

# ENGINEERING

## Degrees Major

- Bachelor of Science with a major in Computer Engineering (BS) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/bachelor-science-major-computer-engineering-bs/>)
- Bachelor of Science with a major in Petroleum Engineering (BS) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/bachelor-science-major-petroleum-engineering-bs/>)
- Bachelor of Science with a major in Systems Engineering (BS) (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/bachelor-science-major-systems-engineering-bs/>)

## Minor

- Minor in Computer Science (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/computer-science-minor/>)
- Minor in Geology (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/geology-minor/>)
- Minor in Petroleum Engineering (<https://catalog.tamui.edu/undergraduate-information/arts-sciences/engineering/petro-minor/>)

## Courses

### CSCE 1136 Funds of Programming Lab

Laboratory course to accompany CSCE 1336. Laboratory exercises reinforce the particular paradigms that are stressed in CSCE 1336. Students will develop and run functional programs that solve elementary algorithmic problems. Students will also gain experience with compiling, finding, correcting syntax errors, and executing programs. This course places importance on scientific communication and collaboration methods.

Corequisites: CSCE 1336.

### CSCE 1137 Object-Oriented Program Lab

Laboratory course to accompany CSCE 1337. Laboratory exercises reinforce the particular paradigms that are stressed in CSCE 1337. Students will develop programs in an object-oriented programming language by practicing the use of a variety of abstract data types and data structures. Students will also gain experience on using advanced design tools and the skills to analyze, debug and correct errors in programs. This course places importance on scientific communication and collaboration methods.

Prerequisites: CSCE 1336 and CSCE 1136.

Corequisites: CSCE 1337.

### CSCE 1336 Fundamentals of Programming

Introduces the fundamental concepts of a high-level programming language and provides a comprehensive introduction to programming for STEM majors. Topics include data types, flow of control, functions, I/O streams, arrays, and the mechanics of running, testing, and debugging. This course assumes computer literacy.

Corequisites: CSCE 1136

### CSCE 1337 Object Oriented Programming

A continuation of CSCE 1336. Emphasis is placed upon applying the object-oriented paradigms to develop the skills in data abstraction and object design where language features, essential programming techniques, and design guidelines are presented from a unified point of view.

Prerequisites: CSCE 1136 and CSCE 1336.

Corequisites: CSCE 1137.

### CSCE 2330 Digital Logic Design

Hardware implementation of arithmetic and logical functions, organization and design of digital systems.

Prerequisites: CSCE 1336 and CSCE 1136.

Corequisites: ENGR 2305 and ENGR 2105.

### CSCE 3301 Algorithms & Data Structures

Builds on the foundation provided by CSCE 1336 and CSCE 1337 with an increased emphasis on algorithms, data structures, and software engineering. The treatment of programming concepts will be both in terms of the object-oriented paradigm as well as independent of any programming language.

Prerequisites: CSCE 1137 and CSCE 1337.

### CSCE 3310 Algorithm Design & Analysis

Introduces formal techniques to support the design and analysis of algorithms focusing on both the underlying mathematical theory and practical considerations of efficiency. Topics include asymptotic complexity bounds, techniques of analysis, algorithmic strategies, and an introduction to automata theory and its application to language translation.

Prerequisites: CSCE 3301 and MATH 3365.

### CSCE 3314 Electronic Devices & Apps

Theory and application of solid state electronic devices. Physical principles of carrier motion in semiconductors leading to operating principles and circuit models for diodes, bipolar transistors, and field effect transistors. Applying the skills in designing amplifiers and op-amp based circuits.

Prerequisites: ENGR 2305 and ENGR 2105.

### CSCE 3320 Signals and Systems

Introduction to the continuous-time and discrete-time signals and systems; time domain characterization of linear time-invariant systems; Fourier analysis; filtering; sampling; modulation techniques for communication systems.

Prerequisites: ENGR 2305, ENGR 2105, and MATH 2415.

### CSCE 3330 Computer Organization

Introduces the organization and architecture of computer systems, beginning with the standard von Neumann model and then moving forward to more recent architectural concepts.

Prerequisites: CSCE 3301.

### CSCE 3335 Networks & Data Communication

This course covers the fundamental concepts of computer communication networks. Topics include the OSI reference model, the physical, data link, network, and transport layers, TCP/IP, network topologies, routing and flow control. The course also covers routing technologies and the deployment of ethernet solutions, while also understanding security concepts as they relate to networks and data communications.

Prerequisites: CSCE 2330 and CSCE 3320

#### **CSCE 3340 Microprocessor Systems**

Basic computer structure, the instruction set, addressing modes, assembly language programming, assembly language subroutines, arithmetic operations, programming in C, implementation of C procedures, elementary data structures, input and output and a survey of microprocessor based design. This course is interchangeable with SENG 3345.

Prerequisites: CSCE 2330

#### **CSCE 3345 Robotics and Automation**

Study of the use, design, and deployment of industrial automation and robotics technologies in high-precision, multi-product manufacturing environments. Robot manipulators, kinematics and dynamics, robot automation and control, integrated robotic systems for manufacturing, automation in manufacturing, programmable logic controllers, applications to industrial systems. Interchangeable with SENG 3340.

Prerequisites: ENGR 2305, ENGR 2105, and MATH 3310

#### **CSCE 3350 Human Computer Interaction**

Presents a comprehensive introduction to the principles and techniques of human-computer interaction.

Prerequisites: CSCE 3301 and MATH 3365.

#### **CSCE 3370 Databases**

Introduces the concepts and techniques and database systems. Topics include information models and systems; database systems; data modeling to include conceptual, object-oriented and relational data models; relational databases; database query languages to include SQL and OQL; relational database design; transaction processing; distributed databases; and physical database design.

