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Course Descriptions CEE

Chemistry

CHEM-003. General Chemistry & Recitation, 4 credits. Deals with the fundamental principles of chemistry, the chemical and physical properties of the elements and their most common compounds, and methods of qualitative inorganic analysis. **Prerequisite:** Students required to take **CAR Math** have to satisfy that requirement before they will be able to enroll in this course.

CHEM-005. General Chemistry Laboratory, 1 credit. Designed to teach some of the techniques of chemical experimentation, illustrate some of the principles of chemical substances.

Civil and Environmental Engineering

EGPP-101. Introduction to Engineering, 2 credits. Provides information on engineering education, the engineering profession, and basic concepts and tools. Introduces the engineering design process and provides the opportunity for students to complete engineering design projects.

CIEG-104. Civil Engineering Software & Design, 3 credits. Civil engineering involves the planning, design, construction, and operation of facilities that support the quality of life for all people, from road networks to water treatment systems to buildings and their foundations. This course will utilize a variety of teaching and learning techniques to introduce students to the civil engineering discipline, including the concentration areas of transportation, environmental, water resources, structural, and geotechnical engineering. Students will work individually to conduct research on civil engineering topics and familiarize themselves with skills/tools needed for success in the field including the following: technical writing, MathCAD, and AutoCAD. By the end of the course, students will be able to:

1. Use MathLab, MathCAD and AutoCAD to complete basic engineering analyses and design.
2. Identify and describe the civil engineering disciplines.
3. Prepare and deliver effective oral presentations.
4. Demonstrate technical writing competencies appropriate for civil engineering practice.

Prerequisite: EGPP-101

CIEG-202. Statics, 3 credits. Introduction to vectors, pseudo-graphical and analytical micro-computer aided resolution and composition of forces; equilibrium of collinear, concurrent, and non-concurrent two and three dimensional force systems, as applied to particles and rigid bodies. Coulomb friction; Hooke's law; introductory application of equilibrium, compatibility, and constitutive relations in the determination of forces moments, displacements and rotations of simple deformable bodies and biomechanical systems, using simple computer aids. **Prerequisite: MATH-157, PHYS-013.**

CIEG-207. Introduction to Environmental Engineering, 3 credits. Introduces concepts in water supply, water and wastewater treatment, air quality, solid and hazardous waste management, and social and ethical considerations. Provides a brief history and background of environmental engineering. **Prerequisite.: CHEM-003.**

CIEG-301. Mechanics of Materials Lecture, 3 credits. Introductory analysis of tension, compression and shear; analysis of stress and strain; ties, shafts, beams and columns; related laboratory experiments and computer applications; introduction to structural analysis and design. **Prerequisite: MATH-159, CIEG-302, MEEG-309; Corequisite.: CIEG-303.**

CIEG-302. Dynamics, 3 credits. Study of motions of particles; particle systems, rigid bodies and simple deformable mass system; rectilinear and curvilinear kinematics; Newton's laws of motion and gravitation; work energy and impulse-momentum principles; conservation laws for energy and momentum; introduction to vibrations; computer-aided applications. **Prerequisite: CIEG-202; Corequisite: MATH-159.**

CIEG-303. Mechanics of Materials Lab, 1 credit. This laboratory course accompanies the Mechanics of Materials lecture. **Corequisite: CIEG-301 or approval of instructor**

CIEG-311. Fluid Mechanics Lecture, 3 credits. Theoretical and laboratory studies of fluid properties, hydrostatics, kinematics, and dynamics of fluid; continuity equation; energy and Bernoulli equation; momentum equation; dimensional analysis and flow resistance. **Prerequisite: MATH-158, CIEG-302; PHYS-013; Corequisite: CIEG-313**

CIEG-313. Fluid Mechanics Lab, 1 credit. This laboratory course accompanies the Fluid Mechanics lecture. CIEG 311. **Prerequisite: MATH-158, CIEG-302; PHYS-013; Corequisite: CIEG-311 or approval of instructor**

CIEG 314. Basic Structural Analysis, 3 credits. An introduction to the elastic behavior of structural elements, statically determinate structures; and reactions, shears, moments, and deflections in beams, trusses, and frames and definition of standard structural engineering loads. **Prerequisite: CIEG-301.**

CIEG-328. Unit Operations in Environmental Engineering, 3 credits. Analysis and basic design of treatment facilities for the remediation of air, water and land pollution. **Prerequisite: CIEG-207.**

CIEG-354 Engineering Economics, 3 credits . Examines principles of accounting, time value of money, depreciation, taxes, retirement, and economic analysis of alternatives for use in personal finances and engineering projects. **Prerequisite: MATH-157. {Note: replaces Engineering Systems Analysis}**

CIEG-351. Probability and Statistics, 3 credits. Stochastic and deterministic statistical modeling: probability and statistics for univariate analysis including probability density functions, confidence intervals and hypothesis testing. Probability and statistics for multivariate analysis including regression analysis, confidence intervals and hypothesis testing; PCA, ANOVA, and risk-based design concepts. **Prerequisite: MATH-158.**

CIEG-352. Water Resources Engineering I, 3 credits. Classical and statistical hydrology: hydrologic cycle, hydrologic processes, physical watershed characteristics, hydrologic modeling, collect analyze and interpret meteorological and hydrologic data using statistical analysis for design of hydrologic and hydraulic structures. Remote sensing data in hydrology. **Prerequisite: CIEG-351.**

CIEG-400. Special Topics in Civil Engineering, 3 credits. Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Content determined by faculty member in consultation with the Department Chair.

