Civil, Coastal, And Environmental Engineering

Department Information

Department of Civil, Coastal, and Environmental Engineering Staff

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<tr>
<td>Chair</td>
<td>Kevin D. White</td>
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<td>Professors</td>
<td>White</td>
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<tr>
<td>Associate Professors</td>
<td>Laier, Omar, Islam, Webb</td>
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<td>Assistant Professors</td>
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Department of Civil, Coastal, and Environmental Engineering web site
http://www.southalabama.edu/colleges/engineering/ce/index.html

Civil Engineering involves the design and construction of systems necessary for our modern society to function. It encompasses many technical specialties whose focus is the design of large, normally one-of-a-kind, facilities such as bridges, buildings, tunnels, highways, dams, waterways, airports, flood control systems, coastal protection systems, water supply networks, and waste treatment plants. As our society expands, challenging opportunities will continue to be available for Civil Engineers practicing in their own private firms, in large companies, or in governmental agencies.

BSCE Program Educational Objectives:
The educational objectives of the Civil Engineering undergraduate program are that, within a few years of program completion, graduates will have used the knowledge and skills gain through academic preparation and post-graduation experience so they have:

1. Advanced in the civil engineering profession, obtained professional licensure, and applied engineering knowledge and problem-solving skills to multi-disciplinary projects.
2. Incorporated economic, environmental, social, regulatory, constructability, and sustainability considerations into the practice of civil engineering.
3. Exhibited effective communication, teamwork, leadership, initiative, project management, and professional and ethical behavior as complements to technical competence.
4. Continued their technical and professional development, which may include graduate level education, continuing education, and participation in professional organizations.

BSCE Student Outcomes:
By the time of graduation from the Civil Engineering Program, students should attain the following outcomes:

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. 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.
4. An ability to function on multidisciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
12. An appreciation of the unique concerns regarding safety when working with electrical and computer systems.

The Bachelor of Science in Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

The curriculum builds on a strong base in mathematics, physical sciences, engineering sciences, and humanities developed primarily during the freshman and sophomore years. During the junior year, students develop an understanding of the fundamentals of each area of Civil Engineering. The specialty areas include:

- Environmental Engineering
- Geotechnical Engineering
- Structural Engineering
- Transportation Engineering
- Water Resources and Coastal Engineering

The senior year focuses on design, construction practices, and the integration of more advanced knowledge in civil engineering. A comprehensive project with students participating in a design team prepares them to enter professional practice.

Satisfactory completion of the program outlined below leads to a Bachelor of Science in Civil Engineering. Students must also comply with the College of Engineering Requirements for a Degree which is covered in this Bulletin under College of Engineering.

Areas Of Study

Civil Engineering (BS)
Civil Engineering (MS)

Courses

Civil Engineering (CE)

**CE 102 Intro to Civil Engineering** 2 cr
Introduction to Civil Engineering as a profession and the issues facing today's Civil Engineers. Team work, freehand sketching and Computer Aided Design (CAD) will be introduced. Students will be introduced to powerful computational tools such as spreadsheets and MathCad and learn their application in Civil Engineering. Techniques of writing a successful research paper will also be presented.
Pre-requisite: MA 113 Minimum Grade of D or MA 125 Minimum Grade of D

**CE 204 Surveying Fundamentals** 2 cr
Applications of fundamental surveying techniques. Students will be introduced to the applications of Global Positioning Systems (GPS) and Geographical Information Systems (GIS) in Civil Engineering.
Co-requisite: CE 205
Pre-requisite: MA 113 Minimum Grade of C or MA 115 Minimum Grade of C or MA 125 Minimum Grade of C and CE 102 Minimum Grade of C

**CE 205 Surveying Fundamentals Lab** 1 cr
Students will collect field data and using state-of-the-art surveying and GPS equipment. Collected data will be used in Geographical Information Systems (GIS) software.
Co-requisite: CE 204
Pre-requisite: MA 113 Minimum Grade of C or MA 115 Minimum Grade of C or MA 125 Minimum Grade of C and CE 102 Minimum Grade of C University test - Math 85(