Prerequisites: CSCE 3301 and MATH 3365.

#### **CSCE 3390 Software Design**

Provides an intensive implementation-oriented introduction to the software-development techniques used to create medium-scale interactive applications, focusing on the use of large object-oriented libraries to create well-designed graphical user interfaces. Topics include event-driven programming, computer graphics, human-computer interaction (HCI), and graphical user interfaces.

Prerequisites: CSCE 3301 and MATH 3365.

#### **CSCE 4152 Internship in Comp Sci & Engr**

A directed internship in a public/private organization that is appropriate to the student's career objective or desire in a computer science setting. Students will apply analytical and technical knowledge acquired in the program in a real world setting and receive on-the-job training experience. Seminar and training will be held to discuss field experience from theoretical and applied perspective. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of the instructor

#### **CSCE 4185 Special Topics in CSCE**

Selected topics in an identified area of computer engineering and science. May be repeated for credit when the topic changes.

Prerequisites: Junior or Senior standing and permission of instructor

#### **CSCE 4195 Undergraduate Research**

Students work on a computer engineering research project. The topic is chosen by the student and approved by the instructor. Evaluation of performance is on a Pass or Fail basis. May be repeated twice for credit.

Prerequisites: Permission of instructor and department.

#### **CSCE 4199 Directed Study in CSCE**

A directed study course. Topics selected from contemporary developments in the field of computer engineering. May be repeated for credit.

Prerequisites: Permission of instructor

#### **CSCE 4252 Internship in Comp Sci & Engr**

A directed internship in a public/private organization that is appropriate to the student's career objective or desire in a computer science setting. Students will apply analytical and technical knowledge acquired in the program in a real world setting and receive on-the-job training experience. Seminar and training will be held to discuss field experience from theoretical and applied perspective. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of the instructor

#### **CSCE 4285 Special Topics in CSCE**

Selected topics in an identified area of computer engineering and science. May be repeated for credit when topic changes.

Prerequisites: Junior or Senior standing and permission of instructor

#### **CSCE 4295 Undergraduate Research**

Students work on a computer engineering research project. The topic is chosen by the student and approved by the instructor. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of instructor and department

#### **CSCE 4299 Directed Study in CSCE**

A directed study course. Topics selected from contemporary developments in the field of computer engineering. May be repeated for credit.

Prerequisites: Permission of instructor

#### **CSCE 4300 Dig Electronic Circuit Design**

Theory of digital and electronics circuits. Digital logic families TTL, IIL, ECL, NMOS, CMOS, and GaAs. Large signal models for transistors. The course includes the study of the MOS device, critical interconnect and gate characteristics that determine the performance of VLSI circuits, using CADENCE VLSI tools, and the development - via simulated environment - of different electronic circuits containing MOSFET and BJT devices.

Prerequisites: CSCE 2330 and CSCE 3314.

#### **CSCE 4301 Software Engineering**

Principles of software engineering and their applications to the development of a software product. Students work in teams to gather projects' requirements, design a solution, and implement their designs. The students also practice good project management using state-of-the-art software engineering processes. The instructor defines projects, and teams formally document the requirements. The teams then work on designing and implementing their solutions, culminating in a formal presentation of the results at the end semester.

Prerequisites: CSCE 3301 and MATH 3365

#### **CSCE 4302 Advanced Software Engineering**

Continuation of CSCE 4201 and CSCE 4101 to work on the software project initiated in the prior semester.

Prerequisites: CSCE 4301

#### **CSCE 4310 Computer Security**

Fundamental concepts and principles of computer security, operating system and network security, private key and public key cryptographic algorithms, hash functions, authentication, firewalls and intrusion detection systems, IPSec and VPN, wireless and web security.

Prerequisites: Senior standing and approval of instructor

#### **CSCE 4315 Embedded Systems**

Characteristics of embedded systems, microprocessors and microcontrollers, system design, modular programming, interface devices, memory management, interrupts, input/output applications, multitasking, and simulation. Interchangeable with SENG 4315.

Prerequisites: ENGR 2305, ENGR 2105, CSCE 1336, and CSCE 1136.

**CSCE 4320 Computer System Architecture**

I/O organization, memory organization including virtual memory, cache memory mapping, pipelining, and multiprocessing, CISC and RISC microprocessors.

Prerequisites: CSCE 3340.

**CSCE 4326 Operating Systems**

Hardware/software evolution leading to contemporary operating systems; basic operating systems concepts; methods of operating systems design and construction including algorithms for CPU scheduling, memory and general resource allocation, process coordination and management.

Prerequisites: CSCE 3301 and MATH 3365.

**CSCE 4330 Parallel Programming & HPC**

This course covers the fundamental concepts and techniques of parallel programming and high-performance computing (HPC). Students will learn how to examine, design, and implement parallel algorithms and programs for a range of problems and using a variety of programming models and languages, including OpenMP, MPI, and CUDA.

Prerequisites: CSCE 3301 or permission of Instructor

**CSCE 4335 Computer Engineering Design**

This course emphasizes hardware design and debugging. Topics include combinational and sequential logic design using VHDL based upon PLA/PLD, as well as the synthesis, design, implementation, and verification of a CPU.

Prerequisites: CSCE 3340

**CSCE 4340 Intelligent Systems**

Introduction to methods for the analysis and design of intelligent engineering systems. Topics include reinforcement learning, optimal estimation, Bayesian networks, expert systems, neural networks, and genetic algorithms. Applications emphasize control and decision-making in engineering, finance, and computer science. Interchangeable with SENG 4340.

**CSCE 4345 Programming Languages**

An in-depth study of programming language design including syntax, semantics, behavior, and implementation issues in imperative, functional, logic, and object-oriented languages. Topics may include type theory, concurrency, data dependency, and nondeterminism.