CIEG-407. Intelligent Transportation Systems, 3 credits. Command, controls and communications in modern multimodal transportation; infrastructure/highway and vehicle automation, advanced traffic management, vehicle control and safety systems; information data, and sensory requirements; practical application. **Prerequisite: CIEG-416, CIEG-465.**

CIEG-416. Transportation Engineering, 3 credits. Involves planning and design of highways. Students work in teams during the preparation of the required design plans, cost estimates and project reports. **Prerequisite: CIEG-104; Co-req.: CIEG-354.**

CIEG-420. Matrix Structural Analysis, 3 credits. Continuation of analysis of statically indeterminate structures; moment distribution; introduction to matrix formulation of the direct stiffness method (emphasized) and the flexibility method (for reference); elementary finite element analysis techniques; introduction to nonlinear (plastic) analysis; structural stability; and structural dynamics. **Prerequisite: CIEG-419.**

CIEG-422. Steel Design, 3 credits. Principles of structural design, loads, types of steels, tension members, columns, non-composite and composite beams, beam-columns, column base plates, and simple bolted and welded connections. The use of the AISC LRFD specification is emphasized and a comprehensive group design project is assigned. **Prerequisite: CIEG-314.**

CIEG-433. Foundations, 3 credits. Based on the principles of soil mechanics, fluid mechanics, and solid mechanics, covers the bearing capacity and settlement analysis of shallow and mat foundations, an introduction to deep foundations, and design of earth retaining structures. Analytical, empirical, and computational methods are used. **Prerequisite: CIEG-434.**

CIEG-434. Soil Mechanics Lecture, 3 credits. Provides for appreciation and understanding of the engineering properties of soils and how they relate to design and construction, including soil identification and classification. **Prerequisite: CIEG-301, CIEG-311; Corequisite: CIEG-438.**

CIEG-435. Reinforced Concrete, 3 credits. Theory and design of reinforced concrete structural members and entire structural systems according to the ACI Building Code Requirements. The students will apply fundamentals and basic design procedures to reinforced concrete members (beams, slabs, columns and footings).
Prerequisite: CIEG-314.

CIEG-438. Soil Mechanics Lab, 1 credit. This laboratory course accompanies the Soil Mechanics lecture. Example tests are permeability, shear strength, and consolidation. **Corequisite: CIEG-434 or instructor approval.**

CIEG-439. Senior Design I, 3 credits. This course is concerned with the planning, management, teaming and the development of the concept documents of the capstone design project. **Prerequisite: CIEG-104, 207; CIEG-305; CIEG-352; CIEG-416; CIEG-434.**

CIEG-440. Water and Wastewater Treatment, 3 credits. Advanced design of facilities for water and wastewater treatment including design ranges, regulations, economics and ethics of environmental design.

Prerequisite: CIEG-328.

CIEG-441. Senior Design II, 3 credits. This course integrates the many sub-disciplines of civil engineering for the concept documents provided in Senior Design I into developed engineering design documents. The process passes through the various phase of design development and ends with the production of a detailed design for the project. The course culminates with a formal presentation of the design and associated lessons learned to faculty and other professionals. **Prerequisite**: CIEG-439.

CIEG-442. Advanced Foundations, 3 credits. Case histories are presented to illustrate typical design and construction problems. Further coverage includes deep foundations and soil exploration and improvement techniques. Focus is placed on behavior, which departs from traditional foundation design expectations. **Prerequisite.: CIEG-433.**

CIEG-445. Undergraduate Research, 3 credits. Requires a student to conduct research under the directives of an instructor. Students must seek and receive the approval of the instructor prior to enrollment in this course. The selected research topic must broaden the student's understanding of one of the five emphasis areas. **Prerequisite: CIEG-351**

CIEG-457. Advanced Hydrology, 3 credits. Modeling of the hydrologic cycle and hydrologic processes; learn and apply hydrologic models such as those hosted by the Watershed Modeling System (WMS) software, including the US Army Corps of Engineers HEC-1 model and the SCS TR-20 and TR-55 models; learn and apply GIS software, Arc GIS. **Prerequisite: CIEG-352.**

