Civil Engineering
(CVEG)

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Department of Civil Engineering Website (https://civil-engineering.uark.edu/)

Civil engineering is the oldest of all engineering fields, yet it is as contemporary as the need to provide solutions to today's environmental, geotechnical, structural and transportation problems. The civil engineer plans, designs, builds, and operates projects for the advancement and well-being of society while coordinating and conserving human and natural resources. Civil engineering projects range from small to monumental and include public water systems, buildings, bridges, rail and highway networks, water and wastewater treatment plants, solid and hazardous waste disposal facilities, airports, and soil conservation and flood diversion controls.

The civil engineering profession offers a vast array of opportunities. Civil engineers may work in private employment or with public agencies. They may work indoors in activities such as planning and design, or outdoors in areas such as construction supervision. Employment is possible anywhere in the world.

The objective of the Civil Engineering undergraduate program is to produce graduates who are prepared to pursue:

• Careers in the broad field of civil engineering
• Licensure as a professional engineer
• Advanced education

To fulfill this objective, all students must take courses in geotechnical, environmental, transportation, and structural engineering. Courses are designed to present "real world" applications without sacrificing conceptual and theoretical basics. Students complete design problems in each of these areas; and, as part of the senior year, they participate in two major design projects.

Completion of degree requirements provides graduates with the following learning outcomes:

• An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
• An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
• An ability to communicate effectively with a range of audiences
• An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
• An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

requirements for B.S. in Civil Engineering
Elective Courses

Students must select three 3-hour civil engineering elective courses in conference with their adviser. Normally, the civil engineering courses are selected from among the 4000-level elective CVEG courses. Exceptional students may be allowed to choose from the 5000 (graduate-level) course series.

Students must also choose one elective course in science, engineering, technology, or math (STEM) field.

Humanities and social science electives are selected from courses approved by the university which satisfy the University Core general education requirement. Lists of approved electives are on file in the department office.

Civil Engineering Design Electives

Students must complete two of the following four CVEG design project electives: CVEG 4812 Environmental Design Project, CVEG 4822 Geotechnical Design Project, CVEG 4832 Structural Design Project, and CVEG 4842 Transportation Design Project. Each design project elective is associated with a specific design-oriented course. The associated course must be taken at the same time as the design project elective. The associated courses may be taken alone but the design electives cannot.

STEM Electives

Students must also choose one elective course in science, engineering, technology, or math (STEM) from among the following:

- CSCE 2004 Programming Foundations I 4
- ELEG 3903 Electric Circuits and Machines 3
- GNEG 3113 Special Topics-Study Abroad 3
- GNEG 3811 Alternating Cooperative Education (must get 3 separate rotations) 1
- MEEG 2013 Dynamics 3
- MEEG 2403 Thermodynamics 3
- MEEG 2703 Computer Methods in Mechanical Engineering 3
- GEOS 3023 Introduction to Cartography 3
- GEOS 3543 Geospatial Applications and Information Science 3
- GEOS 4533 Introduction to Petroleum Geophysics 3
- MATH 3083 Linear Algebra 3
- MATH 4363 Numerical Analysis 3

Any 3000-level or above science, technology, engineering or math course. (It is recommended that students consult with their adviser when making this selection.)

Civil Engineering B.S.C.E.
Eight-Semester Degree Program

The Civil Engineering B.S.C.E. program is eligible for freshman students who want to participate in an Eight-Semester Degree Program. See the Eight-Semester Degree Policy (http://
The following section contains the list of courses required for the Bachelor of Science in Civil Engineering degree and a suggested sequence. Not all courses are offered every semester, so students who deviate from the suggested sequence must pay careful attention to course scheduling and course prerequisites.

See the list of university core courses (http://catalog.uark.edu/undergraduatecatalog/academicregulations/universitycore/) available for engineering students.