Prerequisites: CSCE 3301

**CSCE 4352 Internship in Comp Sci & Engr**

A directed internship in a public/private organization that is appropriate to the student's career objective or desire in a computer science setting. Students will apply analytical and technical knowledge acquired in the program in a real world setting and receive on-the-job training experience. Seminar and training will be held to discuss field experience from theoretical and applied perspective. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of the instructor.

**CSCE 4360 Machine Learning**

This course covers the fundamental concepts and techniques of machine learning. Students will learn about supervised learning, unsupervised learning, and reinforcement learning. They will also learn how to apply machine learning algorithms to real-world problems using Python.

Prerequisites: CSCE 1336, ENGR 2372, and Senior Standing

**CSCE 4380 Senior Design I-WIN**

This is the first course in the senior design sequence. This course provides students the experience of devising a system, component, or process to address predefined needs and requirements within constraints, such as time, cost, technology, etc. Students are expected to propose an iterative and innovative engineered design solution for implementation in CSCE 4390. This course should be taken the semester preceding CSCE 4390.

Prerequisites: ENGL 2311 and Senior Standing

**CSCE 4385 Special Topics in CSCE**

Selected topics in an identified area of computer engineering and science. May be repeated for credit when topic changes.

Prerequisites: Junior or Senior standing and permission of instructor.

**CSCE 4390 Senior Design II**

This is the second and final course in the senior design experience. This course provides students with the experience of implementing/constructing the system, component, or process devised as part of the proposed engineering design in CSCE 4380. Students are expected to demonstrate their ability to complete their projects under identified constraints and using applicable engineering standards. A comprehensive technical report and oral presentation accessible for technical and non-technical audiences will be produced with documentation illustrating the iteration involved in students' engineered designs.

Prerequisites: CSCE 4380

**CSCE 4395 Undergraduate Research**

Students work on a computer engineering research project. The topic is chosen by the student and approved by the instructor.

Prerequisites: Permission of instructor and department

**CSCE 4399 Directed Study in CSCE**

A directed study course. Topics selected from contemporary developments in the field of computer engineering.

Prerequisites: Permission of instructor

**ENGR 1201 Foundations of Engineering I**

Introduction to the engineering profession and disciplines; drawing and design using CAD tools; engineering ethics and professional responsibilities; development of skills in problem solving, analysis, estimation, design, and teamwork; computational analysis; and computer programming applications.

Students work in teams on an engineering project, including the design, testing, and reporting.

Prerequisites: MATH 2413 or concurrent enrollment.

TCCN: ENGR 1201

**ENGR 1202 Foundations of Engineering II**

Introduction to engineering ethics and professional responsibilities; development of skills in problem solving, analysis, estimation, design, and teamwork; introduction to systems engineering; computational analysis, computer programming applications. Students work in teams on an engineering design project, including construction, testing, and reporting.

Prerequisites: ENGR 1201 and MATH 2413.

**ENGR 1204 Engineering Graphics**

Orthographical and isometric drawings. Tolerance, working drawings, three dimensional pictorials, primary and successive auxiliary view and vector graphics. Computer aided design software is used for drawing and development of systems in mechanical, electrical and welding applications.

Prerequisites: ENGR 1201.

TCCN: ENGR 1204

### **ENGR 1304 Computer-Aided Design**

This course involves an introduction and extensive use of AutoCAD and other CAD software. The course will involve the production of 2-D and 3-D technical drawings, text format dimensions, section views, auxiliary views, assembly modeling, and vector graphics.

### **ENGR 2103 Statics & Dynamics Lab**

Laboratory course to accompany ENGR 2303. Laboratory exercises reinforce ENGR2303 lecture material and place importance on scientific communication and collaboration.

Corequisites: ENGR 2303.

### **ENGR 2105 Principles of Elec Engr Lab**

Laboratory course to accompany ENGR 2305. Laboratory exercises reinforce ENGR2305 lecture material and place importance on scientific collaboration.

Corequisites: ENGR 2305.

TCCN: ENGR 2105

### **ENGR 2236 Programming for Engineers**

Introduction of the foundation of programming, software engineering, debugging, and using existing computational codes in the context of controlling physical equipment, gathering experimental data, and visualizing results.

The course will be taught using suitable programming languages (i.e., C++, MATLAB, Python), which provides a balance between access to physical devices and modern programming concepts. Pre-requisite: MATH 2414

### **ENGR 2303 Statics & Dynamics**

Application of the fundamental principles of Newtonian mechanics to the statics and dynamics of particles and the equilibrium of trusses, frames, beams and other rigid bodies. Dynamics of moving particles, including friction, torque, impulse, and momentum.

Prerequisites: PHYS 2325, PHYS 2125, and MATH 2414.

Corequisites: ENGR 2103.

TCCN: ENGR 2303

### **ENGR 2305 Principles of Elec Engineering**

Fundamentals of electrical circuit analysis, AC power and electronics, intended as a terminal course in these areas for most engineering disciplines.

Prerequisites: PHYS 2325 and ENGR 1201.

Corequisites: ENGR 2105.

TCCN: ENGR 2305

### **ENGR 2360 Thermodynamics & Fluid Mech**

Theory and applications of energy methods in engineering as well as a study of fluid at rest and in-motion. Topics covered in the course include: conservation principles to investigate "traditional" thermodynamics and internal flow fluids; fluid properties, pressures, hydrostatics, buoyance; and control volume approach to conservation of mass, momentum, and energy.

