

## Civil Engineering Program

### Course Descriptions (Catalogue)

#### ENG 133 – ENGLISH COMPOSITION I 2 (2, 0, 0)

**Course Description (catalog):** This is an intermediate level writing class. Students are guided through the stages of the writing process to write paragraphs that are both meaningful and organized, and include a topic sentence with a controlling idea and conclusion. Students write multi-draft compositions from a variety of practical and academic purposes. They improve their writing by studying model sentences and paragraphs, basic sentence patterns, mechanics, coordinating conjunctions, transitions and vocabulary

#### ENG 134 – ENGLISH COMPOSITION II 2 (2, 0, 0)

**Course Description (catalog):** English is a course designed to take learners from the paragraph level of writing in English to the Essay level. It concentrates on the essential form and function of the essay and prepares the ground for the academic essay. Particular importance is given to tasks of description and argumentation, including work on comparison, definition, cause-effect and expression of opinion in essay writing. Thus, students are taken through the major stages of the essay composition process. *Prerequisite:* ENG 133.

#### ENG 137 – TECHNICAL WRITING 2 (2, 0, 0)

**Course Description (catalog):** This course introduces students to the fundamentals of writing, designing and conveying technical information to different audiences. Students will learn about technical writing conventions, such as organization, style and tone and illustration and layout as they work through the writing process to produce a variety of common technical documents that they will encounter in their academic work. Two lectures per week. *Prerequisite:* ENG 134.

#### ENG 138 – FUNDAMENTALS OF SPEECH COMMUNICATION 2 (2, 0, 0)

**Course Description (catalog):** A study of communication theories as applied to speech: practical communicative experiences ranging from interpersonal communication and small-group process through problem identification and solution in discussion, to informative and persuasive speaking in standard speaker-audience situations. *Co-requisite:* ENG 134.

#### DEIC 101- ISLAMIC CREED AND CONTEMPRARY DOCTRINES 2 (2, 0, 0)

**Course Description (catalog):** Creed: definition, importance, sources, characteristics, study methodology, pillars of faith, influence of creed on individuals and society, belief nullifiers, thought constraints, study of some contemporary doctrines: secularism, Satan worshipers, Baha'ism, Zionism, Misoneism, Christian fundamentalism. Student is required to memorize part of the holy Quran.

#### DEIC 301- CONTEMPORARY CULTURAL ISSUES 2 (2, 0, 0)

**Course Description (catalog):** Moderation, Islam globalism and human ties, discrimination and nationalism, Arabic as the medium of education and culture, science and religion, interfaith dialogue, Orientalism and Christianization, Colonialism, Westernization, modernity in literature, Globalization, Terrorism, Development of Moslem nations.

#### DEIC 102- FIQH BIOGRAPHY 2 (2, 0, 0)

**Course Description (catalog):** Definition, importance, sources, characteristics, study methodology, pillars of faith, the influence of creed on individuals and society, belief nullifiers, thought constraints, Study of some contemporary doctrines: secularism, Satan worshipers, Baha'ism, Zionism, Misoneism, Christian fundamentalism.

#### DEIC 302- ISLAM AND SCIENCE AND TECHNOLOGY ISSUES 2 (2, 0, 0)

**Course Description (catalog):** Moderation, Islam globalism and human ties, discrimination and nationalism, Arabic as the medium of education and culture, science and religion, interfaith dialogue, Orientalism and Christianization, Colonialism, Westernization, modernity in literature, Globalization, Terrorism, Development of Moslem nations.

#### DEIC 317- ISLAMIC MORALS AND ETHICS 2 (2, 0, 0)

**Course Description (catalog):** Morals (Ethics: definition and foundations, characteristics, study of model samples of the Prophets' morals and ethics, tools of moral/ethical education in Islam. Concept of profession and its importance in human life, constituents of professional morals/ethics and its constraints, model samples of professional morals/ethics in Islam. Student is required to memorize part of the holy Quran.

#### DEIC 318- ECONOMIC SYSTEM IN ISLAM 2 (2, 0, 0)

**Course Description (catalog):** Islamic Economy: (its nature and principles, development, and characteristics), the economic problem and how to face it, contemporary economic systems (capitalism, socialism), economic globalism, World Bank and its goals, World Trade Organization and its goals, ownership in Islam: definition, types, constraints. Islam and economic freedom, Production, distribution, expenditure, economic policies in contracts and transactions. Student is required to memorize part of the holy Quran.

#### DEIC 401- SOCIAL SYSTEM IN ISLAM 2 (2, 0, 0)

**Course Description (catalog):** Society: definition, building blocks of society in Islam, Islamic society attributes, Family in Islam: definition, status, importance,

building blocks, marriage and its purposes, spouses' rights, parents, siblings, and relatives' rights, women's status and rights in Islam, Family controversial issues about family system in Islam and responding to those issues (polygamy, inheritance, veil, divorce, etc.), Family problems and remedies (women's work, alimony, stewardship, etc.). The students are required to memorize part of the holy Quran.

#### DEIC 418- POLITICAL SYSTEM & HUMAN RIGHTS IN ISLAM 2 (2, 0, 0)

**Course Description (catalog):** Political system: definition, characteristics. Country building blocks: homeland, society, authority, goals, foundations, principles of ruling in Islam, ruler selection, ruler duties, state authority, rights of Moslems and non-Moslems in the Islamic state, Manifestations of implementing the political system in KSA: Governance statute, Shura, judiciary system, security, Hisbah. Human rights in Islam: definition, significance, sources, constraints, Basic rights: (equality, freedom, life, justice, safety), Universal/International Declaration of Human Rights and position of KSA from it. Students are required to memorize part of the holy Quran.

