

DEPARTMENT OF CIVIL ENGINEERING

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Website: <http://www.marshall.edu/cecs> (<http://www.marshall.edu/cecs/>)

Civil Engineering is the application of physical and mathematical principles for solving the problems of society. Because civil engineering is a broad profession, it includes several specialized sub-disciplines such as:

- Construction Engineering
- Environmental Engineering
- Geotechnical Engineering
- Structural Engineering
- Transportation Engineering
- Water Resources Engineering

It requires a background knowledge of mechanics and structures, materials science, soils, hydrology, water resources, environment and other fields. Civil engineers' duties include planning, designing, and overseeing construction and maintenance of building structures, and facilities such as roads, railroads, airports, bridges, harbors, channels, irrigation projects, pipelines, power plants and water and sewage systems.

Programs

- Civil Engineering, B.S.C.E. (<http://catalog.marshall.edu/undergraduate/programs-az/engineering-computer-sciences/civil-engineering/civil-engineering-bsce/>)
- Engineering, B.S.E. (<http://catalog.marshall.edu/undergraduate/programs-az/engineering-computer-sciences/civil-engineering/engineering-bse/>)
- Engineering Science, Minor (<http://catalog.marshall.edu/undergraduate/programs-az/engineering-computer-sciences/civil-engineering/engineering-science-minor/>)
- Engineering Transfer Program (<http://catalog.marshall.edu/undergraduate/programs-az/engineering-computer-sciences/civil-engineering/engineering-transfer-program/>)
- Pre-Engineering (<http://catalog.marshall.edu/undergraduate/programs-az/engineering-computer-sciences/civil-engineering/pre-engineering/>)

Courses

 - General Education Course

CE 102 Introduction to CAD 2 Credit hours

An introduction of scales, plan reading, engineering graphics and computer aided design (CAD). Introduction to the operation of modern 2D and 3D CAD software used in civil engineering applications.

Pre-req: MTH 132 (may be taken concurrently) with a minimum grade of D or MTH 229 (may be taken concurrently) with a minimum grade of D or MTH 229H (may be taken concurrently) with a minimum grade of D or MTH 230 (may be taken concurrently) with a minimum grade of D or MTH 231 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: MTH 132 or MTH 229 or MTH 229H or MTH 230 or MTH 231

Attributes: No Textbook Required

Grade Mode: Normal Grading Mode

CE 241 Introduction to Geomatics 3 Credit hours

Introduction to methods and tools used to measure, analyze, and present surveying data: horizontal distances, elevation, angles, areas, and volumes. Including both field and CAD lab exercises. 3 lec.-3 lab.

Pre-req: CE 102 with a minimum grade of D.

Grade Mode: Normal Grading Mode

CE 312 Structural Analysis 3 Credit hours

Stability and determinacy of civil engineering structures. Forces and deflections in statically determinate trusses, beams, and frames. Influence lines for planar structures. Elementary indeterminate structural analysis. Computer applications. 3-lec.

Pre-req: ENGR 216 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: ENGR 216

Grade Mode: Normal Grading Mode

CE 319 Civil Engr Fluid Mechanics Lab 1 Credit hour

Laboratory experiments to support study of civil engineering fluid mechanics, including fluid properties, buoyancy, hydrostatic forces, flow visualization, jet impact, pipe flow, and open channel flow.

Pre-req: ENGR 318 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: ENGR 318

Grade Mode: Normal Grading Mode

CE 321 Civil Engineer Materials 4 Credit hours

The study of civil engineering materials; metals and alloys, mineral aggregates, cements, concrete and concrete products, bituminous materials, lumber and timber. Laboratory testing of materials. 3 lec.-3 lab.

Grade Mode: Normal Grading Mode

CE 322 Geotechnical Engineering 4 Credit hours

This course will provide students with an introduction to soil mechanics, including soil characterization, compaction, consolidation, and shear strength. Students will also understand soil behaviors through hands-on experience 3 lec.-3 lab.