Prerequisites: ENGR 2303, MATH 2415, or concurrent enrollment

### **ENGR 2372 Engineering Statistics**

This course will cover a variety of important topics in probability and statistics such as pictorial and tabular methods in descriptive statistics, measures of location, measures of variability, samples spaces and events, axioms and properties of probability, counting techniques, conditional probability, independence, discrete random variables and probability distributions, continuous random variables and probability distributions, joint probability distributions and random samples. The course will also demonstrate how Microsoft Excel can be used to conduct statistical analysis such as basic simple and multiple regression.

Prerequisites: MATH 2414.

### **ENGR 2376 Cons Prin in Thermal Engr**

Theory and applications of energy methods in engineering; conservation principles to investigate "traditional" thermodynamics and internal flow fluids; material properties.

Prerequisites: ENGR 2303, MATH 2415 or registration therein.

### **ENGR 2380 Fluid Mechanics**

Study of fluid at rest and in-motion. Topics covered in the course include fluid properties, pressures, hydrostatics, buoyance, open system, control volume approach to conservation of mass, momentum, and energy. Applications includes fluid flow through pipes, dimensionless analysis, boundary layers, and lift and drag acting on object.

Prerequisites: MATH 2415 and CHEM 1311

### **ENGR 2390 Mechanics of Materials**

Principle of material mechanics in engineering problems addressing strength and stiffness of different solid material. The course includes topics in continuum stress and strain, torsion of circular shaft, beam bending, and combined stresses applied to an object.

Prerequisites: PHYS 2325, PHYS 2125, and MATH 2414.

### **ENGR 3300 Engineering Economics**

Principles of engineering economics including economic equivalence, time value of money, analysis of single and multiple investments, comparison of alternatives; capital recovery and tax implications; certainty; uncertainty; risk analysis; public sector analysis and break-even concepts. Interchangeable with SENG 3300.

Prerequisites: MATH 2414.

### **EPSC 1170 Survey of Earth Science Lab**

Laboratory course to accompany EPSC 1370. Must be taken concurrently with EPSC 1370. Laboratory fee applicable.

TCCN: GEOL 1101

### **EPSC 1370 Survey of Earth Science**

A survey of the natural processes at work in the atmosphere, lithosphere, hydrosphere, and biosphere of the Earth, as well as Earth's place in the universe. Includes an introduction to astronomy, geology, oceanography, and meteorology. Designed to fulfill laboratory science core curriculum requirements. Must be taken concurrently with EPSC 1170.

TCCN: GEOL 1301

### **EPSC 2101 Atmospheric Science-Lab**

Laboratory course to accompany EPSC 2301. Practical exercises reinforce EPSC 2301 lecture material. Topics will include structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms. Must be taken concurrently with EPSC 2301.

Laboratory fee applicable.

### **EPSC 2301 Atmospheric Science**

Structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms.

TCCN: GEOL 1347

### **GEOL 1103 Intro to Physical Geology Lab**

Laboratory course to accompany GEOL 1303. Must be taken concurrently with GEOL 1303. Laboratory fee applicable.

TCCN: GEOL 1103

### **GEOL 1105 Environmental Geology Lab**

Laboratory course to accompany GEOL 1305. Must be taken concurrently with GEOL 1305. Laboratory fee applicable.

TCCN: GEOL 1105

**GEOL 1303 Intro to Physical Geology**

An introductory study of Earth's composition, structure, and internal and external physical processes. Designed to fulfill laboratory science core curriculum requirements. Must be taken concurrently with GEOL 1103.

TCCN: GEOL 1303

**GEOL 1305 Environmental Geology**

An introductory study of Earth's major resources, including the atmosphere, water, minerals, energy, and biological systems as they relate to the impact of urban development and environmental control. Designed to fulfill laboratory science core curriculum requirements. Must be taken concurrently with GEOL 1105.

TCCN: GEOL 1305

**GEOL 3401 Earth Mats: Minerals & Rocks**

An examination of minerals, and rocks; their formation and economic significance. Includes three hours of lab per week. Laboratory fee applicable.

Prerequisites: GEOL 1303/1103 or EPSC 1370/1170.

**GEOL 3405 Geohydrology**

A study of surface and subsurface hydrology emphasizing geological controls on groundwater flow; quantitative methods of analyzing aquifer systems; regional hydrology; water quality and pollution. Includes three hours of laboratory per week. Laboratory fee applicable.

Prerequisites: Eight hours of Geology.

**GEOL 3415 Sedimentology & Stratigraphy**

Origin of sediments and sedimentary rocks; transport, deposition, and depositional environments for sediments; field and laboratory studies in description and interpretation of sedimentary rocks; principles of stratigraphy; geologic time and correlation; and sequence stratigraphy. Includes three hours of laboratory per week. Laboratory fee applicable.

**GEOL 3420 Petroleum Geology**

This course will begin by covering the foundational concepts, topics, and skills of an introductory study of Geology. The course will thereafter cover topics such as the origin, migration and accumulation of petroleum, in addition to typical U.S. oil and gas fluids and studies in subsurface geology.

**GEOL 3425 Paleontology and Earth History**

An examination of the geologic history of the Earth focusing on the fossil and rock record. Specifically, this course will consider the development and history of life as documented by the fossil record and earth's history from a stratigraphic perspective. Includes three hours of laboratory per week.

Laboratory fee applicable.

Prerequisites: Junior Standing.

**GEOL 4170 Geology Seminar**

A discussion of research and current topics in the geological sciences.

Prerequisites: Twelve semester hours of Geology.

**GEOL 4173 UG Res in Geosciences**

A course adapted to the study of special topics in the geosciences. For advanced students capable of developing a problem independently through conference and research (field and/or laboratory based) directed by the instructor. Problem chosen by the student with approval of the instructor prior to registration. May be repeated not to exceed four semester credit hours total. Laboratory fee, if applicable. (Formerly EPSC 4173-3373)

Prerequisites: Twelve semester hours of Geology.