#### CS 204 – ENGINEERING PROGRAMMING 3 (3, 0, 0)

**Course Description (catalog):** Introduction to computer systems; problem solving methodology; testing and debugging of programs; variables, declarations, and assignments; input and output; data types; control flow and looping; functions and overloading; streams and input/output; one-dimensional arrays; two-

dimensional arrays; pointers and dynamic arrays; structures; abstract data types and classes; inheritance; friends, overloaded operators, and arrays in classes; recursive functions. Three lectures per week. Projects that will require lab work will be assigned weekly. *Prerequisite:* MATH 144.

#### MGT 292 – MANAGEMENT FUNDAMENTALS AND SKIL 3 (3, 0, 0)

**Course Description (catalog):** The course covers Management fundamentals & Skill, such as, Global Management, Change and Innovation, Appendix: Managing Entrepreneurial Ventures, Decision Making, Strategic Management, Module Planning Tools and Techniques, In class discussion: Ethics Dilemma, Operations Management, Marketing Management, E Business, Marketing Plan, Human Resource Management, Team Building, Foundations of Individual Behaviour, Communication.

#### MATH 144 – CALCULUS I 4 (4, 0, 0)

**Course Description (catalog):** This is an introductory course of mathematics for college of engineering students. The course covers the basic concepts and methods of calculus. At the beginning of the course the instructor will provide students the knowledge of the number systems, algebraic operations and functions of single variable with domain and range so that students can learn differentiation of the functions. The main topics to be covered in this course include: Limits, Continuity, Differentiation of functions of a single variable, Exponential, Logarithmic, Trigonometric, Inverse trigonometric functions, Applications of derivatives, Differentials, Curve Sketching, L'Hospital Rule, Mean value theorems, Area and estimating with finite sums, Introduction to integrals and definite integrals.

#### MATH 145 – CALCULUS II 4 (4, 0, 0)

**Course Description (catalog):** This is an intermediate level calculus course designed for undergraduate Engineering students. This course covers mainly the integration and basic principles of Vectors and their applications. At the beginning of this course, the instructor will give the review of differentiation and integration. In depth, the students will learn the methods of integration and vectors. The topic covered include, Techniques of Integration, Improper Integration, Applications of Integration, Infinite Sequences and Series, (Power series and Taylor series), Polar coordinates, Transcendental Functions, Vectors, Vector Valued Functions. *Prerequisite:* MATH 144.

#### MATH 240 – DIFERENTIAL EQUATIONS 3 (3, 0, 0)

**Course Description (catalog):** This course is an introductory course of differential equations for college of engineering students. The course covers different methods and concepts to solve first and second order differential equations. At the beginning of the course we discuss some definitions and terminology about differential equations. Then we move to solving first and second order differential equations. The topics in this course include, linear differential equations, solving first order differential equations, solving second order differential equations, series solutions of second order linear differential equations, solving systems of linear differential equations, Laplace transform and its applications in solving differential equations. *Prerequisite:* MATH 145.

#### MATH 244 – MULTIVARIATE CALCULUS 3 (3, 0, 0)

**Course Description (catalog):** This course is an advanced course in calculus, designed for undergraduate students of engineering. The course covers the basic principles and methods of differentiation and integration of two or more variables. At the beginning of the course, the Instructor will give a review of functions of one variable and its differentiation and integration. Then, the functions of two or more variables with domain and range will be discussed. Throughout the course, the following main topics will be covered: solid analytic geometry; vector calculus; partial derivative; and multiple integrals. The coverage will also include relevant and important applications in the sciences and engineering. *Prerequisite:* MATH 145.

#### MATH 246 – LINEAR ALGEBRA 3 (3, 0, 0)

**Course Description (catalog):** Linear transformations, finite dimensional vector spaces, matrices, determinants, systems of linear equations, and applications to areas such as linear programming, Markov chains and differential equations. *Prerequisite:* MATH 145.

#### PHYS 140 – GENERAL PHYSICS I 3 (3, 0, 0)

**Course Description:** The course is an introduction to units, measurements, motion in one and two dimensions, kinematics and dynamics, Newton's laws, work and energy, rotational dynamics, linear and angular momentum, torque, and collisions. Basic calculus and multi-variable algebra will be used. *Co-requisite: MATH 144 & PHYS 144.*

**PHYS 141 – GENERAL PHYSICS II 3 (3, 0, 0)**

**Course Description:** This course introduces students to the physics of electricity and magnetism and the connections between them. The concepts of electric charge, electric field, electric potential, Kirchhoff Law, Gauss Law, electric and magnetic fluxes, capacitance, resistivity and resistance, connections in series and in parallel, RC-circuit, magnetic field, magnetic force, magnetic and electric torques, Ampere Law, electromagnetic induction, and Faraday Law and Lenz Law will be taught. *Prerequisite: PHYS 140, & Co-requisite: PHYS 145.*

**PHYS 144 – GENERAL PHYSICS I LAB 1 (0, 0, 3)**

**Course Description (catalog):** Measure basic constants such as length, weight and time, value of acceleration due to gravity. Design and conduct experiments in mechanics. Analyze and interpret experiment data. Write a scientific report. Draw and interpret a graph. Apply experimental principles and error calculations to mechanics. *Co-requisite: PHYS 140.*