**CE 314 CE Materials** 3 cr
Study of Engineering Properties of Materials used in civil engineering including steel, concrete, asphalt, and timber.
Co-requisite: CE 315
Pre-requisite: EG 315 Minimum Grade of D

**CE 315 CE Materials Lab** 1 cr
Study of experimental techniques used to evaluate engineering properties of materials. These techniques will be used to test materials used in civil engineering according to ASTM standards.
Co-requisite: CE 314
Pre-requisite: EH 102 Minimum Grade of C or EH 105 Minimum Grade of C and EG 315 Minimum Grade of D
CE 340  Soil Mechanics  3 cr
Co-requisite: CE 341
Pre-requisite: EG 315 Minimum Grade of D and (EG 360 Minimum Grade of D or CE 365 Minimum Grade of D or ME 324 Minimum Grade of D)

CE 341  Geotechnical Laboratory-W  1 cr
Soil identification and classification: experimental measurement of soil properties and technical reporting.
Co-requisite: CE 340
Pre-requisite: (EH 102 Minimum Grade of C or EH 105 Minimum Grade of C) and CE 340 Minimum Grade of D

CE 352  Intro to Transportation  3 cr
Principles of transportation engineering with emphasis on highways and traffic.
Pre-requisite: CE 204 Minimum Grade of C and CE 205 Minimum Grade of C and ST 315 Minimum Grade of C and ST 315 Minimum Grade of D

CE 353  Transp-Geometric Design  3 cr
Basic principles and techniques of highway design, including route layout, alignment, intersection design, and materials/earthwork estimation. Use of computer tools to generate and analyze highway designs.
Pre-requisite: CE 352 Minimum Grade of D

CE 360  Water Resources Engineering I  2 cr
The application of fluid mechanics and other science and engineering disciplines in the development of structures, projects, and systems involving water resources. Introductions to open-channel flow, closed-conduit flow, hydraulic structures, hydraulic machinery, and groundwater flow. Fee.
Co-requisite: CE 367
Pre-requisite: EG 360 Minimum Grade of D

CE 367  Hydraulics Laboratory - W  1 cr
Laboratory and field measurement of fluid and flow properties; hydraulic laboratory practice and model stimulation techniques.
Co-requisite: CE 360
Pre-requisite: EG 360 Minimum Grade of D or CE 365 Minimum Grade of D

CE 370  Intro to Enviro Eng  3 cr
Introduction to the fundamentals of water quality characterization, water pollution hazardous waste management, water and wastewater treatment, solid waste management, waste minimization and control.
Co-requisite: CE 374
Pre-requisite: CH 132 Minimum Grade of C and MA 238 Minimum Grade of D

CE 374  Intro to Environmental Eng Lab  1 cr
Introduction to specific physical, chemical, and microbiological methods of analysis common to environmental engineering; including laboratory and field measurement of water quality characteristics and interpretation of results.
Co-requisite: CE 370
Pre-requisite: CH 132 Minimum Grade of C and MA 238 Minimum Grade of D

CE 384  Structural Analysis  3 cr
Analysis of statically determinate structures such as trusses, beams, and frames including the calculation of deflections. Introduction to analysis of indeterminate structures.
Co-requisite: CE 385
Pre-requisite: EG 315 Minimum Grade of D

CE 385  Structural Analysis Lab  1 cr
Modeling and analysis of determinate and indeterminate structures. Use of state-of-the-art structural analysis software.
Co-requisite: CE 384
Pre-requisite: EG 315 Minimum Grade of D

CE 410  Construction Engineering  3 cr
An introduction to the construction industry and the role of civil engineering in construction. Construction engineering methods including preparation of cost estimates, critical path scheduling and resource allocation. Instructor permission. Fee.

CE 412  Mgmt & Sustainability of C.I.  3 cr
Management and sustainability of Civil infrastructure is designed to present an overview of infrastructure engineering and management systems and to use project management, decision support tools, and life cycle costing tools in connection with infrastructure planning and assessment. Students will be presented with the understanding that achieving sustainability requires the consideration to meeting present and future human needs and respecting "triple bottom line: economic, social, and environmental goals. The course also provides a review of several important design and management tools to support sustainable development and communities.

