, civil engineering, or related fields.
2. Provide employers with a well-educated workforce that is ready and able to perform valuable environmental and civil engineering services immediately after graduation.
3. Encourage the growth of knowledge-based industry and stimulate economic growth in Arkansas.

ABET Program Educational Objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. These objectives must be consistent with the mission of the institution, the needs of the program's various constituencies, and the ABET Criteria for Accrediting Engineering Programs. They must be reviewed and revised periodically, through a process that involves the program's constituencies.

The objectives of the program are to produce engineering graduates who:

- Are certified Engineering Interns (EI) employed in environmental engineering, civil engineering, or related fields or are pursuing graduate or professional education in engineering, medicine, business, law, etc.
- Become licensed Professional Engineers (PE) and Board Certified Environmental Engineers (BCEE) after gaining the required professional experience and the additional requisite knowledge to pass the licensing and certification exams.
- Engage in lifelong learning, e.g., through additional formal education, continuing education, professional development, research, and self-study, in order to use state-of-the-art knowledge to design safe and effective environmental systems and programs and to provide high quality services to the general public, employers, clients, and other professionals.

ABET Student Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

The environmental engineering program will produce graduates who have:

- a. An ability to design and conduct experiments, as well as to analyze and interpret data.
- b. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

- c. An ability to apply knowledge of mathematics, science, and
- d. An ability to function on multidisciplinary teams.
- e. An ability to identify, formulate, and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i. A recognition of the need for, and an ability to engage in life-long learning.
- j. A knowledge of contemporary issues.
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Courses in Construction Management and Architectural, Civil, Construction, and Environmental Engineering

In general, courses are offered only in the term that is indicated in the course description. However, courses may be offered in other terms if sufficient student demand exists and if qualified instructors are available.

CNMG 1085 Architecture, Engineering, and Construction (AEC) Seminar

This non-credit seminar is required for all students majoring in architectural and construction engineering, civil and construction engineering, and environmental engineering. The seminar meets once per month, four times per semester, and provides students with opportunities for professional development and social interaction. Activities will include learning about student organizations and student competitions, hearing guest speakers from industry and government, learning about employment opportunities, attending senior design project final presentations, and social events. One hour per month. Zero credit hours. Fall and Spring.

CNMG 1101 First-Year Colloquium in Construction

An introduction to construction engineering and construction management, along with goal setting, time management, and the on- and off-campus resources needed for success at UALR. Hands-on activities and group projects explore various concepts in construction. Satisfies the UALR First Year Colloquium requirement. Two hours lab. One credit hour. Fall only.

CNMG 1201 The Construction Industry

Introduction to the construction industry and the career opportunities available within residential, building, heavy civil, and industrial construction. The different roles of the various participants are examined along with industry history and traditions. Proper dress and safety requirements for office and field site visits discussed. Includes guest speakers, field trips, and project site visits. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 1305 Drawings and Specifications

Introduction to basic construction drawings and specification interpretation. Emphasis on construction drawings and blueprint reading, CSI specifications and master format, project manual, shop drawings, as-built drawings, and proper construction terminology. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 1313 Civil Engineering Materials with Lab

Prerequisites: CHEM 1402 or 1406, and MATH 1451, or consent of instructor. Properties of materials and materials science, including atomic structure and bonding, lattice structures and defects, grain structure, alloys, and phase diagrams. Construction engineering materials, including steel, aluminum, aggregates, Portland cement, concrete, masonry, asphalt, wood, and composites. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 1385 Infrastructure, Environment, and Society

This course examines the relationships between the natural environment, the built environment, and society. By studying the civil infrastructure that provides shelter, clean air and water, and transportation systems for people and cargo, the disciplines and subdisciplines of architectural, environmental, civil, and construction engineering are introduced. Students deliver oral presentations and listen to and critique the presentations of others. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 2274 Thermal and Fluid Engineering

Prerequisites: CHEM 1406, MATH 1452, and PHYS 2321, or consent of instructor. An integrated introduction to thermodynamics, fluid mechanics, and heat transfer. Topics include thermodynamic properties, the laws of thermodynamics, cycles, and psychrometrics; conservation of mass, momentum, and energy in fluid flow; introduction to conduction, convection, and radiation heat transfer. One hour lecture. Three hours lab. Two credit hours. No longer offered.