**PHYS 145 – GENERAL PHYSICS II LAB 1 (0, 0, 3)**

**Course Description (catalog):** This course introduces students to the basic electrical measurements techniques and to the physics of electricity and magnetism. The concepts of basic measurements, Resistors in series and in parallel, Verifying Ohm's law, Wheatstone Bridge, Verifying Kirchhoff's Laws, Resistivity, Capacitors in series and in parallel, RC circuit, Introduction to Oscilloscope, the Mechanical Equivalent of Heat, the Negative Temperature Coefficient of Resistance (Thermistor), Galvanometer, and the Magnetic Moment will be taught. *Co-requisite: PHYS 141.*

**CHEM 140- GENERAL CHEMISTRY I 3 (3, 0, 0)**

**Course Description (catalog):** Matter properties and measurement, Atoms and the Atomic Theory, Chemical Compounds, Chemical Reactions, Reactions in Aqueous Solutions, Liquids Solids and Intermolecular Forces, Electrons in Atoms, Periodic Table and Atomic Properties, Chemical Bonding, Valence-Bond, Hybridization of Atomic Orbital, Multiple Covalent Bonds, Molecular Orbital Theory, Liquids and Solids.

**CHEM 142- GENERAL CHEMISTRY II 3 (3, 0, 0)**

**Course Description (catalog):** Properties of Gases: Kinetic-molecular theory of gases, Ideal gas law, Mixtures of gases, Thermo- chemistry, Principles of Chemical Equilibrium, Acids and Bases, Buffer Solutions, Neutralization Reactions and Titration Curves, Solubility and Complex-Ion Equilibria, Spontaneous Change: Entropy and Free Energy, Thermodynamic, Solutions and Their Physical Properties, Chemical Kinetics and Electrochemistry. *Prerequisite: CHEM 140, & Co-requisite: CHEM 143.*

**CHEM 143 – GENERAL CHEMISTRY LAB 1 (0, 0, 3)**

**Course Description (catalog):** Laboratory safety rules and Evaluation of analytical data, Definition and determination of density, explanation and determination of specific heat, concept of Acids, bases and Heat of Neutralization Reaction and its determination, reversible reactions, concept of equilibrium constant and its determination, Le Chatelier principle and its verification, principle involved in Acid base titrations, indicators, Ionization of electrolytes, determination of dissociation constant of weak acid (Ka), principle involved in complex metric titrations, hardness of water and its determination. *Co-requisite: CHEM 142.*

**ENGR 100- INTRODUCTION TO ENGINEERING 1 (1, 0, 0)**

**Course Description (catalog):** This course introduces engineering to students, particularly those who are interested in an engineering profession. It covers engineering ethics, teamwork, communication skills, engineering topics, and engineering problem solving skills and design methodology. One lecture per week.

**ENGR 105- ENGINEERING COMPUTING & SKILLS 2 (2, 0, 0)**

**Course Description (catalog):** Problem solving skills and computing using MATLAB. *Co-requisite: MATH 145.*

**ENGR 106 – ENGINEERING GRAPHICS 2 (1, 0, 3)**

**Course Description (catalog):** An introductory course in engineering graphics focuses on graphical communication. Topics include descriptive geometry elements, visualization, engineering drawing techniques, orthographic projection, pictorial representation, section views, and basic dimensioning. The course incorporates computer aided drafting (CAD) with engineering applications using 2-D drawing. This course is divided in to two sections: sketching and AutoCAD. The course begins by teaching the basics of engineering graphics using sketching. Freehand sketching using only a pencil and paper is an important skill for any engineer. It is a means of quickly conveying technical information to others. Through sketching the concepts of pictorial projections, section views, auxiliary views and dimensioning are taught. Once the foundation of engineering graphics is known, these concepts can be applied using computer aided design (CAD) software. AutoCAD is taught first. AutoCAD is a drawing software package used to create two dimensional engineering drawings.

**ENGR 201 – STATICS 3 (3, 0, 0)**

**Course Description (catalog):** The subject of Statics deals with forces acting on rigid bodies at rest covering coplanar and non-coplanar forces, concurrent and non-concurrent forces, friction forces, hydrostatic forces, centroid and moments of inertia. Much time will be spent finding resultant forces for a variety of force systems, as well as analyzing forces acting on bodies to find the reacting forces

supporting those bodies. This course also shows how to find the internal forces in structural elements and how to get the centroid and inertia for areas. Students will develop critical thinking skills necessary to formulate appropriate approaches to problem solutions. *Prerequisite: PHYS 140.*

**ENGR 202 - STRENGTH OF MATERIALS 3 (3, 0, 0)**

**Course Description (catalog):** The course covers strength of materials in depth including the followings: Basic Concepts in Strength of Materials, Direct Stress, Strain, Axial Deformation and Thermal Stress, Torsion, Transverse Shearing Forces, Bending Moments in Beams and Stress Due to Bending, Shearing Stresses in Beams, Combined Stresses and Pressure Vessels, Stress Transformations, Deflection of Beams, Columns. *Prerequisite: ENGR 201.*

**ENGR 203 – DYNAMIC 3 (3, 0, 0)**

**Course Description (catalog):** Fundamentals of particle and rigid body dynamics. Kinematics and kinetics of a single particle and system of particles. Application of Newton's laws and energy and moment principles in solving problems involving particles or rigid bodies in planar motion. Introduction to kinetics of rigid bodies in three dimensions, angular acceleration, angular momentum, instantaneous centre, mechanical vibrations of simple spring-mass systems. *Prerequisite: ENGR 201.*

**ENGR 206 - ELECTRIC CIRCUITS 3 (3, 0, 0)**

**Course Description (catalog):** Resistors, capacitors, inductors, currents; voltages; power and energy; circuit analysis techniques; DC and AC analysis; magnetic circuits and transformers; Introduction to DC and AC machines. *Prerequisite: PHYS 141.*