CE 431  Civil Engineering Design I  2 cr
Introduction to the practice of civil engineering and the engineering design process. In depth consideration of ethical issues in engineering practice. Participation in engineering design teams for project planning, proposal development, and completion of a feasibility study. Written and oral presentations of results. Senior Capstone Course. Fee.
Pre-requisite: CE 352 Minimum Grade of D or CE 443 Minimum Grade of D or CE 460 Minimum Grade of D or CE 470 Minimum Grade of D or CE 480 Minimum Grade of D or CE 485 Minimum Grade of D
CE 432 Civil Engineering Design II 4 cr
A multidisciplinary development of a project involving analysis and design in Civil Engineering. Implementation of design concepts and methodologies from conception to final design. Completion of a comprehensive design project including cost estimates, oral and written presentation of results. A senior capstone course. Fee.
Pre-requisite: CE 431 Minimum Grade of D

CE 440 Intro to Geotech Eng 3 cr
An Introduction to Geotechnical Engineering designed to provide tools to analyze geomechanical and geohydraulic problems associated with the design of foundations, retaining structures, slopes and other geotechnically related designs.
Pre-requisite: CE 340 Minimum Grade of D and CE 341 Minimum Grade of D

CE 442 Foundation Engineering 3 cr
Principles of foundation analysis, design and construction in engineering practice.
Pre-requisite: CE 443 Minimum Grade of D

CE 443 Geotechnical Engineering 2 cr
An introduction to Geotechnical Engineering. Analysis of geomechanical and geohydraulic problems accompanying the design of foundations, retaining structures and slopes.
Pre-requisite: CE 340 Minimum Grade of D

CE 452 Transportation Geometric Design 3 cr
This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, design of the alignment and intersections, and evaluation of earthwork requirements. The student should be able to understand and apply these principles to highway design problems. The student should also be able to use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design.
Fee.
Pre-requisite: CE 352 Minimum Grade of D

CE 460 Water Resources Engineering II 3 cr
The application of hydrologic and hydraulic principles for hydrologic analysis, frequency analysis, flood routing, hydrologic simulation, urban hydrology, floodplain hydraulics, and coastal engineering.
Pre-requisite: CE 360 Minimum Grade of D and CE 367 Minimum Grade of D

CE 466 Coastal and Harbor Eng 3 cr
An introduction to the principles of coastal hydraulic and sedimentary processes and the design of coastal and harbor works such as ship channels, marinas, jetties, breakwaters, groins, seawalls and beach nourishment projects.
Pre-requisite: CE 460 Minimum Grade of D

CE 470 Water-Wastewater Trtmnt Design 3 cr
Development of the principles of design for components of water supply and wastewater treatment facilities, including drinking water distribution and wastewater collection systems.
Co-requisite: CE 471
Pre-requisite: CE 360 Minimum Grade of D and CE 370 Minimum Grade of D and CE 374 Minimum Grade of D

CE 471 Water-Wastewater Design Lab 1 cr
Application of design principles and criteria to analyze, design, and evaluate water and wastewater treatment facility components, including water distribution and wastewater collection systems.
Co-requisite: CE 470
Pre-requisite: CE 360 Minimum Grade of D and CE 370 Minimum Grade of D and CE 374 Minimum Grade of D

CE 474 Industrial Waste Treatment 3 cr
Topics in Industrial Waste Treatment unit processes and their design, including those addressing wastewater treatment, air pollution control, solid waste, and hazardous management.
Pre-requisite: CE 470 Minimum Grade of D

CE 480 Design of Steel Structures 3 cr
Design of Steel Trusses, Girders, Building Frames, and other Steel Structures.
Co-requisite: CE 481
Pre-requisite: CE 384 Minimum Grade of D and CE 314 Minimum Grade of D and CE 315 Minimum Grade of D

CE 481 Steel Design Lab 1 cr
Application of structural steel design methods to specific cases.
Co-requisite: CE 480
Pre-requisite: CE 384 Minimum Grade of D and CE 314 Minimum Grade of D and CE 315 Minimum Grade of D