CNMG 2303 Construction Practicum

Prerequisite concurrent: CNMG 1305 or consent of instructor. Construction methods and hands-on projects related to foundations, framing, doors, windows, finish carpentry, and masonry. Two hours lecture, two hours lab. Three credit hours. No longer offered.

CNMG 2304 MEP Practicum

Prerequisite concurrent: CNMG 1305 or consent of instructor. Construction methods and hands-on projects related to interior and exterior finishes, thermal and moisture protection, plumbing, and electrical wiring. Two hours lecture, two hours lab. Three credit hours. No longer offered.

CNMG 2313 Construction Materials and Methods

Prerequisite concurrent: CNMG 1305 or consent of instructor. Introduction to specifications, standards, codes, quality control, and quantity survey as they pertain to the execution of selected construction materials. Topics include site work, concrete, masonry, steel, rough and finish carpentry, thermal and moisture protection, doors and windows, finishes, and specialties. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 2314 Mechanical, Electrical, and Plumbing (MEP) Systems

Prerequisite concurrent: CNMG 1305 or consent of instructor. Introduction to functions of service systems within a modern structure. Includes heating, ventilating, air-conditioning (HVAC), plumbing, fire protection, electrical, and conveying systems. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 2316 Construction Surveying with Lab

Prerequisite: CNMG 1305 and MATH 1303 or 1401, or consent of instructor. Introduction to the principles of construction surveying, project layout, and field performance and surveying equipment management. Topics will include use and care of surveying instruments, directions, angles, surveying calculations, errors, and computations of areas and volumes. Two hours lecture, three hours lab. Three credit hours. Spring only.

CNMG 2318 Building Information Modeling

Prerequisite: CNMG 2313, or consent of instructor. The course will focus on utilizing basic functions of Building Information Modeling (BIM) for residential and commercial construction. During the course, students will examine geometry, spatial relationships, geographic information, quantities and properties of building components. Students will create virtual models of buildings that can be used for quantity take offs. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 2333 Statics and Strength of Materials

Prerequisites: CNMG 2313, MATH 1303 or 1401, and PHYS 1321/1121, or consent of instructor. An analytical and practical approach to the principles and physical concepts of statics and strength of materials related to construction. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 2370 Engineering Statics

Prerequisite: PHYS 2321 or consent of instructor. Prerequisite concurrent: MATH 2453 or consent of instructor. Static equilibrium of particles, equivalent systems of forces, equilibrium of rigid bodies, centroids and centers of gravity, analysis of structures, dry friction, and moments of inertia. Two hours lecture. Two hours lab. Three credit hours. Cross listed as SYEN 2370. Fall only.

CNMG 2385 Architectural History and Design

Prerequisites: ARHA 2305 and HIST 1311 or 1312, or consent of instructor. A survey of major architectural developments throughout history and across cultures and geography; elements of architectural design theory; introduction to architectural modeling: sketches, drawings, physical models, and building information modeling (BIM) software. Two hours lecture. Three hours lab. Three credit hours. Fall only.

CNMG 2199, 2299, 2399 Special Topics in Construction

Prerequisites: consent of instructor based on relevance of subject matter to student career goals. Designed to meet special needs of students or industry to cover application of construction management or construction engineering to specific problems. Meets equivalent of one hour per week for each credit hour value. May be taken more than once for credit. One, two, or three credit hours. Offered on demand.

CNMG 3195 Community Service Projects

Prerequisites: Sophomore standing and consent of instructor. Students will complete at least 40 hours of on- or off-campus community service on an approved project. Three hours lab. One credit hour. Fall only.

CNMG 3285 Civil Engineering Laboratory

Concurrent prerequisites: CNMG 3312 and 3374 or consent of instructor. Introduction to civil engineering software, for tasks such as computer-aided drafting, building information modeling, site planning, structural analysis, hydrologic analysis, hydraulic analysis, and highway design; lab or field testing of structural materials, components or systems, water, wastewater, etc. Students will learn to design and conduct experiments in accordance with testing standards, and to collect, analyze, and interpret data. One hour lecture, three hours lab. Two credit hours. No longer offered.