**GEOL 4199 Special Topics in Geosciences**

A course involving instruction in geology depending on student interest and specialty of instructor. May be repeated for credit when topic changes.

Laboratory fee, if applicable.

Prerequisites: Twelve semester hours of Geology.

**GEOL 4273 UG Res in Geosciences**

A course adapted to the study of special topics in the geosciences. For advanced students capable of developing a problem independently through conference and research (field and/or laboratory based) directed by the instructor. Problem chosen by the student with approval of the instructor prior to registration. May be repeated not to exceed four semester credit hours total. Laboratory fee, if applicable. (Formerly EPSC 4173-3373)

Prerequisites: Twelve semester hours of Geology.

**GEOL 4299 Special Topics in Geosciences**

A course involving instruction in geology depending on student interest and specialty of instructor. May be repeated for credit when topic changes.

Laboratory fee, if applicable.

Prerequisites: Twelve semester hours of Geology.

**GEOL 4373 UG Res in Geosciences**

A course adapted to the study of special topics in the geosciences. For advanced students capable of developing a problem independently through conference and research (field and/or laboratory based) directed by the instructor. Problem chosen by the student with approval of the instructor prior to registration. May be repeated not to exceed four semester credit hours total. (Formerly EPSC 4173-4473)

Prerequisites: Twelve semester hours of Geology.

**GEOL 4399 Special Topics in Geosciences**

A course involving instruction in geology depending on student interest and specialty of instructor. May be repeated for credit when topic changes.

Laboratory fee, if applicable.

Prerequisites: Twelve semester hours of Geology.

**GEOL 4450 Geo Info Science for Engr**

This course will explore fundamental concepts in earth sciences and geographic information technologies including geotechnical applications and case studies in engineering. Students will also be exposed to the power of geographic information systems to elucidate complex scientific problems.

Prerequisites: ENGR 1201 and Junior Standing

**GEOL 4460 Intro to Geographic Info Sys**

This course will explore fundamental concepts of geographic information technologies with a focus on applications within the geosciences and natural sciences in general. Students will be exposed to the power of geographic information systems to elucidate complex problems. (Cross-listed with BIOL 4460 and BIOL 5460)

Prerequisites: Senior standing.

**GEOL 4473 UG Res in Geosciences**

A course adapted to the study of special topics in the geosciences. For advanced students capable of developing a problem independently through conference and research (field and/or laboratory based) directed by the instructor. Problem chosen by the student with approval of the instructor prior to registration. May be repeated not to exceed four semester credit hours total. Laboratory fee, if applicable. (Formerly EPSC 4173-3373)

Prerequisites: Twelve semester hours of Geology.

**GEOL 4499 Special Topics in Geosciences**

A course involving instruction in geology depending on student interest and specialty of instructor. May be repeated for credit when topic changes.

Laboratory fee, if applicable.

Prerequisites: Twelve semester hours of Geology.

**PETE 3101 Drilling Engineering I Lab**

Preparation, testing and control of rotary drilling fluid systems. API recommended diagnostic testing of drilling fluids for measuring the physical properties of drilling fluids, cements and additives. A laboratory study of the functions and applications of drilling and well completion fluids. Learning the rig floor simulator for drilling operations that virtually resembles the drilling and well control exercises.

Corequisites: PETE 3301

**PETE 3110 Petrophysics Lab**

Hands-on Laboratory study of reservoir rock and rock-fluid interaction fundamentals, including porosity, rock strength, absolute permeability, wettability, capillary pressure, fluid saturation, and relative permeability.

Corequisites: PETE 3310

**PETE 3111 Well Log & Formation Eval Lab**

Observation of well logging tools and recording devices; Laboratory investigation of core analysis (routine core, special core, and thin section) for different formations. Interpretation of borehole surveys to determine formation character, fluid content, and production potential. Measurement of electrical, radioactive, acoustic, magnetic properties of rocks and fluids; The spontaneous potential log, gamma-ray log, porosity logs, nuclear magnetic resonance (NMR) log, and caliper log. Formation evaluation field-case studies using commercial software on different types of formations by interpretation of resistivity logs, spontaneous potential log, gamma-ray log, porosity logs, nuclear magnetic resonance (NMR) log, and caliper log.

Corequisites: PETE 3311

**PETE 3120 Petroleum Production Eng I Lab**

Laboratory investigation of produced fluid treatment and separation problems. Engineering solutions to petroleum production problems. Investigation of multiphase flow and pipeline fluid flow. Petroleum production system analysis using commercial simulator.

Corequisites: PETE 3320

**PETE 3301 Drilling Engineering I**

Introduction to petroleum drilling systems, including fundamental petroleum engineering concepts, quantities and unit systems, drilling rig components, drilling fluids, pressure loss calculations, casing, well cementing, and directional drilling.

Prerequisites: ENGR 2390.

Corequisites: PETE 3101.

**PETE 3307 Reservoir Engineering I**

Fundamental properties of reservoir formations and fluids including reservoir volumetric, reservoir statics and dynamics. Analysis of Darcy's law and the mechanics of single and multiphase fluid flow through reservoir rock, capillary phenomena, material balance, and reservoir drive mechanisms.

Prerequisites: PETE 3310 and PETE 3311

**PETE 3310 Petrophysics**

The course is designed to equip students with the skills necessary for accurate reservoir characterization and assessment through a systematic theoretical study of reservoir rock-fluid interaction fundamentals. Reservoir rock characteristics include lithology, porosity, elastic properties, rock strength, electrical properties, Darcy's Law, and absolute permeability. It also delves into the rock-fluid interaction characteristics that contribute to the fluid flow in porous media, including the existence of multi-phases, relative and effective permeability, fluid saturations, capillary characteristics, wettability, adsorption, and absorption processes.