CE 482 Timber Design 3 cr
This course will cover the design of timber structures. Design loads, structural behavior, properties and grades of wood will be covered. Design of beams, columns, diaphragms, shearwalls, structural glued laminated timber, and structural connections. Instructor Approval Required
Pre-requisite: CE 384 Minimum Grade of D and CE 385 Minimum Grade of D

CE 485 Reinforced Concrete Design 3 cr
Co-requisite: CE 486
Pre-requisite: CE 384 Minimum Grade of D and CE 314 Minimum Grade of D and CE 315 Minimum Grade of D
CE 486 Reinforced Concrete Design Lab  
1 cr  
Integrated reinforced concrete design problems similar to those found in practice will be presented. Students will solve similar problems in class during the lab period.  
Co-requisite: CE 485  
Pre-requisite: CE 384 Minimum Grade of D and CE 314  
Minimum Grade of D and CE 315 Minimum Grade of D

CE 490 Special Topics -  
1 TO 4 cr  
Topics of current civil engineering interest.

CE 494 Directed Independent Study -  
1 TO 4 cr  
Directed study, under the guidance of a faculty advisor, of a topic from the field of civil engineering not offered in a regularly scheduled course. Requires department chair permission.

CE 499 Honors Senior Project - H  
1 TO 6 cr  
Under the advice and guidance of a faculty mentor, honors students will identify and carry out a research project, relevant to the field of Civil Engineering study, that will lead to a formal presentation at the Annual Honors Student Colloquium. The senior project will be judged and graded by three faculty, chaired by the honors mentor. This course is required for Honors recognition. A minimum of 4 credit hours is required, but a student may enroll for a maximum of 6 credit hours over two semesters. Prerequisites: Completion of the most advanced required course in the subdiscipline of the project (CE 440, CE 366, CE 470, or CE 384) and completion of an approved project prospectus.  
Pre-requisite: CE 352 Minimum Grade of C or CE 366 Minimum Grade of D or CE 384 Minimum Grade of C or CE 443 Minimum Grade of C

CE 501 Intro to Coastal Design Enviro  
3 cr  
An overview of the unique aspects of the design environment faced by civil engineers along the coast including water wave mechanics, coastal water levels, coastal circulations and mixing, coastal groundwater levels and flow, coastal sediment transport, and hurricane winds.

CE 502 Intro to CE Dsn-Coastal Enviro  
3 cr  
An introduction to the design of civil engineering infrastructure in the coastal environment including beaches, seawalls, revetments, bulkheads, piers, jetties, constructed wetlands, coastal bridges and roadways, hurricane resistant buildings, sewer outfalls and other environmental protection devices and coastal regulatory policy.  
Pre-requisite: CE 501 Minimum Grade of C

CE 510 Construction Engineering  
3 cr  
An introduction to the construction industry and the role of civil engineering in construction. Construction engineering methods including preparation of cost estimates, critical path scheduling and resource allocation. Instructor permission required. Fee.

CE 512 Mgmt & Sustainability of Infr  
3 cr  
This course is designed to present an overview of infrastructure systems and how to manage and maintain these systems. Project management, decision support tools, and life cycle costing tools will be presented, in connection with infrastructure planning and assessment. Infrastructure sustainability will also be addressed, particularly considering the "triple bottom line" of economic, social, and environmental goals. The course also provides a review of several important design and management tools to support sustainable development and communities. A course project is required.

CE 540 Advanced Soil Mechanics  
3 cr  
Shearing strength and deformation behavior of soils with applications to retaining structures, slopes and bearing capacity. Behavior of cohesionless soils and cohesive soils under drained and undrained conditions. Permeability, steady state flow and effective stress in soils. Consolidation theory.  
Pre-requisite: CE 443 Minimum Grade of C

CE 542 Foundation Engineering  
3 cr  
This course is to provide advanced knowledge of selected geotechnical principals for analysis, design and construction of a variety of foundations systems. This course is dually listed with an equivalent 400 level course (CE 442). Fee.  
Pre-requisite: CE 441 Minimum Grade of C and CE 443 Minimum Grade of C