CNMG 3302 Engineering Economy

Prerequisite: MATH 1311, 1342 or 1451, or consent of instructor. Introduction to engineering economic decisions for evaluating the worth of products, services, projects and systems; time value of money, economic equivalence concepts, comparison of investment alternatives, evaluating economic life and replacement analysis, inflation, depreciation and impact of taxes on engineering decisions, and economic risk analysis. Three hours lecture. Three credit hours. Cross listed as SYEN 3301. Spring only.

CNMG 3312 Engineering Structural Analysis

Prerequisites: MATH 2453 and CNMG 3376, or consent of instructor. Structural analysis of trusses, beams, frames, cables, and arches, including determinate and indeterminate structures; deflections of beams and frames; introduction to stiffness methods and matrix analysis of structures. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 3321 Steel Construction

Prerequisite: CNMG 2333 or consent of instructor. Structural steel materials, shapes and uses; structural steel specifications and construction practices; structural steel fabrication and erection techniques, practices, and estimation; bolting, welding, and cutting of structural steel; construction techniques for stairs, bar joists and girders, tilt-ups, and steel deck; steel drawings, including set-up, design, detail, and erection drawings; estimating structural steel quantities and pricing. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 3322 Concrete Construction

Prerequisite: CNMG 2333 or consent of instructor. Provides an in-depth examination of the principles and applications of concrete construction. Study of process of placing ready mix concrete from batching to curing along with the design, analysis, and economics of formwork. Reinforcing steel, the ACI field technician applications, and the ACI Flatwork Technician Certification are also covered. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 3324 Heavy Civil Construction

Prerequisites: CNMG 2316, or consent of instructor. This course introduces construction management concepts applicable to heavy civil projects, such as highways, bridges, and water treatment plants. Topics include estimating, bidding, planning, scheduling, contract administration, and construction safety. The course emphasizes differences between the management of heavy civil construction projects and commercial building construction projects. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 3327 Field Engineering and Construction Equipment

Prerequisite: CNMG 2333 or 3376, or consent of instructor. Principles of construction project field supervision and construction equipment. Leadership, motivation, communications, problem solving, decision making, production control, quality control, and computerized reporting. Earth moving fundamentals, equipment ownership and operating costs, and equipment selection and usage. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 3339 Estimating I

Prerequisites: MATH 1303 or 1401, and CNMG 2313 and 2314, or consent of the instructor. Theory and practice of construction project bidding and estimating. Topics include proposal solicitation and preparation, bidding strategy, estimate types and content, quantity survey, ethics, and an introduction to computer use in estimating. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 3347 Engineering Soil Mechanics with Lab

Prerequisites: CNMG 2333 or 3376, or consent of instructor. Introduction to soils and foundation engineering and construction soil mechanics technology. Students will study engineering properties of soils, soil field exploration procedures, soil test reports, soil compaction and stabilization construction methods, water movement in soils, moisture control and drainage procedures, in-situ stress distribution in shallow and deep soils, shear strength of clay, silt and sand soils and design of shallow building foundations. Students will perform ASTM soil testing to support the course content and generate laboratory technical reports for major laboratory tests performed during the course. Two hours lecture and two hours laboratory. Three credit hours. Fall only.

CNMG 3357 Introduction to Environmental Engineering with Lab

Prerequisites: CHEM 1402 or 1406, or consent of instructor. Concurrent Prerequisite: MATH 3322, or consent of instructor. The study of the fundamental principles of environmental processes, pollution, and pollution control. Topics include mass transfer, water chemistry and microbiology, water and air pollution, and solid- and hazardous-waste management. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 3370 Statics and Dynamics

Prerequisites: PHYS 2321 or consent of instructor. Prerequisite concurrent: MATH 2453 or consent of instructor. Statics of particles, equivalent systems of forces, equilibrium of rigid bodies, centroids and centers of gravity, analysis of structures, friction, moments of inertia, kinematics and kinetics of particles, introduction to kinematics and kinetics of rigid bodies, forces and accelerations. Three hours lecture. Three credit hours. Cross listed as SYEN 3370. No longer offered.

CNMG 3371 Engineering Dynamics

Prerequisite: CNMG 2370 or consent of instructor. Kinematics and kinetics of particles, systems of particles, and rigid bodies; energy and momentum methods; mechanical vibrations and resonance; introduction to structural dynamics due to time-varying loads, such as wind and seismic loading. Two hours lecture. Two hours lab. Three credit hours. Cross listed as SYEN 3371. No longer offered.