### First Year

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#### MATH 2554 Calculus I (ACTS Equivalency = MATH 2405) 4

#### PHYS 2054 University Physics I (ACTS Equivalency = PHYS 2034) 4

#### GNEG 1111 Introduction to Engineering I 1

#### CHEM 1103 University Chemistry I (ACTS Equivalency = CHEM 1414 Lecture) 3

#### ENGL 1013 Composition I (ACTS Equivalency = ENGL 1013) 3

#### MATH 2564 Calculus II (ACTS Equivalency = MATH 2505) 4

#### GNEG 1121 Introduction to Engineering II 1

#### Freshman Science Elective 4

#### Freshman Science Elective Lab 0

#### ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023) 3

#### Select one of the following: 3

- HIST 2003 History of the American People to 1877 (ACTS Equivalency = HIST 2113)
- HIST 2013 History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)

#### Year Total: 15 15

### Second Year

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#### MATH 2574 Calculus III (ACTS Equivalency = MATH 2603) 4

#### CVEG 2013 Civil Engineering Mechanics I 3

#### CVEG 2002 Introduction to Civil Engineering Plans and CADD 2

#### CVEG 2053 Surveying Systems & CVEG 2051L Surveying Systems Laboratory 4

#### Fine Arts Elective (from University/State Core list) 3

#### MATH 2584 Elementary Differential Equations 4

#### CVEG 2023 Civil Engineering Mechanics II 3

#### CVEG 2113 Structural Materials 3

#### INEG 2313 Applied Probability and Statistics for Engineers I 3

#### GEOS 1113 General Geology (ACTS Equivalency = GEOL 1114 Lecture) 4

& GEOS 1111L General Geology Laboratory (ACTS Equivalency = GEOL 1114 Lab) 4

#### Year Total: 16 17

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#### INEG 2413 Engineering Economic Analysis 3

#### CVEG 3303 Structural Analysis 3

#### CVEG 3213 Hydraulics 3

#### STEM Elective 3

#### CVEG 3413 Transportation Systems Engineering 3

#### CVEG 2851 Engineering Professional Practice Issues 1

#### CVEG 4303 Reinforced Concrete Design I 3

#### CVEG 3243 Environmental Engineering 3

#### CVEG 3132 Soil Mechanics & CVEG 3131L Soil Mechanics Laboratory 3

#### CVEG 3223 Hydrology 3

#### Social Science Elective (from University/State Core list) 3

#### Year Total: 16 15

### Fourth Year

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#### Civil Engineering Elective 1 3

#### Civil Engineering Design Elective 2

#### CVEG 4143 Foundation Engineering 3

#### CVEG 4423 Transportation Infrastructure 3

#### CVEG 4890 Fundamentals of Engineering Seminar 0

#### Humanities Elective (from University/State Core List) 3

#### Social Science Elective (from University/State Core list) 3

#### CVEG 4513 Construction Management 3

#### Civil Engineering Design Elective 2

#### CVEG 4243 Environmental Engineering Design 3

#### Civil Engineering Electives 1 6

#### Social Science Elective (from University/State Core List) 3

#### CVEG 4243 Environmental Engineering Design 3

#### CVEG 4243 Environmental Engineering Design 3

#### Civil Engineering Electives 1 6

#### Social Science Elective (from University/State Core list) 3

#### Year Total: 17 17

#### Total Units in Sequence: 128

1. See the elective list among the program requirements.

### Honors Program Requirements

Students enrolled in the Honors College who are to receive the Bachelor of Science in Civil Engineering must complete a minimum of 12 hours of honors credit. At least 6 hours must be completed within the Civil Engineering program including at least 3 hours resulting in an Honors Thesis. The CVEG honors courses are acceptable as engineering electives and in some cases may be substituted for required courses. The following Civil Engineering courses are offered for honors credit:
CVEG 491VH Honors Studies in Geotechnical Engineering, CVEG 492VH Honors Studies in Environmental Engineering, CVEG 493VH Honors Studies in Structural Engineering, CVEG 494VH Honors Studies in Transportation Engineering, and CVEG 4983H Honors Undergraduate Thesis.