CE 547 Groundwater  
3 cr  
Principals of fluid flow through porous media, well hydraulics. Ground water contamination, including principals that govern fate, transport, and remediation. Fee.  
Pre-requisite: CE 340 Minimum Grade of C and CE 470 Minimum Grade of C

CE 551 Traffic Engineering  
3 cr  
This course will focus on traffic flow parameters and their influence on roadway traffic conditions, with emphasis on traffic data collection, traffic safety analysis, roadway markings, traffic signs, traffic signal timing and signal capacity analysis, and traffic management systems.  
Pre-requisite: CE 352 Minimum Grade of C

CE 552 Transportation Geometric Design  
3 cr  
This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, design of the alignment and intersections, and evaluation of earthwork requirements. The student should be able to understand and apply these principles to highway design problems. The student should also be able to use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design. This course is dually listed with an equivalent 400 level course (DE 452). Fee.  
Pre-requisite: CE 352 Minimum Grade of C
CE 553 Transportation Systems Eval 3 cr
This course will focus on concepts and principles of transportation economic analysis, transportation costs and benefits, user and nonuser consequences, methods of evaluation of plans and projects, environmental impact assessments, and transportation programming and management. Requires Instructor Permission.

CE 560 Coastal Hydrodynamics 3 cr
Theory and analysis of advanced coastal and estuarine hydrodynamics. Potential topics to be covered include: wave mechanics; tidal dynamics; coastal and estuarine circulation; and transport and mixing in coastal waters.
Pre-requisite: CE 501 Minimum Grade of C

CE 563 Hydrodynamic Modeling 3 cr
Theory and application of numerical models to coastal hydrodynamics. Potential topics to be covered include: overview of numerical simulation techniques; wave transformation processes; engineering wave models; principles of circulation; and advanced circulation models.
Pre-requisite: CE 501 Minimum Grade of C

CE 566 Coastal and Harbor Engineering 3 cr
Advanced principles of coastal hydraulic and sedimentary processes and the design of coastal and harbor works such as ship channels, marina, jetties, breakwaters, groins, seawalls, and beach nourishment projects. This course is dually listed with an equivalent 400 level course (CE 466). Fee.
Pre-requisite: CE 460 Minimum Grade of C and CE 501 Minimum Grade of C

CE 571 Biological Wastewater Treatment 3 cr
Theory, analysis and design criteria of biological treatment systems for municipal and industrial wastewaters, including suspended and attached growth processes in both the aerobic and anaerobic environments.
Pre-requisite: CE 470 Minimum Grade of C

CE 572 Physical Wastewater Treatment 3 cr
Advanced theory and applications in physical and chemical wastewater treatment. Topics covered include mass balance; reactor design, modeling, and analysis; filtration; mixing and flocculation; flotation; dissolved oxygen transfer optimization; chemical treatment of nutrient loads; disinfection; and residuals management.
Pre-requisite: CE 470 Minimum Grade of C

CE 574 Industrial Waste Treatment 3 cr
Topics in Industrial Waste Treatment unit processes and their design, including those addressing waste water treatment, air pollution, solid waste, and hazardous waste management. This course is dually listed with an equivalent 400 level course (CE 474). Credit for both CE 474 and CE 574 is not permitted. Fee.
Pre-requisite: CE 470 Minimum Grade of C

CE 579 Fundamentals Environmental Eng 3 cr
Fundamentals of water quality characterization, water pollution, hazardous waste management, water and wastewater treatment, solid waste management, and waste minimization and control. This course includes a comprehensive project in addition to the lecture class. Note: This course is a core course for MS degree students in the Environmental Toxicology Program and not intended for Engineering Majors. Instructor Permission. (This course is dual listed with CE 370.) Fee.
Pre-requisite: (CH 116 Minimum Grade of C or CH 132 Minimum Grade of C)

CE 580 Steel Design 3 cr
Design of steel trusses, girders, building frames, and other steel structures. This course is dually listed with an equivalent 400 level course (CE 480). Fee.
Co-requisite: CE 581
Pre-requisite: CE 384 Minimum Grade of C or CE 385 Minimum Grade of C

CE 581 Steel Design Lab 1 cr
Application of structural steel design methods to specific cases. This course is dually listed with an equivalent 400 level course (CE 481). Fee.
Co-requisite: CE 580
Pre-requisite: CE 384 Minimum Grade of C and CE 385 Minimum Grade of C

CE 582 Timber Design 3 cr
This course will cover the design of timber structures. Design loads, structural behavior, properties and grades of wood will be covered. Design of beams, columns, diaphragms, shearwalls, structural glued laminated timber, and structural connections. This course is dually listed with an equivalent 400 level course (CE 482). Instructor Approval Required.