CNMG 3372 Engineering Materials

Prerequisites: CHEM 1402 and MATH 1451, or consent of instructor. Atomic structure and bonding, crystal structures, crystal geometry, solidification, crystalline imperfections, diffusion in solids, mechanical properties of metals, polymeric materials, phase diagrams, engineering alloys, ceramics, composite materials, corrosion. Three hours lecture. Three credit hours. Cross listed as SYEN 3372. No longer offered.

CNMG 3374 Hydraulic Engineering with Lab

Prerequisites: CNMG 2370 and 3357, or consent of instructor. Properties of water; hydrostatics; water flow in pipes; pipelines and piping networks; water pumps; water flow in open channels; basic fluid mechanics measurement equipment and techniques. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 3376 Engineering Structural Mechanics

Prerequisites: CNMG 1213 and 2370, or consent of instructor. The study of deformation in structural materials: stresses and strains due to tension, compression, torsion, and bending; internal shear forces and bending moments; stress and strain transformations; design of beams and analysis of beam deflections; buckling of columns; introduction to the deformation of structures. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 3378 Engineering Thermodynamics

Prerequisites: CHEM 1402, PHYS 2321, and MATH 1452, or consent of instructor. Properties of pure substances, thermodynamic processes, heat and work, the first law of thermodynamics, closed systems, enthalpy, open systems, the second law of thermodynamics, entropy, exergy, and an introduction to power and refrigeration cycles. Three hours lecture. Three credit hours. Cross listed as SYEN 3378. Spring only.

CNMG 4100, 4200, 4300 Independent Study

Prerequisite: junior standing. Topic and method of procedure must have approval of the supervising faculty member. Four to six hours per week of work on the project for each hour of credit earned. The exact hourly commitment per week and credit hour value depends on the nature of the project and is agreed on in advance by the student and the instructor. With approval, may be repeated for up to six hours of credit. One, two, or three credit hours. Offered on demand.

CNMG 4144 Construction Project Acquisition

Prerequisite: SPCH 1300. Concurrent prerequisite: CNMG 4315. The principles of acquiring negotiated and qualification-based construction projects. The role of marketing and business development functions in a construction firm and the formulation of project acquisition strategies will be studied. The preparation of effective responses to Request for Qualifications (RFQ) and the development of persuasive interview presentations will be practiced by students in a competitive environment. Two hours lab. One credit hour. Fall only.

CNMG 4145 Professional Constructor Certification

Prerequisite: Senior standing or consent of instructor. Description of American Institute of Construction (AIC) certification programs and preparation for Constructor Qualifying Examinations leading to certifications as Associate Constructor (AC) and Certified Professional Constructor (CPC). Two hours lab. One credit hour. Spring only.

CNMG 4174 Fluid Mechanics Laboratory

Prerequisite concurrent: CNMG 4374. Analysis of experimental data, basic electrical measurements and sensing devices, pressure measurement, flow measurement, temperature measurement, data acquisition and processing, report writing and presentation, design of experiments. Two hours lab. One credit hour. Cross listed as SYEN 4174. Spring only. No longer offered.

CNMG 4176 Mechanics of Materials Laboratory

Prerequisite concurrent: CNMG 4376 or consent of instructor. Analysis of experimental data, basic electrical measurements and sensing devices, force measurement, torque measurement, strain measurement, motion measurement, vibration measurement, data acquisition and processing, report writing and presentation, design of experiments. Two hours lab. One credit hour. Cross listed as SYEN 4176. No longer offered.

CNMG 4185 Professional Engineering Seminar

Prerequisites: CNMG 1385 and either 4351, 4354, 4357, 4362, 4371, or consent of instructor. Restricted to students within two semesters of graduation who have passed, or are registered to take, the FE and AC exams, or consent of instructor. This course explores the Civil Engineering Body of Knowledge for the 21st Century, as developed by the American Society of Civil Engineers (ASCE). Students learn about the importance of engineering licensure and constructor certification, gain an understanding of professional and ethical responsibility, enhance the ability to function on a multidisciplinary team, and begin preliminary work on the senior design project, which continues in CNMG 4285. Three hours lab. One credit hour. Fall only.