Prerequisites: CHEM 1311, ENGR 2305, and MATH 2415.

Corequisites: PETE 3110

**PETE 3311 Well Log & Formation Eval**

This course covers topics on methods of how to measure and interpret the physical and chemical properties of formation through the well logging tools. Fundamental principles of the use of borehole surveys to evaluate the formation characteristics and fluid contents of porous strata; well-log interpretation for formation evaluation of hydrocarbon-bearing reservoirs; basic rock physics principles; theory of tool operation; analysis of open-hole logs and core measurements to estimate hydrocarbon reserves and petrophysical properties of the formation such as porosity, net pay thickness, water/hydrocarbon saturation, permeability, and saturation-dependent capillary pressure; formation evaluation of clay-free and shaly-sand formations as well as basic introduction to formation evaluation of organic-shale formations. Measurement principles, test types, and application of wireline Formation Testing, Production logging; Core analysis techniques; Integration of core analysis; Well logging results for reservoir modeling.

Prerequisites: ENGR 2390, GEOL 3420, PHYS 2326, and PHYS 2126.

Corequisites: PETE 3111.

**PETE 3320 Petroleum Production Eng I**

Introduction to production operations, production systems, and oil field equipment; inflow performance analysis, effect of formation damage on well flow, nodal systems analysis; perforating techniques and their effect on inflow; and stimulation treatments to enhance well performance; production problems; Well stimulation design and workover and recompletion analysis. Design of surface separation and treating facilities.

Prerequisites: PETE 3310.

Corequisites: PETE 3120

**PETE 3330 Reservoir Fluids**

This course is designed to provide students with the fundamentals of thermodynamic behavior of naturally occurring hydrocarbon mixtures, evaluation, and correlation of physical properties of petroleum reservoir fluids, including laboratory and empirical methods. This introduction to reservoir fluid properties covers all the basic concepts and applications of fluid properties (PVT), including fluid composition, properties, types, fluid sampling, measurement, analysis, PVT laboratory experiments and PT report analysis for further use in reservoir engineering.

Prerequisites: ENGR 2360

**PETE 3340 Geophysics for Petro Engineers**

The fundamentals of geophysics are given to petroleum engineering students, with special emphasis on 2-D and 3-D seismic. Application of seismic to oil and gas exploration problems.

Prerequisites: GEOL 3320

**PETE 4152 Internship in PETE**

A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor approval

**PETE 4185 Special Topics in PETE**

This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.

Prerequisites: Senior standing or permission of instructor

**PETE 4190 Senior Design I**

This is the first course in the senior design sequence. This course provides students the experience of devising a system, component, or process to address predefined needs and requirements within constraints, such as time, cost, technology, etc. Students are expected to propose an iterative and innovative engineered design solution for implementation in PETE 4290. This course should be taken the semester preceding PETE 4290.

Prerequisites: ENGL 2311 and Senior Standing.

**PETE 4195 Undergraduate Research in PETE**

Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis. May be repeated twice for credit.

Prerequisites: Instructor Approval

**PETE 4199 Directed Study in PETE**

A directed study course. Topics selected from contemporary developments in the field of petroleum engineering. May be repeated twice for credit.

Prerequisites: Permission of instructor

**PETE 4252 Internship in PETE**

A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor approval

**PETE 4285 Special Topics in PETE**

This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.

Prerequisites: Senior standing or permission of instructor

**PETE 4290 Senior Design II**

This course is the second and final course in the senior design sequence. This course provides students the experience of implementing (including building, testing, and documenting) the approved project in PETE 4190, within budget and on schedule. Requires integration of knowledge from required petroleum engineering courses. Course requirements include a written report and oral presentation.

Prerequisites: PETE 4190

**PETE 4295 Undergraduate Research in PETE**

Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor Approval

**PETE 4299 Directed Study in PETE**

A directed study course. Topics selected from contemporary developments in the field of petroleum engineering.

Prerequisites: Permission of instructor

**PETE 4302 Drilling Engineering II**

This course addresses the current advancement and technologies applied in modern drilling designs. The course focuses on building and designing directional well paths, wellbore surveying methods, predicting dog-leg severity, bottom hole assembly and operational techniques used in directional drilling, limiting factors and wellbore issues associated with directional drilling.

Prerequisites: PETE 3301

**PETE 4312 Reservoir Engineering II**

Determination of reserves; material balance methods; aquifer models; fractional flow and frontal advance; displacement, pattern, and vertical sweep efficiencies in water floods; enhanced oil recovery processes; design of optimal recovery processes.

Prerequisites: PETE 3307

**PETE 4313 Integrated Reservoir Mngt**

Principles of reservoir management and applications to specific reservoirs. Examine case studies that include new fields, mature fields, water floods and enhanced recovery projects. Requirements for successful operation of a reservoir through integration of people, technology, tools and data, synergy, fostering teamwork and integration.

Prerequisites: PETE 3301, PETE 3307, and PETE 3320

**PETE 4321 Petroleum Production Eng. II**

Fundamental production engineering design, evaluation and optimization for oil and gas wells, including well deliverability, formation damage and skin analysis, completion performance, and technologies that improve oil and gas well performance (artificial lift and well stimulation).

Prerequisites: PETE 3320.

**PETE 4322 Artificial Lift**

Fundamentals of artificial lift. Design, Evaluation and Optimization of different methods: Beam pumping, Electric submersible pumps and Gas lift. Equipment and installations required at the field. Case studies in different types of petroleum fields.