CIEG-462. Seminar, 1 credit. Forum for presentation of current topics of interest in civil engineering by individuals from industry, government and practice. **Prerequisite: CIEG-439; Co-req.: CIEG-441.**

CIEG-463. Water Resources Planning, 3 credits. Presents basic concepts in the planning of water resources development systems; analytical techniques, basic information required for planning; and examples for planning flood control, wastewater management, and water supply systems. **(Senior Status)**

CIEG-464. Engineering Project Management, 3 credits. Involves planning performing and controlling of engineering projects; introduces management roles, project scheduling, principles and procedures, as well as project proposal writing. **Prerequisite: CIEG-354 or equivalent.**

CIEG-465. Traffic Engineering 1, 3 credits. Involves the collection and use of traffic engineering data and introduces students to traffic operations and safety. Students use software for capacity analysis and signal optimization. Students are required to prepare reports. **Prerequisite: CIEG-351; CIEG-416.**

CIEG-466. Traffic Engineering II, 3 credits. Involves the introduction to traffic impact analysis, and use of traffic simulation models for evaluating traffic operation on highway networks, including traffic impact studies and signal warrant analyses. **Prerequisite: CIEG-465.**

Comprehensive Sciences

COMP-001. Life Sciences Lecture & Laboratory, 3 Credits. This course explores the basic concepts of the biological (life) sciences. These concepts will be presented through the examination of the principal characteristics that all living things (life forms) have in common (i.e., ecology, genetics, taxonomy, metabolism, evolution, reproduction and development, etc.). The lecture information surveys living systems

on the chemical, cellular and organismal levels. The exploration is complemented by key laboratory applications and observations that will enable the students to recognize, comprehend and appreciate the complexities of biological organization that exist in nature. **Note: Students must register for the Lecture and Lab.**

COMP-002. Planetary Science Lecture & Laboratory, 3 Credits. The planetary science course involves studies of astronomy (planets, stars, the universe) and geology (the earth). In geology, the principal features of planet earth such as size, shape, composition, motions are presented. How planet earth changes as a result of internal and external forces act on it provides a topic of interest. In astronomy, emphasis is on the other planets, the solar system and other celestial bodies that exist in the universe. Laboratory investigations involve the examination of various samples, planetarium visits and field trips to area geological sites and venues where advanced technological telescopes can be used. **Note: Students must register for the Lecture and Lab.**

English

Note - Each student must complete the minimum requirement of six (6) credit hours in English as follows:

ENGL-002. Freshmen Composition I, 3 credits . Designed to develop the student's ability to express ideas clearly and effectively in writing and to read with perception and accuracy; emphasizes the power and value of written communication by reading exemplary text.

ENGL-003. Freshmen Composition II, 3 credits. Intended to increase the student's ability to write effectively, to read critically, and to present ideals logically. **Prerequisite: ENGL-002.**

Mathematics

MATH-156. Calculus I, 4 credits. Limits, continuity, and the derivative and integral of functions of one variable, with applications.

MATH-157. Calculus II, 4 credits. Continuation of MATH-156, including more integration, sequences, series, Taylor's theorem, improper integrals, and L'Hospital's rule. **Prerequisite: MATH 156.**

MATH-158. Calculus III, 4 credits. Continuation of MATH-157, including calculus of functions of several variables, with applications. **Prerequisite: MATH-157.**

MATH-159. Differential Equations, 4 credits. Elementary techniques of solving ordinary differential equations, including slope fields, equilibrium, separation of variables, linear differential equations, homogeneous differential equations, undetermined coefficients, bifurcations, power series, Laplace transforms, systems, and numerical methods. **Prerequisite: MATH-157.**

MATH 164. Introduction to Numerical Analysis. 3 crs. Treats numerical integration and numerical solution of differential equations, numerical linear algebra, matrix inversion, characteristic values; error propagation; and stability. **Prerequisite: CIEG-103; Corequisite: MATH-159.**

Mechanical Engineering

MEEG 209. Materials Science, 3 credits. Correlation of the structure of metals, ceramics, and organic materials with their mechanical and physical properties, control of properties by modifying the microstructure, and stability of materials in service environments. **Prerequisite: CHEM-003; PHYS 014**.

Physics

PHYS-013. Physics for Science and Engineering Lecture I, 3 credits. This lecture/recitation calculus-based course deals with mechanics, heat and sound. **Prerequisite: MATH-156; Corequisite: PHYS-023.**

PHYS-023 Physics for S&E Lab I, 1 credit. Laboratory course to accompany introductory physics course, **Corequisite: PHYS-013**.

PHYS-014. Physics for Science and Engineering Lecture II, 3 credits. This lecture and recitation calculus-based course covers electricity and magnetism, light and optics. **Prerequisite: PHYS-013, MATH 157; Corequisite: PHYS-023.**

PHYS-024 Physics for S&E Lab II, 1 credit. Laboratory course to accompany introductory physics course, PHYS-023.