CNMG 4245 Construction Management Capstone

Prerequisites: Restricted to students in the final semester of the construction management or construction engineering program. A capstone course. Students develop and organize construction companies. Project contracts are awarded and contract administration is required. Two hours lecture. Two credit hours. Spring only.

CNMG 4285 Engineering Design Project

Prerequisite: CNMG 4185. Restricted to students in the final semester of one of the engineering programs. Continuation of CNMG 4185. Prepare for engineering practice by designing a major architectural, environmental, or civil engineering project, based on knowledge and skills acquired in earlier course work and incorporating appropriate engineering codes and standards, and multiple realistic constraints (e.g., economic, ethical, safety). One hour lecture, three hours lab. Two credit hours. Spring only.

CNMG 4310 Construction Financial Management

Prerequisites: ACCT 2310 and CNMG 3339, or consent of the instructor. Concepts and principles of construction financial management: construction financial systems and transactions, financial statements, depreciation analysis, labor burden, overhead determination, bid profit margins, and profit center analysis. Three hours lecture. Three credit hours. Fall only.

CNMG 4311 Estimating II

Prerequisites: CNMG 3339 or consent of instructor. Advanced applications and concepts of construction project estimating. Topics include computer aided estimating, correcting estimating errors, labor and equipment productivity, risk adjustment to price, pricing by asset utilization, mark-up, and ethics. Students compete in mock bids on different types of construction projects. Two hours lecture, two hours lab. Three credit hours. Spring only.

CNMG 4315 Construction Business Operations

Prerequisite: CNMG 3339, or consent of the instructor. The course will identify and explore the tasks required for the successful operation of a construction company. Beginning with start-up, the course will study and participate in the operation of a medium size construction through a fiscal year. Course work will include daily, weekly, monthly, quarterly, and annual tasks. The course will cover portions of the Arkansas Contractor's Licensing requirements. Three hours lecture. Three credit hours. Fall only.

CNMG 4318 Advanced BIM

Prerequisites: CNMG 2314, 2318, and 2333, or consent of instructor. Building information modeling (BIM) functions will be used for complex commercial construction; topographic information of sites, project datum, quantities and properties of building components, building sustainability analysis, documenting projects, and detailing of MEP or structural designs; Rendering of exterior and interior views. Two hours lecture and two hours lab. Three credit hours. Fall only.

CNMG 4321 Reinforced Concrete Design

Prerequisite: CNMG 3312 or consent of instructor. Behavior and design of reinforced concrete elements, including beams, columns, slabs, footings, foundations, and retaining walls; introduction to prestressed concrete design. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 4322 Building Structure Design

Prerequisites: CNMG 3321 and 3322, or consent of instructor. Introduction to design and analysis of steel and concrete building structures. Student will study beams, columns, and tension components including fasteners and welds constructed from high strength structural steel following the AISC Manual, during the first half of the course. Reinforced concrete design and analysis procedures for rectangular beams and slabs for bending and shear loads and axially loaded round and square long columns will be studied during the second half of the course. The provisions of the ACI Code will be followed. Concrete prestressed beam technology will be included as well as steel rebar development. Two hours lecture and two hours problem lab. Three credit hours. Offered on demand.

CNMG 4323 Construction Administration

Prerequisites: CNMG 1305 and junior standing, or consent of instructor. An introduction to construction project control and administration through computer applications. Topics include project team development, standard agreements, contract documents utilization, record keeping, submittals, subcontract management, purchasing, expediting, change orders, claims, progress payments, closeout, and internet-based project control. Three hours lecture. Three credit hours. Spring only.

CNMG 4325 Project Quality Control (QC) and Submittals

Prerequisite: Restricted to students in the final semester of the construction management program. Project scope identification, management, and control; scope breakdown and submittal management in the identification of quality control issues related to the estimate and scope procurement process. Three hours lecture. Three credit hours. Spring only.

CNMG 4327 Temporary Structures

Prerequisites: CNMG 3321 and 3322 or consent of instructor. The study of engineering standards, designs, practices, and procedures for erecting temporary structures used to facilitate construction. Topics include earth-retaining structures, slurry walls, dewatering, underpinning, scaffolding, formwork, falsework and shoring, bracing and guying for stability. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4329 Construction Planning and Scheduling

Prerequisite: CNMG 3339 or consent of instructor. An in-depth study of the process of creating and monitoring a construction project schedule. Creation of project schedules on a variety of scheduling software. Two hours lecture, two hours lab. Three credit hours. Fall only.