**ENGR 209 – STRENGTH OF MATERIALS LAB 1 (1, 0, 3)**

**Course Description (catalog):** Strength of materials lab contains several equipment that can be utilized to introduce the most important concepts of materials and its ability to withstand external loads without failure which is the base of machine and components design. On the other hand, strength of material lab will support student information in materials and its properties and strength of materials and types of loadings and types of stresses induced in members due to the loadings. The most important experiments in the field of strength of materials like tensile test, compression test, torsion test, Fatigue test, Hardness test, impact test, and creep test will be discussed. *Prerequisite: ENGR 202.*

**ENGR 307 – ENGINEERING ECONOMICS 3 (3, 0, 0)**

**Course Description (catalog):** The course covers the following topics: Engineering Economic Decisions; Understanding Financial Statements; Cost Concepts and Behaviors; Time is Money; Understanding Money and Its Management; Principles of Investing; Present Worth Analysis; Annual Equivalent Worth Analysis; Rate of Return Analysis; Depreciation; Taxes; Break-Even Analysis, Cost Estimation; Developing Project Cash Flows; Inflation; Replacement Decisions. *Prerequisite: ENGR 100.*

**ENGR 309 - FLUID MECHANICS 3 (3, 0, 0)**

**Course Description (catalog):** The course addresses flow classification, fluid properties, fluid in statics, pressure measurements, buoyancy, fluids in motion, continuity equation, pressure gradient in fluid flow, Bernoulli's, Reynold's transport theorem, momentum and energy equations, dimensional analysis and similitude, and an introduction to the hydrodynamic boundary layer. *Prerequisite: ENGR 203 & MATH 240.*

**ENGR 310 - NUMERICAL METHODS 3 (3, 0, 0)**

**Course Description (catalog):** Introduction to Numerical Methods, Solution of Nonlinear Equations, Solution of Simultaneous Linear Algebraic Equations, Solution of Matrix Eigenvalue Problem, Curve Fitting and Interpolation, Numerical Differentiation, Numerical Integration, Ordinary Differential Equations: Initial-Value Problems, Ordinary Differential Equations: Boundary-Value Problems. *Prerequisite: MATH 240, CS 204, & ENGR 105.*

**ENGR 312 – FLUID MECHANICS LAB 1 (0, 0, 3)**

**Course Description (catalog):** Conduct experiments to understand the basic concepts of fluid mechanics such as Hydrostatic Bench, Orifice and Jet Flow Apparatus, Bernoulli's Theorem Apparatus, Impact of Jet Apparatus, Piping Loss Test Panel, Open Circuit Wind Tunnel, Pump Test Set, Turbine Service Unit, Series/ Parallel Pumps, Variable Slope Channel. *Prerequisite: ENGR 309.*

**ENGR 399 - ENGINEERING TRAINING 0 (0, 0, 0)**

**Course Description (catalog):** All engineering students are required to undergo a comprehensive "Engineering Training Program" with a reputable and specialized industrial firm. The firm can be in or outside Saudi Arabia relevant to his major area of interest in engineering analysis, design, or construction. The main purpose of this summer training is to enhance the students' practical experience and career abilities. Also, it deepens their engineering knowledge acquired during their academic years in the field of practical experience in real-life engineering projects. Additionally, such a program improves the relationship between the College of Engineering and the governmental and private industrial firms. Also, it can provide the industry with well-trained professionals in the near future. The qualifying student should spend at least eight weeks in a governmental organization, a reputable industrial firm, or a research center that is involved with engineering activities. Two months of full time training. *Prerequisite: ENG 137 & (Level 7 or above).*

**ME 202 – THERMODYNAMICS I 3 (3, 0, 0)**

**Course Description (catalog):** Thermodynamics concepts and definitions, states, properties, systems, control volume, processes, cycles, units, tables of properties, work and heat, first law, internal energy and enthalpy, conservation of mass, steady-state and uniform state processes, second law, reversible processes, entropy, Clausius inequality, principle of the increase of entropy, efficiencies, irreversibility

and availability, power and refrigeration cycles. *Prerequisite:* CHEM 140, PHYS 141, & MATH 145.

**CEE 101 – GEOLOGY 3 (3, 0, 0)**

**Course Description (catalog):** The course provides sufficient knowledge of qualitative and quantitative description of soils and rock masses with emphasis on the physical properties as well as the geological processes, e.g., weathering, erosion, plate tectonics, earthquakes, groundwater flow, land subsidence etc. On the other hand, the basic concepts of structural geology are focused to some extent by considering the basics of geological mapping. The course provides an introduction of engineering geology with the purpose of making an understanding that how the geology influences the design and construction of engineering project. It also establishes a good understanding about the geological and geophysical techniques for site investigation process.

**CEE 272 – SURVEYING AND GPS 3 (2, 1, 3)**

**Course Description (catalog):** An introduction to surveying, which includes surveying terminology, distance and area measurement, coordinate systems, surveying techniques, equipment use, theory of errors, tape measurements, leveling, theodolite, traverse surveying, topographic surveys, highway curves, control survey and land survey. Introduction to reference systems; types of GPS observable; basic principles of GPS operations; GPS error analysis; field procedures; data collection, processing; applications. Emphasis is placed on use of the hand compass and GPS receivers. Designing and conducting experiments as well as to analyze and interpret data through conducting several field experiments ranging from distance measurements to topographic mapping. *Prerequisite:* MATH 144 & ENGR 106.