Bernhardt-Barry, Michelle, Ph.D., M.S.C.E., B.S.C.E. (Texas A&M University), Assistant Professor, 2013.
Braham, Andrew F., Ph.D. (University of Illinois-Urbana-Champaign), M.S., B.S. (University of Wisconsin-Madison), Associate Professor, 2010.
Coffman, Rick, Ph.D. (University of Missouri-Columbia), M.S. (University of Texas at Austin), B.S. (University of Wyoming), Associate Professor, 2009.
Dennis, Norman D., Ph.D. (University of Texas at Austin), M.B.A. (Boston University), M.S.C.E., B.S.C.E. (Missouri University of Science and Technology), Professor, 1996.
Edwards, Findlay, Ph.D. (New Mexico State University), M.S. (University of New Mexico), M.S.C.E. (New Mexico State University), Associate Professor, 1999.
Fairey, Julian, Ph.D., M.S.C.E. (University of Texas at Austin), B.S.C.E. (University of Alberta, Canada), Associate Professor, 2008.
Fernstrom, Eric, Ph.D. (University of Arkansas), Instructor, 2014.
Gattis, J. L., Ph.D. (Texas A&M University), M.S.C.E. (University of Texas Arlington), B.S.C.E. (University of Arkansas), Professor, 1993.
Hale, Micah, Ph.D., M.S.C.E., B.S.C.E. (University of Oklahoma), Professor, 2002.
Hall, Kevin D., Ph.D. (University of Illinois-Urbana-Champaign), M.S.C.E., B.S.C.E. (University of Arkansas), Professor, 1993.
Hernandez, Sarah, Ph.D., M.S. (University of California, Irvine), B.S. (University of Florida), Assistant Professor, 2015.
Heymsfield, Ernie, Ph.D. (City University of New York), M.S.C.E. (Polytechnic University), Associate Professor, 2001.
Prinz, Gary S., Ph.D., M.S., B.S. (Brigham Young University), Assistant Professor, 2014.
Selvam, R. Panneer, Ph.D. (Texas Tech University), M.S.C.E. (South Dakota School of Mines and Technology), M.E., B.E. (University of Madras, India), University Professor, 1986.
Williams, Stacy Goad, Ph.D., M.S.C.E., B.S.C.E. (University of Arkansas), Associate Professor, 1997.
Williams, Rodney D., Ph.D., M.S., B.S.C.E. (University of Arkansas), Assistant Professor, 1998.
Wood, Clinton M., Ph.D. (University of Texas at Austin), M.S.C.E., B.S.C.E. (University of Arkansas), Assistant Professor, 2013.
Zhang, Wen, Ph.D. (Purdue University), M.S. (University of Kansas), Assistant Professor, 2011.

Courses

CVEG 2002. Introduction to Civil Engineering Plans and CADD. 2 Hours.
Development and preparation of design and construction plans; plan terminology and features; introduction to computer-aided drafting and design (CADD) software. Corequisite: Drill component. Prerequisite: Civil Engineering major or departmental consent. (Typically offered: Fall, Spring and Summer)

CVEG 3213. Hydrology. 3 Hours.
Study of incompressible fluids. Topics include fluid properties, fluid statics, continuity, energy and hydraulic gradients, fundamentals of flow in pipes and open channels. Hardy Cross analyses, measurement of flow of incompressible fluids, hydraulic similitude and dimensional analysis. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CVEG 2053 or CVEG 2015 or CVEG 2023. (Typically offered: Fall and Spring)

CVEG 3223. Hydrology. 3 Hours.
Study of incompressible fluids. Topics include fluid properties, fluid statics, continuity, energy and hydraulic gradients, fundamentals of flow in pipes and open channels. Hardy Cross analyses, measurement of flow of incompressible fluids, hydraulic similitude and dimensional analysis. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CVEG 2053 or CVEG 2015 or CVEG 2023. (Typically offered: Fall and Spring)
CVEG 3303. Structural Analysis. 3 Hours.
Truss analysis, influence lines for beams and frames, and effects of moving loads. Deformation of beams, frames, and trusses. Analysis of indeterminate structures by moment area, slope deflection, and moment distribution methods; approximate methods of analysis. Lecture 3 hours, drill 3 hours per week. Corequisite: Lab component. Prerequisite: MEEG 3013 or CVEG 2015 (formerly CVEG 2014) or CVEG 2023. (Typically offered: Fall and Spring)

CVEG 3413. Transportation Systems Engineering. 3 Hours.
Transportation Systems Engineering: Introduction to transportation systems engineering and planning. Includes the following topics: transportation governance, financing, and the effect on the environment; traffic flow theory; safety; traffic operations and control; capacity; and travel demand modeling. Prerequisite: CVEG 2053 and INEG 2313. (Typically offered: Fall)

CVEG 4053. Land Surveying. 3 Hours.