CNMG 4334 Construction Contracts and Law

Prerequisites: senior standing and CNMG 4323, or consent of instructor. A study of construction contracts in relation to project delivery systems and the basic principles of construction law. Case studies are used to analyze selected areas that affect the construction process. Topics include standard agreements and conditions, negligence, risk, indemnities, modifications, mechanics lien, claims, dispute resolution, conflicts of interest, ethical consideration, and labor law. Three hours lecture. Three credit hours. Fall only.

CNMG 4342 Construction Safety

Prerequisites: junior standing or higher, or consent of instructor. A study of the principles of construction safety management and OSHA 29 CFR PART 1926. The OSHA Construction Industry Training Course 500 topics covered in depth. Students develop a company safety plan and hazardous communications program, perform safety analysis, conduct safety meetings, and write accident investigation reports. Students complete the topic requirements for the OSHA 10-hour and 30-hour Construction Safety and Health training card. Two hours lecture and two hours lab. Three credit hours. Spring only.

CNMG 4351 Foundation Design

Prerequisite: CNMG 3347 or consent of instructor. A brief review of introductory soil mechanics followed by complete hands-on laboratory testing of sample soils for consolidation and tri-axial shear. The major portion of the course is composed of selected geotechnical aspects of foundation design, including both shallow and deep foundations. Topics include: ultimate bearing capacity, allowable bearing capacity, consolidation settlement of shallow foundations, pile foundations for bearing and friction piles, lateral earth pressure and retaining wall design, foundation design on difficult soil s, and specialty soil improvement and ground modification. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4354 Highway Engineering

Prerequisite: CNMG 2316 or consent of instructor. An introduction to highway engineering and traffic analysis. Topics include geometric design of highways, pavement design, traffic flow, highway capacity, level-of-service analysis, traffic control devices and safety, travel demand and traffic forecasting. Three hours lecture. Three credit hours. Fall only.

CNMG 4357 Water and Wastewater Engineering

Prerequisites: CNMG 3374, or consent of instructor. An introduction to drinking water treatment and distribution and wastewater collection and treatment. Topics include coagulation; flocculation; softening; ion exchange; membrane filtration; sedimentation; filtration; disinfection; wastewater microbiology; primary, secondary, and tertiary treatment of wastewater; and residuals management. Three hours lecture. Three credit hours. Spring only.

CNMG 4361 Green Construction

Prerequisite: Junior standing or higher. Overview of design and construction delivery systems for high performance green buildings; relevant criteria and established guidelines; green standards; high performance green buildings and sustainability; vocabulary associated with sustainability and green buildings; physical limitations of materials. Three hours lecture. Three credit hours. Fall only.

CNMG 4362 Water Resources Engineering

Prerequisites: CNMG 3374 and ERSC 4372, or consent of instructor. Analysis and design of hydraulic facilities including water supply and distribution systems, stormwater and wastewater collection systems, pumps and turbines, open channels, culverts, and groundwater wells. Analysis of rainfall and river flow; surface and subsurface water storage. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4364 Air Pollution Engineering

Prerequisites: CNMG 3357 and CHEM 1403, or consent of instructor. The study of the fundamental principles of air pollution, sources, effects, and management mechanisms. Discussion of air quality standards, regulations and criteria; meteorological factors and dispersion modeling. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4366 Solid and Hazardous Waste Management

Prerequisites: CNMG 3357 or consent of instructor. Overview of fundamental principles related to solid and hazardous waste management including collection, handling, costs and disposal. Discussion of rules, regulations and management systems for proper destruction, immobilization and control of solid and hazardous wastes. Evaluation of engineering systems to minimize costs and assessment of environmental impact of management system. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 4368 Environmental Risk Assessment

Prerequisites: BIOL 2401 and CNMG 3357, or consent of instructor. Concurrent Prerequisites: STAT 3352 or consent of instructor. Fundamentals of risk assessment, including ecological and human risk and applications in environmental engineering. Topics include hazard identification, dose response assessment, exposure assessment and risk characterization. Two hours lecture. Two hours lab. Three credit hours. Fall only.