Grade Mode: Normal Grading Mode

CE 331 Hydraulic Engineering 3 Credit hours

Hydraulic flow in pipe networks, water hammer, surge tanks, pumps and turbines. Basic open channel flow. Storm and sanitary sewer design. Dams and reservoirs. 3 lec.

Pre-req: ENGR 318 with a minimum grade of D.

Grade Mode: Normal Grading Mode

CE 341 Advanced Geomatics**3 Credit hours**

Introduction to advanced geo-spatial data collection instrumentation, processes and capabilities. Geo-spatial data display, integration and analyses software tools are presented and utilized in a lecture/lab format.

Pre-req: CE 241.**Grade Mode:** Normal Grading Mode**CE 342 Transportation Engineering****3 Credit hours**

Introduction to transportation systems: highway, rail, water, and air transportation organization and administration; vehicle and human characteristics; rectilinear and curvilinear vehicle motion; location, design and planning of transportation systems. 3-lec.

Pre-req: CE 241 with a minimum grade of D.**Grade Mode:** Normal Grading Mode**CE 351 Environmental Engineering****3 Credit hours**

Environmental issues, problems, and evaluation methodology; fundamental concepts in pollution modeling and control, and engineering management approaches; material transport, balance, and separations; kinetics and reactor design. 3-lec.

Pre-req: ENGR 318 (may be taken concurrently) with a minimum grade of D and CHM 212 (may be taken concurrently) with a minimum grade of D.**Concurrent PR:** ENGR 318 and CHM 212**Grade Mode:** Normal Grading Mode**CE 413 Reinforced Concrete****3 Credit hours**

Behavior and design of reinforced concrete elements according to ACI 318. Design of beams, one-way slabs, columns, and beam-columns based on strength and serviceability requirements. 3-lec.

Pre-req: CE 312.**Grade Mode:** Normal Grading Mode**CE 414 Structural Steel Design****3 Credit hours**

Behavior and design of structural steel elements according to AISC 360. Design of tension members, bolted and welded connections, columns, beams, and beam-columns based on strength and serviceability requirements. 3-lec.

Pre-req: CVLE 212 or CE 312.**Attributes:** No Textbook Required**Grade Mode:** Normal Grading Mode**CE 425 Foundation Engineering****3 Credit hours**

This course will focus on designing shallow and deep foundations, including spread and mat foundations, driven piles, and drilled shafts. Topics include bearing capacity of soils, settlement, and pile behaviors. 3-lec.

Pre-req: CE 322.**Grade Mode:** Normal Grading Mode**CE 426 Retaining Structures and Slope****3 Credit hours**

This course will provide students with an understanding of retaining structure applications and slope stability analysis in Geotechnical Engineering practice.

Pre-req: CE 322 with a minimum grade of D.**Grade Mode:** Normal Grading Mode**CE 433 Hydrologic Engineering****3 Credit hours**

Introduction to the water cycle, including precipitation, evaporation, infiltration, and runoff. Methods of modeling surface runoff, routing, and floodplain analysis. Computerized design of culverts, storm sewers, and watershed modeling. 3-lec.

Pre-req: CE 331.**Grade Mode:** Normal Grading Mode**CE 434 Water/Wastewater Trtmt Dsgn****3 Credit hours**

Physical, chemical, and biological principles in water and wastewater treatment. Design of treatment systems, including flocculation, sedimentation, disinfection, activated sludge, fixed-growth, and solids treatment. Includes bench-scale demonstrations of treatment steps.

Pre-req: CE 351.**Grade Mode:** Normal Grading Mode**CE 438 Pavement Design and Management****3 Credit hours**

This course is designed to teach the undergraduate engineering student about the application of transportation engineering, material behavior and engineering management principles to design and manage highway pavements.