CVEG 4083. Control Surveys. 3 Hours.
Sun and Polaris observations for astronomical azimuth, solar access studies; control traversing, leveling, triangulation; state plane coordinate systems. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CVEG 2053 and CVEG 2051L. (Typically offered: Irregular)

CVEG 4143. Foundation Engineering. 3 Hours.
Analysis and design of retaining walls, footings, sheet piles, and piles. Determination of foundation settlements in sand and clay. Prerequisite: CVEG 3132 and INEG 2413. (Typically offered: Fall and Spring)

CVEG 4203. Environmental Regulations and Permits. 3 Hours.
Topics include federal and state environmental regulations, the permitting process, permit requirements and related issues. Prerequisite: CVEG 3243 and senior standing. (Typically offered: Fall)

CVEG 4243. Environmental Engineering Design. 3 Hours.
Application of physical, biological, and chemical operations and processes to the design of water supply and wastewater treatment systems. Prerequisite: CVEG 3243 and INEG 2413. (Typically offered: Fall and Spring)

CVEG 4263. Air Pollution Control. 3 Hours.
Fundamentals of air pollution causes, effects, and measurements; as well as, control methods with application to current industrial problems. Prerequisite: CVEG 3213 or MEEG 3503. (Typically offered: Spring)

CVEG 4273. Open Channel Flow. 3 Hours.
Open Channel Flow includes advanced open channel hydraulics, flow measurement techniques, a hydrology review, culvert and storm drainage design, natural channel classification (fluvial geomorphology) and rehabilitation, computer methods and environmental issues. Prerequisite: CVEG 3213 and CVEG 3223. (Typically offered: Spring)

CVEG 4303. Reinforced Concrete Design I. 3 Hours.
Design of reinforced concrete elements with emphasis on ultimate strength design supplemented by working stress design for deflection and crack analysis. Prerequisite: CVEG 2113 and CVEG 3304. (Typically offered: Fall and Spring)

CVEG 4313. Structural Steel Design I. 3 Hours.
Design of structural steel elements by elastic design the Load and Resistance Factor Design method. Intensive treatment of tension members, beams, columns, and connections. Pre- or Corequisite: CVEG 2113. Prerequisite: CVEG 3303 (formerly CVEG 3304). (Typically offered: Fall and Spring)

CVEG 4323. Structural Loadings. 3 Hours.
Theoretical background to and practical code requirements for various structural loadings. These include dead loads, occupancy loads, roof loads and ponding, snow loads, granular loads, vehicular loads, wind loading, and seismic loads. Prerequisite: CVEG 3303 (formerly CVEG 3304), INEG 2413 and (CVEG 4303 or CVEG 4313). (Typically offered: Spring)

CVEG 4343. Reinforced Masonry Design. 3 Hours.

CVEG 4353. Timber Design. 3 Hours.
Selection of timber beams, columns, and beam-columns. Physical properties of wood, analysis and design of timber connections. Truss design, glulam members, timber bridge design, treatment for decay, and fire protection. Pre- or Corequisite: CVEG 2113. Prerequisite: CVEG 3303 (formerly CVEG 3304). (Typically offered: Irregular)

CVEG 4413. Pavement Evaluation and Rehabilitation. 3 Hours.
Introduction of concepts and procedures for pavement condition surveys; evaluation by nondestructive and destructive testing; maintenance strategies; rehabilitation of pavement systems for highway and airfields; pavement management systems. Prerequisite: CVEG 4433. (Typically offered: Irregular)

CVEG 4423. Transportation Infrastructure. 3 Hours.
Transportation infrastructure includes discussion on the geometric design of roadways, roadway drainage, roadway materials, roadway structural design, and an economic analysis of roadways. This includes the design of horizontal and vertical alignment, cross section, intersections, pavement materials, and structural capacity. Prerequisite: CVEG 3413 and INEG 2413. (Typically offered: Fall and Spring)