Prerequisites: PETE 3320

#### **PETE 4330 Petroleum Data Analytics & ML**

Data analytics knowledge appropriate for petroleum engineers and geoscientists; emphasis on implementing data-driven methods on various types of subsurface data; assembly of data-driven workflows and application of them on various types of subsurface data generated during petroleum engineering and geoscience operations and work on case studies that integrate various domains of petroleum engineering and geoscience; emphasis on the use of supervised learning, classification and regression, unsupervised learning, transformations, clustering, and feature extraction, and neural networks using open-source Python computational platforms; facilitation of understanding the basics of machine learning, data science and data analysis and their applications to petroleum engineering and geoscience.

Prerequisites: ENGR 2372 and Junior Standing

#### **PETE 4332 Env Hlth & Saf in Oil Indus**

This course analyzes U.S. laws, and how regulatory agencies address compliance concerns in the oil and gas industry. Attention will be paid to health, safety, and environmental concerns.

#### **PETE 4352 Internship in PETE**

A directed internship in a company or organization that is relevant to the oil and gas industry. Students will apply analytical and technical knowledge acquired in the program in a real-world setting and receive on-the-job training experience. Students will regularly document their learning experience via progress reports, presentations, and a final report at the end of the semester. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor approval

#### **PETE 4355 Drilling Optimization**

Optimization of the drilling process for oil and gas well based on geo-mechanical and dynamical models. Topics to be covered include drilling hydraulics, drill bit selection, operating parameter selection, analysis of drilling time and cost, and rate of penetration predications.

Prerequisites: PETE 4302

#### **PETE 4370 Well Testing**

Well test objectives and principles. Basics of Well Test Interpretation; Pressure transient tests and interpretation methods, unsteady-state fluid flow through porous rock, analysis of the drawdown and buildup tests, wellbore storage, application of pressure derivative in pressure transient data analysis, testing of hydraulically fractured wells, type curve methods, testing of horizontal wells, unified method of analysis, well test design, case studies of local field examples using well test commercial simulator; basics of specialized well test including Interference, pulse and vertical permeability testing, drill stem test (DST); Reservoir limit test; Wire line and slick line formation tests; Repeat formation tester (RFT).

Prerequisites: PETE 3307, PETE 3311, and PETE 3320

#### **PETE 4380 Shale Oil & Gas Engineering**

Overview of the unconventional basins and plays – North America, the rest of the world and Emerging basins; characteristics of unconventional oil and gas resources; unconventional resources workflow – exploration, identification, characterization, economics, efficient completion technologies, challenges, and development strategies. Pilot project in Shale resources development.

Prerequisites: PETE 3307 and PETE 3311

#### **PETE 4382 Reserv Modeling & Simulation**

Introduction to the fundamentals and applications of reservoir modeling and simulation. In this class, numerical models are built based on finite-difference and finite-volume approximations of governing equations of fluid flow in porous media, which integrate conservation of mass, isothermal fluid PVT behavior, and Darcy's flow approximations.

Prerequisites: PETE 3307 and PETE 3320.

#### **PETE 4385 Special Topics in PETE**

This course is to provide faculty with a platform to cover emerging issues that are relevant to the petroleum engineering discipline and not covered in the curriculum. This course can also be used to offer specialized complementary content that makes students of the program more well-rounded petroleum engineers. This course can be cross-listed with courses from other programs or departments. May be repeated for credit when the topic changes.

#### **PETE 4395 Undergraduate Research in PETE**

Students work on a research project relevant to the petroleum engineering discipline under the supervision and mentorship of a faculty member from the program. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Instructor Approval

#### **PETE 4399 Directed Study in PETE**

A directed study course. Topics selected from contemporary developments in the field of petroleum engineering.

Prerequisites: Permission of instructor

#### **SENG 3300 Engineering Economics**

Principles of engineering economics including economic equivalence, time value of money, analysis of single and multiple investments, comparison of alternatives; capital recovery and tax implications; certainty; uncertainty; risk analysis; public sector analysis and break-even concepts. Interchangeable with ENGR 3300.

Prerequisites: MATH 2414.

#### **SENG 3310 Intro to Control Systems**

Analysis and synthesis of controlled, dynamic, linear mechanical, electrical, fluid and/or thermal systems; introduction to concepts of stability, controllability, and observability. Optimal control systems and nonlinear control theory.

Prerequisites: CSCE 1336, CSCE 1136, ENGR 2305, MATH 3310 and MATH 3330.

#### **SENG 3320 Engineering Modeling & Design**

This course will cover the fundamentals of modeling and design, introduce students to engineering design criteria such as human factors and ergonomics, maintainability, and reliability. The course will also introduce students to project management topics such as project scheduling, schedule reduction, design and project selection models, and multi-criteria decision making. Contemporary case studies of failures in modeling and design will be analyzed to identify lessons learned.

Prerequisites: ENGR 2372

#### **SENG 3330 Operations Research I**

Introduction to the fundamental deterministic analytical methods and their applications to the industrial and systems engineering. Modeling and decision making. Methods include linear programming, the simplex method, integer programming, distribution and network models (transportation, transshipment, and assignment problems), nonlinear programming, queuing analysis, simulation, and forecasting.

Prerequisites: MATH 3310 and SENG 3320.



**SENG 3337 Software Development**

This course will cover advanced software development techniques including object-oriented programming, inheritance, polymorphism, formatted file access, recursion, functional and operator overloading, parsing using a FSM, stacks and queues using linked list, search algorithms using binary search trees, and shortest path algorithms.

Prerequisites: CSCE 1336 and CSCE 1136.

**SENG 3340 Robotics and Automation**

Study of the use, design, and deployment of industrial automation and robotics technologies in high-precision, multi-product manufacturing environments. Robot manipulators, kinematics and dynamics, robot automation and control, integrated robotic systems for manufacturing, automation in manufacturing, programmable logic controllers, applications to industrial systems. Interchangeable with CSCE 3345.