**CEE 281 – CONSTRUCTION MATERIALS LAB 1 (0, 0, 3)**

**Course Description (catalog):** This course is designed to provide civil engineering students fundamental principles of the behavior, physical and engineering properties of various common civil engineering materials, including, sands, aggregates, cement, and concrete. Selection and design of materials based on their intended use in design and construction are emphasized. The laboratory sections are designed to provide students a hand-on experience on concrete mix design which includes proportioning, mixing, casting, and concrete testing concepts and procedures. Written reports and oral presentation of experimental results will be required. *Co-requisite:* CEE 282.

**CEE 282 – CONSTRUCTION MATERIALS 3 (3, 0, 0)**

**Course Description (catalog):** This is an elementary course designed for undergraduate students of civil engineering. The course covers introduction to structures and properties of civil engineering materials such as cement, aggregates, concrete, asphalt, geological materials, steel, polymers, and wood. The properties range from elastic, plastic and fracture properties to porosity and thermal and environmental responses. *Prerequisite:* CHEM 140 & CEE 101. *Co-requisite:* CEE 281, & ENGR 202.

**CEE 309 – INTRODUCTION TO PROBABILITY & STATISTICS 2 (2, 0, 0)**

**Course Description (catalog):** This is a basic study of probability and statistical theory with emphasis on engineering applications. Students become knowledgeable of the collection, processing, analysis, and interpretation of numerical data. They learn the basic concepts of probability theory and statistical inference, and become aware of techniques of statistical design. Topics include elementary principles and applications of descriptive statistics, counting principles, elementary probability principles, probability distributions, estimation of parameters, hypothesis testing, linear regression and correlation, and Analysis of Variance. The primary goal of this online course is to become familiar and experienced with topics of probability and statistics. *Prerequisite:* MATH 145.

**CEE 310- STRUCTURAL ANALYSIS 3 (3, 0, 0)**

**Course Description (catalog):** This is an elementary structural analysis course designed for undergraduate students of civil engineering. The course covers basic principles and methods of structural analysis including the followings: Types of structures, structural systems, structural elements and loadings, Analysis and Design codes, densities of materials, estimation of loads, tributary areas for live loads, Determinate and indeterminate structures, stability in structures, Analysis of determinate structures to calculate reactions, Principle of superposition, Trusses, Internal loadings, Influence line diagrams, Maximum and absolute maximum values of functions, Deformations using double integration method, moment-area theorems, conjugate-beam method, method of virtual work, and method of least work, Analysis of indeterminate structures by Force method, Slope-deflection method, and Moment-distribution method, Analysis software SABLE and SAP2000. This course also gives a brief introduction of difference between analysis and design, and application of structural analysis in structural design. Students also participate in a group or individual project related to analysis of real structures. *Prerequisite:* ENGR 202 & MATH 244.

**CEE 330 – REINFORCED CONCRETE DESIGN 3 (3, 0, 0)**

**Course Description (catalog):** This course is designed for undergraduate students. The objective of this course is to develop an understanding of the fundamental behavior and design of reinforced concrete structures. Students will become familiar with using the ACI 318 – Building Code Requirements for Structural Concrete. Students will learn about the application of concrete materials, and mechanics in the construction of civil structures, and to develop problem solving and engineering judgment skills. Specific areas to be covered include: materials for reinforced concrete, structural safety and design philosophy considering provisions of the ACI Code, behavior and design of reinforced concrete members under axial compression and bending (columns), under flexure and transverse shear (beams and one-way slabs), continuous beams and slabs using ACI moment and shear coefficients. *Prerequisite:* CEE 282 & CEE 310.

**CEE 335 - HYDROLOGY 3 (3, 0, 0)**

**Course Description (catalog):** A study of water properties, occurrence, distribution, and movement and their relationship with the environment within each phase of the hydrological cycle. The course also examines water quantity and quality issues, and water management policies. Concepts include watershed analysis, precipitation, infiltration, evaporation, runoff, detention, hydrograph routing, groundwater flow, and management. Three one hour lectures per week. *Prerequisite:* ENGR 309.

**CEE 340 – HIGHWAY ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** The course covers requirements engineering in depth including the followings: Introduction of transportation engineering, basic elements of transportation engineering and their characteristics, Introduction to Pavement, different types of pavements, material consideration in pavement design (Properties, Environmental Effects and Evaluation), traffic load analysis, load equivalency factor concept, tire-pavement contact area concept, stress-strain analysis of flexible and rigid pavements, flexible pavement design, rigid pavement design, highway maintenance and rehabilitation, flexible pavement distresses and their repair techniques, highway drainage facility, introduction to Marshal mix design method and SuperPave Volumetric design method. *Prerequisite:* CEE 272 & CEE 282. *Co-requisite:* CEE 341.

**CEE 341 – HIGHWAY ENGINEERING LAB 1 (0, 0, 3)**

**Course Description (catalog):** The course covers requirements engineering in depth including the followings: Introduction to Performance Grade (PG) specifications and SuperPave mix design, hands-on testing on SuperPave equipment, determination of the rheological properties of Bitumen using SuperPave equipment, Evaluation of Hot Mix Asphalt (HMA) using SuperPave equipment. *Co-requisite:* CEE 340.