CE 583 Advanced Steel Design 3 cr
This course covers the design of built-up members, composite beams, columns and floors. Design of advanced bolted and welded connections will also be covered. Students will use state-of-the-art software to model and design complex steel structures.
Pre-requisite: CE 480 Minimum Grade of C or CE 481 Minimum Grade of C

CE 584 Advanced Structural Analysis 3 cr
Students will be introduced to the analysis of indeterminate structures using classical and matrix methods. Students will also be introduced to advanced structural modeling techniques using state-of-the-art software. Fee.
Pre-requisite: CE 384 Minimum Grade of C and CE 385 Minimum Grade of C
CE 585  Concrete Design  3 cr
Fundamentals of reinforced concrete analysis and design. Design of beams, one-way slabs, short columns, and single footings. Calculations of cracking and deflection of beams. This course is dually listed with an equivalent 400 level course (CE 485). Fee. Co-requisite: CE 586
Pre-requisite: CE 384 Minimum Grade of C or CE 385 Minimum Grade of C

CE 586  Concrete Design Lab  1 cr
Integrated reinforced concrete design problems similar to those found in practice will be presented. Students will solve similar problems in class during the lab period. This course is dually listed with an equivalent 400 level course (CE 486). Fee. Co-requisite: CE 585
Pre-requisite: CE 384 Minimum Grade of C and CE 385 Minimum Grade of C

CE 587  Advanced Concrete Design  3 cr
Students will be introduced to the analysis and design of reinforced concrete footings, retaining walls, two-way floor systems, long columns, beams subjected to torsion and deep beams. Fee. Pre-requisite: CE 485 Minimum Grade of C and CE 486 Minimum Grade of C

CE 588  Prestressed Concrete Design  3 cr
Students will be introduced to the concepts of prestressing, loss of prestress, design of prestressed beams, columns and slabs. Fee. Pre-requisite: CE 485 Minimum Grade of C and CE 486 Minimum Grade of C

CE 590  Special Topics -  1 TO 4 cr
Topics of current civil engineering interest.

CE 592  Directed Independent Study -  1 TO 3 cr
Directed study, under the guidance of a faculty advisor, of a topic from the field of Civil Engineering not offered in a regularly scheduled course. Requires Instructor Permission. Fee.

CE 594  Projects in Civil Engineering  1 TO 3 cr
May be repeated for credit. Requires approved proposal and consent of director of engineering graduate studies. Fee.

CE 599  Thesis  1 TO 6 cr
Thesis research. May be taken more than once. Requires approved prospectus. Fee.

Engineering (EG)

EG 101  Intro to Engineering & Design  2 cr
A course for first time engineering students that assists with maximizing the student's potential to achieve academic success and to adjust responsibly to the individual and interpersonal challenges presented by college life. Introduction to engineering fundamentals through reading, homework assignments, laboratory investigations, guest lecturers and group discussions on the engineering profession. Pre-requisite: (MA 113 Minimum Grade of D or MA 172 Minimum Grade of D) or (MA 125 Minimum Grade of C or MA 132 Minimum Grade of D)

EG 201  Intro to Engr & Prob Solving  2 cr
A course for first-time transfer students that helps maximize the student's potential to achieve academic success and to address the transition from community college to four-year college. Introduction to engineering fundamentals and problem solving techniques through reading, homework assignments, laboratory investigations, guest lecturers and group discussions on the engineering profession. Pre-requisite: MA 126 Minimum Grade of C