Prerequisites: ENGR 2305, ENGR 2105, and MATH 3310

**SENG 3345 Microprocessor Systems**

Introduces basic computer structure, the instruction set, addressing modes, assembly language programming, assembly language subroutines, arithmetic operations, programming in C, implementation of C procedures, elementary data structures, input and output, and a survey of microprocessor-based design. This course is interchangeable with CSCE 3340.

Prerequisites: CSCE 2330

**SENG 3370 Computer Int Manufacturing**

Programmable automation applied to manufacturing systems. Sensors and data acquisition. Continuous and discrete control system design and analysis. Computer control of manufacturing processes and integration. Communications through local areas networks.

Prerequisites: Junior or Senior standing.

**SENG 3380 Measurements and Devices**

Basic concepts and principles of measurement methods; characteristics of signals; signal conditioning; data acquisition and processing; transducers and sensors, analog and digital devices, voltage regulators; power supplies; measurements of temperature, pressure, velocity, flow, and strain.

Prerequisites: ENGR 2305/2105.

**SENG 4152 Internship in Systems Engr**

A directed internship in an organization appropriate to the student's career objectives. May be repeated for credit. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of instructor.

**SENG 4185 Special Topics in Systems Engr**

Topics may be from any area of Systems Engineering. May be repeated when topic changes.

Prerequisites: Senior standing or permission of instructor

**SENG 4195 Undergraduate Research**

Permits work on a research engineering project. May be repeated for credit.

Prerequisites: Permission of instructor.

**SENG 4199 Directed Study in SENG**

A directed study course. Topics selected from contemporary developments in the field of systems engineering. May be repeated for credit.

Prerequisites: Permission of instructor.

**SENG 4252 Internship in Systems Engr**

A directed internship in an organization appropriate to the student's career objectives. Evaluation of performance is on a Pass or Fail basis.

Prerequisites: Permission of instructor.

**SENG 4285 Special Topics in Systems Engr**

Topics may be from any area of Systems Engineering.

Prerequisites: Senior standing or permission of instructor

**SENG 4295 Undergraduate Research**

Permits work on a research engineering project.

Prerequisites: Permission of instructor.

**SENG 4299 Directed Study in SENG**

A directed study course. Topics selected from contemporary developments in the field of systems engineering.

Prerequisites: Permission of instructor.

**SENG 4301 Senior Design I**

This course is the first in the senior design sequence. It will cover principles of project management; planning, scheduling, and control; engineering proposals; and technical reports. Students prepare proposals, including specifications, timelines, schedule, and budget, for projects to be implemented in SENG 4390. This course should be taken the semester preceding SENG 4390. (Formerly SENG 3301).

Prerequisites: ENGL 2311 and senior standing

**SENG 4315 Embedded Systems**

Characteristics of embedded systems, microprocessors and microcontrollers, system design, modular programming, interface devices, memory management, interrupts, input/output applications, multitasking, and simulation. Interchangeable with CSCE 4315.

Prerequisites: ENGR 2305, ENGR 2105, CSCE 1336, and CSCE 1136.

**SENG 4330 Operations Research II**

This course will present mathematical models for inventory management. It also covers a variety of statistics topics such as analysis of variance (One Factor and Two Factors), simple and advanced multiple linear regression. Techniques to deal with collinearity in datasets such as stepwise regression and best subsets are presented. Other topics include game theory, Markov chains, and multi-criteria decision-making through goal programming

Prerequisites: ENGR 2372 and SENG 3330.

**SENG 4340 Intelligent Systems**

Introduction to methods for the analysis and design of intelligent engineering systems. Topics include reinforcement learning, optimal estimation, Bayesian networks, expert systems, neural networks, and genetic algorithms. Applications emphasize control and decision-making in engineering, finance, and computer science. Interchangeable with CSCE 4340.

Prerequisites: SENG 3340.

**SENG 4350 Facilities Design & Logistics**

Design and analysis of models and algorithms for facility location, vehicle routing, and facility layout problems. Emphasis will be placed on both the use of computers and the theoretical analysis of models and algorithms in the design of production/service facilities, sequencing, and scheduling. Fundamental concepts applied through a sequence of design projects.

Prerequisites: SENG 3330.

**SENG 4352 Internship in Systems Engr**

A directed internship in an organization appropriate to the student's career objectives.

Prerequisites: Permission of instructor.



**SENG 4360 Systems Simulation**

Study the structure, logic, methodologies, and computer techniques for simulating systems. Topics include fundamentals of discrete simulation, design-modeling and subsequent analysis, model verification and validation, and understanding and predicting the behavior of systems.

Prerequisites: SENG 3330.

**SENG 4370 Intro to Virtual Manufacturing**

Introduction to virtual manufacturing, virtual reality applications in manufacturing systems design, networked manufacturing applications, and modeling of occupational safety engineering.

Prerequisites: SENG 3370.

**SENG 4385 Special Topics in Systems Engr**

Topics may be from any area of systems engineering. May be repeated when topic changes.

Prerequisites: Senior standing or permission of instructor.

**SENG 4390 Senior Design II**

This course is the second and final course in the senior design sequence. This course provides students the experience of implementing (including building, testing, and documenting) the approved project in SENG 4301, within budget and on schedule. Requires integration of knowledge from required systems engineering courses. Course requirements include a written report and oral presentation.

Prerequisites: SENG 4301.

**SENG 4395 Undergraduate Research**

Permits work on research engineering project.

Prerequisites: Permission of instructor.

**SENG 4399 Directed Study in SENG**

A directed study course. Topics selected from contemporary developments in the field of systems engineering.

Prerequisites: Permission of instructor.