**CEE 345 – CONSTRUCTION MANAGEMENT 3 (3, 0, 0)**

**Course Description (catalog):** The course covers construction management in depth including the followings: Basic concepts and terminology, Construction versus manufacturing processes, Construction industry and its structure, Contract type and bid package, Prequalification and award of contract, Issues during construction phase, Contract agreement, Change orders, Liquidated damages, Progress payments, Acceptance and final payment, Legal structure of organizations, Developing the work breakdown structure (WBS), Work packages, Cost control related to WBS, Estimating activity duration, Bar charts, Activity precedence diagrams, Critical path method, Activity floats, Relationship scheduling computations, Program evaluation and review techniques (PERT) network, Linear construction operations, Production curves, Cash flows, Project funding, Project cost control systems, Cost accounts, Cost coding systems, Material management process, Ordering material and approval process, Need for safe work practices, and Safety management system will be discussed. *Co-requisite:* CEE 330.

**CEE 350- ENVIRONMENTAL ENGINEERING 3 (2, 0, 3)**

**Course Description (catalog):** This course is designed to introduce the student to the principles of environmental engineering. Topics include environmental chemistry, materials and energy balances, water quality management, water treatment, wastewater treatment, and air pollution. Weekly experiments carried out through the course, include water quality measurements such as dissolve oxygen measurement, pH and EC measurement, total solid measurement determination of biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), nitrogen, phosphorus, hardness, turbidity, alkalinity, etc. Two one hour lectures and three hours lab per week. *Prerequisite:* CHEM 142 & ENGR 309.

**CEE 360 – GEOTECHNICAL ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** This course covers geology and origin of geomaterials, index and classification of soils, clay minerals and soil structure, water flow in soils (one and two dimensional water flow), geotextile filter design, soil stresses, compaction and stabilizing of soils, distribution of stresses in soil due to external loads, consolidation and consolidation settlement, shear strength of soils, stability of slope. *Prerequisite:* ENGR 202 & CEE 282. *Co-requisite:* ENGR 309 & CEE 361.

**CEE 361 – GEOTECHNICAL ENGINEERING LAB 1 (0, 0, 3)**

**Course Description (catalog):** Perform tests for soil samples in the following properties Index and classification of soil, soil stresses, soil compaction, consolidation and consolidation settlement, shear strength of soils. The course was provide laboratory and field practice to the civil engineering students on performing some of soil mechanics tests that are necessary to classify, stabilize, and obtain the engineering properties of soil. Water content determination, liquid and plastic limit, shrinkage limit, grain size distribution (sieve analysis), hydrometer analysis, compaction, in-situ field density, constant and falling head permeability tests, unconfined compression test, and direct shear test. *Co-requisite:* CEE 360.

**CEE 390 – CIVIL ENGINEERING DRAWINGS 1 (0, 0, 3)**

**Course Description (catalog):** This course is designed to provide civil engineering undergraduates with basic understanding of the theory and practice of civil engineering drawings. Students will learn to read and construct blueprints and working drawings by means of lectures, discussion of drawing, examples related to existing buildings or projects and CAD practice. Topics will include basic fundamentals of graphics and drafting principles, Auto-Cad fundamentals, RCC and steel structural drawings, Geotechnical drawings, Transportation drawings, and Hydraulic structure drawings. *Prerequisite:* ENGR 106.

**CEE 410 – ADVANCED STRUCTURAL ANALYSIS 3 (3, 0, 0)**

**Course Description (catalog):** This course covers advanced methods of structural analysis for indeterminate structures in depth including the followings: Theory and application of structural analysis, Degree of indeterminacy, Equilibrium and

compatibility, Stiffness and flexibility methods of analysis, Application of deflection methods in force method, Influence lines for indeterminate structures: beams, frames, and trusses, Approximate methods of analysis, Moment distribution method: beams and frames with and without sway having vertical and sloping legs, Method of successive corrections: multi-storey frames having side-sway, Matrix method of analysis with emphasis on the direct stiffness method, Use of computer programs in structural analysis, Modeling of two- and three-dimensional. This course gives also a brief introduction of application of structural analysis in design. Students also participate in a group or individual project on analysis of real structures using hand calculations and verification by commercially available computer based software such as SAP2000. *Prerequisite: CEE 310.*

### **CEE 411- TRANSPORTATION ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** This course provides an introduction to transportation engineering and traffic analysis. Topics covered include an introduction to the significance of highway transportation to the social and economic underpinnings of society, transportation planning, road vehicle performance, geometric design of highways, traffic flow characteristics, highway capacity and level of service analysis, traffic control and analysis at signalized intersections, and travel demand and traffic forecasting. Introduction to railway and airport transportation systems. *Prerequisite: CEE 272 & CEE 309.*

### **CEE 427- FOUNDATION ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** Introduction, Soil mechanics review, Site investigation & subsurface exploration, bearing capacity of shallow foundation & foundation design, distribution of stresses in soils, mat foundations, settlement of shallow foundation, foundation on rock, pile foundations & group piles, lateral earth pressure and earth retaining structures, sheet pile walls, braced excavations. *Prerequisite: CEE 360. Co-requisite: CEE 330.*

### **CEE 430- STEEL DESIGN 3 (3, 0, 0)**

**Course Description (catalog):** This is an introductory steel design course designed for undergraduate students of civil engineering. The course covers basic principles and methods of steel structural analysis and design. At the beginning of this course, Instructor will give a refresher to the students about the types of structures, structural systems, structural elements, loadings, analysis and design codes, densities of materials, estimation of loads, and tributary areas for live loads. In depth, students will learn designing of steel structures by Allowable stress design method (ASD), and Load and Resistance Factor Design (LRFD) method of American Institute of Steel Construction (AISC). Main topics covered include introduction to steel structures; types of loads; factor of safety; design of tension members; design for fatigue; design of compression members; buckling; residual stresses; beam design; serviceability requirements (deflection control); beam-column design; bolted and welded connections; plate girder; stiffness design of plate girder; design of a truss. *Prerequisite: CEE 310*