EG 220  Electrical Circuits  3 cr
Basic SI units. Resistive (R) networks with independent and dependent sources. Ohm's and Kirchhoff's laws. Network theorems -superposition, source transformation Thevenin's and Norton's. Inductors (L) and capacitors (C) as energy storage elements in RLC circuits. Sinusoids and phasors and their applications in RLC circuits. RMS values of voltages and currents. Average power and power factor in AC circuits. Pre-requisite: MA 125 Minimum Grade of C and PH 202 Minimum Grade of C

EG 231  Intro to Ethics and Economics  3 cr
Introduction to ethics and the use of codes of ethics in developing an ethical profession. Application of engineering economic principles to engineering problems. Pre-requisite: MA 126 Minimum Grade of D

EG 270  Engineering Thermodynamics  3 cr
First and second law of thermodynamics with applications. Pre-requisite: MA 126 Minimum Grade of C and PH 201 Minimum Grade of C

EG 283  Statics  3 cr
Vector algebra, forces, moments, couples, equilibrium of rigid bodies, beams, trusses, frames, area and mass moments of inertia, and friction. Pre-requisite: (MA 126 Minimum Grade of D or MA 233 Minimum Grade of D) and (PH 201 Minimum Grade of D or PH 216 Minimum Grade of D)

EG 284  Dynamics  3 cr
Kinematics and kinetcs of particles and rigid bodies. Work/energy and momentum methods. Pre-requisite: EG 283 Minimum Grade of D and (MA 126 Minimum Grade of D or MA 233 Minimum Grade of D)
EG 290  Sp Top in Engineering - 1 TO 5 cr
Subjects of special interest in engineering. Requires permission of instructor.

EG 315  Mechanics of Materials 3 cr
Pre-requisite: EG 283 Minimum Grade of D and (MA 227 Minimum Grade of D or MA 234 Minimum Grade of D) and (PH 201 Minimum Grade of D or PH 216 Minimum Grade of D)

EG 360  Fluid Mechanics 3 cr
Study of the properties of fluids including fluid statics, kinematics; integral and differential equations of mass, momentum and energy conservation principles; dimensional analysis; flow in ducts; boundary layer flows; and compressible flow.
Pre-requisite: MA 238 Minimum Grade of D and EG 284 Minimum Grade of D

EG 480  Prin of Eng Mgmt and Ldrshp 3 cr
An examination of skills, abilities, personality, attitudes, values, interests and behaviors to increase self-awareness of management and leadership competencies. Students will also examine the concept of Professional Improvement Process that integrates strategy, human resources and accountability.

EG 490  Special Topics in Engineering 1 TO 3 cr
This course covers topics of current interest in Engineering.

EG 494  DIS In Engineering 1 TO 3 cr
Directed study, under the guidance of a faculty advisor of a topic from the field of Engineering not offered in a regularly scheduled course.

EG 501  Research Integrity and Seminar 1 cr
This course is designed to expose Engineering graduate students who are about to undertake an MS thesis project to a series of seminars and a variety of issues concerning research integrity and inform them of current policies related to research activities and thesis development. This is a pass/fail course.

EG 590  Sp Top - 1 TO 3 cr
Subjects of special interest in engineering for engineering graduate students. Requires permission of instructor.

EG 620  Biomedical Engineering I 4 cr
Fundamental concepts of medical instrumentation, biomedical imaging and biological systems modeling as used in biomedical engineering. Course is cross-listed with IDL 620. Fee.

EG 621  Biomedical Engineering II 4 cr
Fundamental concepts of transport phenomena, cellular and tissue mechanics, and materials as used in biomedical engineering. Course is cross-listed with IDL 621. Fee.

Systems Engineering (SE)

SE 500  Engr Probability & Statistics 3 cr
Probability and statistical concepts; discrete, continuous, and joint distributions; point and interval estimation; hypothesis testing; regression and correlation analysis; analysis of variance.

SE 501  Engr Operations Research 3 cr
Model construction, linear programming, network models, dynamic models, stochastic models, queuing theory, and decision theory.
Pre-requisite: SE 500 Minimum Grade of B

SE 601  Systems Eng Fundamentals 3 cr
Fundamentals of systems engineering, structure of complex systems, system development process, systems engineering management and documentation, needs analysis, requirements development, engineering design and development, integration and test, change management, process improvement. Fee.