CVEG 4433. Transportation Pavements and Materials. 3 Hours.
Study of the engineering properties and behavior of materials commonly used in transportation facilities as they relate to the design and performance of flexible and rigid pavement systems. Lecture 2 hours, laboratory 3 hours per week. Corequisite: Lab component. Prerequisite: CVEG 3132, CVEG 3413, and INEG 2313. (Typically offered: Irregular)

CVEG 4513. Construction Management. 3 Hours.
Introduction to methods and procedures for management of civil engineering construction projects including organization, plans and specs, cost estimating and bidding, project planning and finance, quality control/assurance, construction safety, cost management, labor issues, change orders, and subcontractor issues. Prerequisite: Senior standing and Civil Engineering majors only. (Typically offered: Fall and Spring)

CVEG 4812. Environmental Design Project. 2 Hours.
Comprehensive engineering design project primarily related to environmental issues. Corequisite: CVEG 4243. (Typically offered: Spring)

CVEG 4822. Geotechnical Design Project. 2 Hours.
Comprehensive engineering design project primarily related to geotechnical issues. Corequisite: CVEG 4143. Prerequisite: CVEG 4303. (Typically offered: Fall)

CVEG 4832. Structural Design Project. 2 Hours.
Comprehensive engineering design project primarily related to structural issues. Corequisite: CVEG 4323. Prerequisite: CVEG 4303 and CVEG 4313. (Typically offered: Spring)

CVEG 4842. Transportation Design Project. 2 Hours.
Comprehensive engineering design project primarily related to transportation issues. Corequisite: CVEG 4423. Prerequisite: CVEG 2002. (Typically offered: Fall)
CVEG 4863. Sustainability in Civil Engineering. 3 Hours.
Quality and quantify the economic, environmental, societal, and engineering drivers behind sustainability in Civil Engineering. Justification of the feasibility and benefits of sustainability in environmental, geotechnical, structural, and transportation engineering through verbal and written communications. Prerequisite: Senior standing. (Typically offered: Irregular)

CVEG 488V. Special Problems. 1-6 Hour.
Special problems. Prerequisite: Senior standing. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

CVEG 488VH. Honors Special Problems. 1-6 Hour.
Service Learning in Belize. Prerequisite: Senior standing. (Typically offered: Irregular)
This course is equivalent to CVEG 488V.

CVEG 4890. Fundamentals of Engineering Seminar. 0 Hours.
Preparation for students taking the Fundamentals of Engineering (FE) examination, administered by the National Council of Examiners for Engineering and Surveying (NCEES). Concept review and problem-solving drills for topics covered on the FE-Civil examination. Prerequisite: Civil Engineering major and senior standing. (Typically offered: Fall and Spring)

CVEG 491VH. Honors Studies in Geotechnical Engineering. 1-6 Hour.
The study of advanced topics in the geotechnical engineering field. May include participation in geotechnical engineering courses normally available only to graduate students. Prerequisite: CVEG 3132 with a grade of C or better. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

CVEG 492VH. Honors Studies in Environmental Engineering. 1-6 Hour.
The study of advanced topics in the environmental engineering field. May include participation in environmental engineering courses normally available only to graduate students. Prerequisite: CVEG 3243 with a grade of C or better. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

CVEG 493VH. Honors Studies in Structural Engineering. 1-6 Hour.
The study of advanced topics in the structural engineering field. May include participation in structural engineering courses normally available only to graduate students. Prerequisite: CVEG 3304 with a grade of C or better. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

CVEG 494VH. Honors Studies in Transportation Engineering. 1-6 Hour.
The study of advanced topics in the transportation engineering field. May include participation in transportation engineering courses normally available only to graduate students. Prerequisite: CVEG 3413 with a grade of C or better. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

CVEG 4983H. Honors Undergraduate Thesis. 3 Hours.
Thesis research for civil engineering students enrolled in the honors college. Prerequisite: Honors College. (Typically offered: Irregular)