### **CEE 436- BRIDGE ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** This course is designed for undergraduate students. Bridge Engineering is one of the most important area of Civil Engineering. The objective of this course is to develop an understanding of the fundamentals of bridge design and construction. Different bridge types and various step of bridge construction ranging from initial site selection to final construction of bridges. Students are also introduced with American Association of State Highway Transportation Officials (AASHTO). Students will learn about the application of these specification for the design of concrete and steel bridges which will also improve their ability to problem solving and engineering judgment skills. Specific areas to be covered include: Bridge types, materials for construction, design philosophy, load calculation, load distribution, analysis and design of Slab Bridge, T-beam Bridge and Truss Bridge. Students will also be introduced to computer aided modelling of these bridges using SAP 2000. *Prerequisite: CEE 330.*

### **CEE 439 – FINITE ELEMENT METHOD 3 (3, 0, 0)**

**Course Description (catalog):** This is an introductory course designed for undergraduate students of civil engineering. The course teaches basic fundamentals of the finite element methods (FEM), apprise the students about the finite element techniques, covers mathematical background of the FEM, and teaches how typical commercial Finite Element Analysis (FEA) software works to solve engineering problems. Beginning with a refresher to the students about the matrix algebra, one-dimensional problem, continuing to two- dimensional and three-dimensional elements, and ending with different application areas in various fields of engineering. However, major emphasis will be on the solution of problems related to Civil Engineering. *Prerequisite: CEE 310, CS 204, & MATH 246.*

### **CEE 451 - WATER SUPPLY AND SEWERAGE SYSTEMS 3 (3, 0, 0)**

**Course Description (catalog):** This course aims to provide basic description and understanding of the water and sewerage distribution system. This will include coverage of the scientific basis of both the distribution systems as well as the conventional approach to their engineering design. The course will highlight quantification of water, wastewater and storm water, hydraulics, design of water supply system, design of sanitary and storm sewer systems, appurtenances of water, sanitary and storm networks, application of computer programs for design of water networks, and sewer construction and maintenance. *Prerequisite: CEE 335.*

### **CEE 452 – AIR POLLUTION 3 (3, 0, 0)**

**Course Description (catalog):** This is an introductory course to air pollution covering a wide range of topics. In this course, students will learn effects of air pollutants on human beings and environment, what their sources are, and their physical and chemical behavior in the atmosphere. Also, students will get exposed to a wide range of control technologies and future trends towards preventing air pollution. Also, this course covers industrial, agricultural and municipal contributions to acid rain, smog, and toxic air pollutants. Students will demonstrate skills in the use of mathematical and computer predictions for the fate of air

pollutants, in the design of air pollution control systems. The student, upon completion of this course, should have a knowledge of which air pollutants are of concern, their source, fate, atmospheric transport and transformation and policies developed to help manage the problem. Students will demonstrate skill in the use of mathematical and computer predictions for the fate of air pollutants, in the design of air pollution control systems. *Prerequisite: CEE 350.*

### **CEE 453 – SOLID WASTE MANAGEMENT 3 (3, 0, 0)**

**Course Description (catalog):** This course is designed for students in Civil and Environmental Engineering to give the student fundamentals of municipal solid waste management including collection, transfer, transport, and disposal. Methods of processing, basic disposal facilities, disposal options, and the economic and environmental issues of solid waste management will be covered in this course. In addition, this course provides the student with relevant information about municipal solid waste reduction and recycling systems including technology, communications, and financial aspects. Topics include: the basis and impact of the 3 Rs on waste management systems, industry examples, recycling and recovery of paper, cardboard, metals, plastic, oil, glass, and other commodities, new uses of recycling and recovery, the basics of composting and other organic waste management methods, and design of plants for disposal. *Prerequisite: CEE 350.*

### **CEE 460- ROCK MECHANICS & UNDERGROUND STRUCTURES 3 (3, 0, 0)**

**Course Description (catalog):** This introductory course explores the nature of rocks and rock masses as construction, foundation, or engineering materials. Topics covered include: Physical properties and classifications of intact rocks; stresses and strains; mechanical properties of rocks and rock masses; applications of theory of elasticity in rock mechanics; visco-elasticity; rock discontinuities; *in situ* stresses and stress measurements; rock slope engineering, Foundation on rocks, and underground excavations in rock. *Prerequisite: CEE 360.*

### **CEE 462 – ADVANCED CONCRETE DESIGN 3 (3, 0, 0)**

**Course Description (catalog):** This course is designed for undergraduate students. Concrete design is one of the most important area of Civil Engineering. The objective of this course is to develop an understanding of the concrete design and construction problems. Design of different structural components such as columns, slabs, foundation and retaining walls would be tough in depth. Students would also learn computer aided modelling of these components as isolated members and as an assembly in the form of multi-storey concrete structure. Students are also introduced with American design codes such as American Concrete Institute ACI-318-11, Uniform Building Code UBC-97 and ASCE-07 Minimum design loads. Students will learn about the application of these specifications for the design of concrete structures, which will also improve their ability to problem solving and engineering judgment skills. Specific areas to be covered include design of slender columns, design of two-way slab, retaining walls and design of construction form work. Students will also be introduced to computer aided modelling of these structures using state of the art computer program such as SAP, ETABS and SAFE. *Prerequisite: CEE 330.*