SE 602  Risk and Failure Analysis 3 cr
Risk Analysis needs, risk analysis methods, performance requirement analysis, trade studies, failure analysis needs, failure analysis tracking, and failure analysis methods.
Pre-requisites: Requires a background in calculus-based statistics and permission of instructor. Fee.
Pre-requisite: SE 500 Minimum Grade of C

SE 603  Integration, Test & Evaluation 3 cr
Interface control documents, design reviews, requirements management, allocation of test methods to requirements, test plans, test procedures, test execution, and failure tracking and resolution. Fee
Pre-requisite: SE 601 Minimum Grade of C

SE 604  Software Systems Engineering 3 cr
Software development methodologies, software development tools, change management, software concept development, software requirements development and allocation, coding and unit test, program technical interfaces, software engineering management. Fee.
Pre-requisite: SE 601 Minimum Grade of C

SE 605  SE Project Management 3 cr
Management of system design, development and risk, work breakdown, structure, systems engineering management plan, design reviews, budget and schedule analyses, negotiation and conflict resolution, contracts, customer interactions, team selection, failure resolution. Fee.
SE 606  Systems Architecture  3 cr
The systems architecture is that foundational structure of a system, capturing the core capability and structure of the system. This course will cover principles of systems architcting, system architecture drivers, relationship of systems architecture to system requirements, common tools and techniques to include design structure matrices, IDEF0, SysML, and simulation.
Pre-requisite: SE 601 Minimum Grade of C

SE 607  Systems Simulation  3 cr
This course rigorously examines system modeling and simulation methodologies, emphasizing statistical analysis and discrete-event simulation via simulation software.
Pre-requisite: SE 500 Minimum Grade of C

SE 608  Reliability Engineering  3 cr
This course rigorously examines reliability, and maintainability methodologies, emphasizing mathematical constructs, design concepts, and data analysis employed to quantify reliability, availability, and maintainability measures for operational readiness, support system design, and system effectiveness.
Pre-requisite: SE 500 Minimum Grade of C

SE 609  Engineering Research Methods  1 TO 3 cr
This course is a fast tracked course examining quantitative and qualitative methods for conducting meaningful inquiry and research. Topics include research ethics, intent, design, methodologies, techniques, formatting, data management, analysis, publication, and presentation utilizing common statistical approaches.
Pre-requisite: SE 601 Minimum Grade of C

SE 610  Systems Thinking  3 cr
The act of systems thinking is taking a step back from the details considered during engineering design, and looking at the whole picture. This class exposes the student to a conceptual framework to allow them to properly define complex systems and enterprises drawing from synthesizing techniques from systems science, soft systems methodologies, and systems engineering. The class demonstrates the ability to leverage the simultaneity of perspectives, the role of paradox, and the centrality of soft issues in resolving complexity.

SE 611  Socio-Technical Systems  3 cr
Socio-Technical systems are those systems which contain and/or are strongly influenced by human, social and institutional elements. Because of those influences, they quickly become dependent on community partnerships, infrastructure constraints, and government-aspects that are not traditionally part of the engineering equation. This course considers the systems engineering approach as it relates to the challenges of socio-technical systems.
Pre-requisite: SE 601 Minimum Grade of C

SE 612  Production System Engineering  1 TO 3 cr
This course rigorously examines principles, design, models and techniques for operational planning and analysis of production and distribution systems emphasizing quantitative methods.

SE 611  Special Topics in SE  3 cr
Topics of current interest in Systems Engineering. Fee.

SE 692  Directed Study in SE  3 cr
Directed study, under the guidance of a faculty advisor, of a topic from the field of Systems Engineering not offered in a regularly scheduled course. Prerequisite: Instructor's permission.

SE 699  Dissertation in SE  1 TO 6 cr
An investigation of an original problem in Systems Engineering under the guidance of the student's major professor. Prerequisite: Approval of the dissertation prospectus by the student's Advisory Committee, the Graduate School, and consent of the Director of Engineering Graduate Studies.

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