Pre-req: ENGR 216 with a minimum grade of D and CE 342 with a minimum grade of D.**Grade Mode:** Normal Grading Mode**CE 443 Transportation Systems Design****3 Credit hours**

Application of transportation engineering principles to evaluate existing transportation systems and design necessary improvements. Transportation systems include roadway segments, intersections, sidewalks, and interchanges. Course includes a design project. 3-lec.

Pre-req: CE 342.**Grade Mode:** Normal Grading Mode**CE 452 Senior Seminar of Civil Engr****1 Credit hour**

This seminar course will prepare students for engineering practice upon graduation. Topics include professional responsibility, engineering ethics, employment opportunities, and review for the Fundamentals of Engineering Exam.

Pre-req: CE 312 with a minimum grade of D or CE 331 with a minimum grade of D.**Grade Mode:** Normal Grading Mode**CE 453  Capstone Senior Design****3 Credit hours**

Students utilize the engineering design process to complete a comprehensive civil engineering project that addresses a real-world problem with realistic constraints in a collaborative environment. (PR: ENGR 451 and on CE Design Elective).

Attributes: Capstone Course**Grade Mode:** Normal Grading Mode**CE 480 Special Topics in CE****1-4 Credit hours**

Current topics in civil engineering to be selected depending on the interests of the students and faculty. Current topics in civil engineering to be selected depending on the interests of the students and faculty.

Grade Mode: Normal Grading Mode**CE 481 Special Topics in CE****1-4 Credit hours**

Current topics in civil engineering to be selected depending on the interests of the students and faculty. Current topics in civil engineering to be selected depending on the interests of students and faculty.

Grade Mode: Normal Grading Mode**CE 482 Special Topics in CE****1-4 Credit hours**

Current topics in civil engineering to be selected depending on the interests of the students and faculty. Current topics in civil engineering to be selected depending on the interests of students and faculty.

Grade Mode: Normal Grading Mode**CE 483 Special Topics in CE****1-4 Credit hours**

Current topics in civil engineering to be selected depending on the interests of the students and faculty. Current topics in civil engineering to be selected depending on the interests of students and faculty.