CNMG 4369 Soil and Groundwater Remediation

Prerequisites: CNMG 3357. Prerequisite Concurrent: ERSC 4473. Overview of fundamental principles related to groundwater and soil remediation. Discussion of physical, chemical, and biological remediation technologies for contaminated groundwater and soil by in-situ and ex-situ applications. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4371 Structural Steel Design

Prerequisite: CNMG 3312 or consent of instructor. Behavior and design of structural steel elements, including connectors, tension and compression members, columns, and braced and unbraced beams; members under combined forces; joints and connecting elements; connections. Two hours lecture. Two hours lab. Three credit hours. Spring only.

CNMG 4374 Fluid Mechanics

Prerequisites: CNMG 3370 and MATH 3322, or consent of instructor. Prerequisite concurrent: CNMG 3378 or consent of instructor. Properties of fluids, pressure and fluid statics, fluid kinematics, Bernoulli and energy equations, momentum, dimensional analysis, flow in pipes, differential analysis, approximation of the Navier-Stokes equation, drag and lift, compressible flow, open channel flow, turbomachinery, CFD. Three hours lecture. Three credit hours. Cross listed as SYEN 4374. No longer offered.

CNMG 4376 Mechanics of Materials

Prerequisites: CNMG 3370, and 1313 or 3372, or consent of instructor. Stress, strain, axial loading, torsion, pure bending, analysis and design of beams, shearing stresses in beams and thin-walled members, transformation of stress and strain, principal stresses, deflection of beams, columns, energy methods. Three hours lecture. Three credit hours. Cross listed as SYEN 4376. No longer offered.

CNMG 4379 Heat Transfer

Prerequisites: CNMG 3374 or 4374, or consent of instructor. Prerequisite concurrent: MATH 3322, or consent of instructor. Steady and transient heat conduction; forced, natural, and multiphase convection; heat exchanger design and analysis; radiation heat transfer; mass transfer. Three hours lecture. Three credit hours. Cross listed as SYEN 4379. No longer offered.

CNMG 4380 Heating, Ventilating, Air-Conditioning, and Refrigeration (HVACR) Engineering Fundamentals

Prerequisite: CNMG 2274 or SYEN/CNMG 3378, or consent of instructor. Fundamentals of heating, ventilating, air-conditioning, and refrigeration (HVACR) engineering; refrigeration cycles; psychometrics; indoor air quality and ventilation; heating and cooling loads. Two hours lecture, two hours lab. Three credit hours. Cross-listed as SYEN 4380. Spring only.

CNMG 4381 Thermal Powerplant Engineering

Prerequisite: CNMG 2274 or SYEN/CNMG 3378, or consent of instructor. Thermodynamics of combustion and power cycles; internal combustion engines; steam turbine powerplants; gas turbine powerplants; combined cycle powerplants; introduction to alternative energy systems. Two hours lecture. Two hours lab. Three credit hours. Cross listed as SYEN 4381. Offered on demand.

CNMG 4389/5389 Professional Engineering Licensure

Prerequisite concurrent: Senior standing and registration for the Fundamentals of Engineering exam, or consent of instructor. Legal, regulatory, and ethical issues related to the practice of engineering; preparation for engineering licensure examinations. Two hours lecture. Three hours lab. Three credit hours. Cross listed as SYEN 4389/5389. No longer offered.

CNMG 4391 Cooperative Education

Prerequisites: junior standing, declared major in construction management or construction engineering, and cumulative GPA of at least 2.50; approval of assignment by department chairperson. Requires at least 200 contact hours on the job. Three credit hours. Offered on demand.

CNMG 4395 Professional Development

Prerequisites: senior standing and consent of instructor. Partnerships between students and nonprofit community organizations will be established. Students use skills in construction management or construction engineering to assist with construction-related projects. Service hours will be established at the beginning of the course. Three credit hours. Offered on demand.

CNMG 4199, 4299, 4399 Special Topics in Construction

Prerequisites: consent of instructor based on relevance of subject matter to student career goals. Designed to meet special needs of students or industry to cover application of construction management or construction engineering to specific problems. Meets equivalent of one hour per week for each credit hour value. May be taken more than once for credit. One, two, or three credit hours. Offered on demand.