Grade Mode: Normal Grading Mode

CE 534 Geometric Highway Design	3 Credit hours	CE 622 Foundation Engineering 2	3 Credit hours
Highway planning and design, including the capacity, horizontal alignment, vertical alignment, roadside design, traffic control, and other related aspects. Types of facilities discussed will include roadways, sidewalks, intersections, and interchanges.		Grade Mode: Normal Grading Mode	
Grade Mode: Normal Grading Mode		CE 623 Advanced Soil Testing Theory	3 Credit hours
CE 538 Pavement Design	3 Credit hours	Grade Mode: Normal Grading Mode	
Design of highway pavement systems, subgrades, subbases and bases, soil stabilization, flexible and rigid pavements; cost analysis and pavement selection; traffic data collection; drainage; earthwork; pavement evaluation and maintenance.		CE 624 Design of Earth Structures	3 Credit hours
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 602 Structural Mechanics	3 Credit hours	CE 626 Groundwater Investigation	3 Credit hours
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 604 Buckling of Struct Mem &	3 Credit hours	CE 631 Geometric Design of Highways	3 Credit hours
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 605 Structural Vibrations	3 Credit hours	CE 632 Highway Materials 1	3 Credit hours
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 611 Plastic Design	3 Credit hours	CE 633 Highway Materials 2	3 Credit hours
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 612 Advanced Steel Design	3 Credit hours	CE 634 Traffic Engineering	3 Credit hours
Background of AISC 360, emphasizing building applications. Analysis method for second-order effects. Composite member design. Plate girders. Splices and bracing connections. Eccentric connections. Wind and seismic applications.		Design and application of signs, markings, and signals; timing of isolated and interconnected signals; speed regulation on one-way streets; capacity and analysis of highway facilities.	
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 614 Advanced Concrete Design	3 Credit hours	CE 635 Eval of Transportation Systems	3 Credit hours
Background of ACI 318, emphasizing building applications. Precast elements. Moment frames and shear walls. Continuous construction. Foundations and earth-retaining structures. Two-way slab design methods. Strut-and-tie analogies. Column supported slabs. Modern reinforced concrete design procedures; comparison of standard design codes; review of research on behavior of reinforced concrete structures; projection to future changes in design and construction practices.		Concepts of transportation economic analysis, transportation costs and benefits, needs studies, finance and taxation, methods of evaluation of plans and projects, environmental impact assessment.	
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 616 Prestressed Concrete Design	3 Credit hours	CE 636 Transportation Planning	3 Credit hours
Behavior and design of prestressed concrete beams, columns, and beam-columns, emphasizing highway bridge applications. Methods of prestressing and loss estimation for precast and cast-in-place elements. Design of prestressed concrete structures; design for flexure, shear, and torsion; camber and deflections; continuity; connections; fire rating; and review of research and projection to changes in practices.		Techniques used to plan urban transportation systems; data collection, trip generation, trip distribution, mode choice, traffic assignment, modeling and evaluation techniques; travel demand modeling.	
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
CE 618 Bridge Engineering	3 Credit hours	CE 637 Highway Safety Engineering	3 Credit hours
Analysis, design, and rating of bridges according to AASHTO specifications, emphasizing steel superstructures. Detailing of elements and systems based on strength, serviceability, constructability, and fatigue requirements. An overview of design of highway bridges and an introduction to maintenance of highway bridges; history of bridge engineering, types, design rules, loads, inspection, rating and preventive maintenance, aesthetics.		Traffic safety studies including: crash analysis, control and geometry improvements, hazard and countermeasures identification, before-and-after studies; data collection and computer tools for highway traffic and safety evaluation.	
Pre-req: CE 616.		Grade Mode: Normal Grading Mode	
Grade Mode: Normal Grading Mode		CE 639 Infrastructure Management	3 Credit hours
CE 621 Advanced Soil Mechanics	3 Credit hours	Application of decision analysis, mathematical programming, performance modeling and various heuristics to develop management plans for transportation infrastructure assets, primarily focusing on highway pavements and bridges.	
Grade Mode: Normal Grading Mode		Grade Mode: Normal Grading Mode	
		CE 650 Special Topics Civil Engr	3 Credit hours
		Selected topics of special and current interest to civil engineers.	
		Grade Mode: Normal Grading Mode	
		CE 651 Spec Topics Civil Engr	3 Credit hours
		Selected topics of special and current interest to civil engineers.	
		Grade Mode: Normal Grading Mode	
		CE 652 Spec Topics Civil Engr	3 Credit hours
		Selected topics of special and current interest to civil engineers.	
		Grade Mode: Normal Grading Mode	
		CE 680 Special Topics	3 Credit hours
		Grade Mode: Normal Grading Mode	
		CE 681 Water & Wastewater Engr Dsgn 1	3 Credit hours
		Grade Mode: Normal Grading Mode	

CE 682 Water & Wastewater Engr Dsgn 2 Grade Mode: Normal Grading Mode	3 Credit hours
CE 684 Biol & Physiochem Process	3 Credit hours
CE 685 Hydrology Grade Mode: Normal Grading Mode	3 Credit hours
CE 686 Hyd/Sedi of Surface Mined Land Grade Mode: Normal Grading Mode	3 Credit hours
CE 687 Engineering Geology Grade Mode: Normal Grading Mode	3 Credit hours
CE 690 Special Topics in Civil Engr Grade Mode: Normal Grading Mode	1-6 Credit hours
CE 715 Adv Matrix Meth of Struct Anal Grade Mode: Normal Grading Mode	3 Credit hours
CE 790 Advanced Independent Study Grade Mode: Normal Grading Mode	1-6 Credit hours
CE 799 Research Grade Mode: Normal Grading Mode	1-12 Credit hours