### **CEE 470 – CONTRACTS AND SPECIFICATIONS 2 (2, 0, 0)**

**Course Description (catalog):** The course covers contracts and specifications in depth including the following: Project delivery methods, contract management, Role of engineering professional societies and engineering code of ethics, Forming engineering and construction contracts, Contract administration models, Engineering design contracts, Construction contracts, Duties and responsibilities of the Architects and Engineers, Performance and breach of contract, Ways to terminate contracts, Specifications and their types, Standard specifications, Technical standards, Government construction contracts, Bonding requirements and types, Change orders, Construction claims and management, Dispute resolutions methods, Contract negotiations, Contract mediation, Arbitration, Litigation, Dispute review boards, and ADR methods will be discussed. *Co-requisite: CEE 330.*

### **CEE 472 – APPLICATIONS OF GIS IN CIVIL ENGINEERING 3 (1, 0, 6)**

**Course Description (catalog):** This course covers fundamental concepts underlying computerized geographic information systems (GIS) at an introductory and intermediate level, and its applications for Civil Engineering. It combines an overview of the general principles of GIS with a theoretical view of and analytical use of spatial information. The practical component of the course gives students hands-on experience with the latest ArcGIS software and focuses on data modeling, and management, and creating solutions to problems in civil engineering applications; usually three to five problem-solving tasks will be assigned at the end of each lecture. *Prerequisite: CEE 272 & (7<sup>th</sup> level or above).*

### **CEE 480– ADVANCED CONCRETE TECHNOLOGY 3 (3, 0, 0)**

**Course Description (catalog):** This course provides a comprehensive understanding of the materials and civil engineering principles that result in the production and construction of high quality concrete, through the study of mixture proportioning with and without pozzolanic materials, aggregate testing, concrete testing, effects of admixtures, non-destructive testing, and durability issues. It covers the aspects of design and performance assessment of various cement-based materials, including normal and high strength concrete, as well as special cement composites. Other topics include properties of concrete in fresh and hardened states, strength and fracture, volume changes due to creep, shrinkage, and thermal dilation, transport of heat, moisture and ions, and durability against corrosion, freezing and thawing, and alkali-aggregate reaction. *Prerequisite: CEE 330.*

### **CEE 485 – SPECIAL TOPICS IN CIVIL ENGINEERING 3 (3, 0, 0)**

**Course Description (catalog):** In this course an in-depth study of some civil engineering subjects will be conducted. The content of the course will be in different areas of interest in civil engineering aiming to enhance knowledge and understanding of the student in the selected area. Areas of interest include Construction Engineering, Geotechnical Engineering, Structures and Mechanics, Transportation Engineering, and Water Resources and Environmental Engineering.

The specific content of the course offerings can vary from semester to semester and will be provided before the start of early registration for the semester in which the course is offered. *Prerequisite: 7<sup>th</sup> level or above.*

**CEE 486 – UNDERGRADUATE RESEARCH 3 (3, 0, 0)**

**Course Description (catalog):** This course covers in depth undergraduate research in civil engineering including the followings: student integrity, forbids cheating, fabrication, multiple submissions of academic work, plagiarism, academic research, presenting results, editing and reviewing. Students to know how to write a report including project title, abstract, description, objectives and constraints, data and assumption; design alternatives, expected conclusions and recommendations. The course includes project selection, conceptual design, data collection, identification of real-life constraints, possible design alternatives, and preparation of a work plan for implementing and completing the project. The course provides the student with an opportunity to prepare a research proposal under the guidance of the instructor. The students have to orally present the project. Students with a high GPA should take this course. *Prerequisite: 7<sup>th</sup> level or above.*

**CEE 488 – ADVANCED ASPHALT MATERIALS 3 (3, 0, 0)**

**Course Description (catalog):** This course provides an introduction to the advancement in asphalt materials. Topics covered include an introduction to the significance of materials used in highway construction, types of asphalt/bitumen and advances in bitumen technology to increase the pavement life, types and characteristics of bitumen modifiers, SuperPave binder testing and mix design. *Prerequisite: CEE 340 & CEE 341.*

**CEE 493 – ESTIMATING CONSTRUCTION COSTS 3 (3, 0, 0)**

**Course Description (catalog):** The course covers quantity surveying and estimation in construction including the followings: Types of estimates, Quantity surveying, Contract documents, Bonds and insurance, Project manual, Workup sheets and summary sheet, Computers in estimating, Overhead and contingencies, Labour hours and productivity, Labour burden, Pricing labour, Equipment operating and ownership costs, Rental and mobilization costs, Calculating excavation for new site grades and rough grading, Cross-section method, Average end area method, Perimeter and area, Topsoil removal, General and special excavation, Backfilling, Rock excavation, Asphalt paving, Estimating concrete and reinforcing, Estimating masonry, Concrete masonry, Estimating tile, Estimating wood, Doors and windows, Electrical works, Plumbing work, and HVAC work will be discussed. *Prerequisite: CEE 282. Co-requisite: CEE 390.*

**CEE 494 – SAFETY AND RISK MANAGEMENT IN CONSTRUCTION 3 (3, 0, 0)**

**Course Description (catalog):** This course covers in depth safety and risk management in construction including the followings: Construction accidents and injuries, Cost of construction worker injuries, OSHA, Problem areas in construction safety, Job-site safety assessment, Safety meetings, Safety in construction contracts, Subcontractor safety, Elements of an effective safety program, Safety Management and Safety Culture, Risk and uncertainty in projects, Risk and opportunity identification, Risk and opportunity analysis, Risk response, Developing and implementing a successful risk and opportunity management system, Risk allocation and liability sharing in construction. *Prerequisite: ENGR 307 & CEE 345.*

**CEE 495 – SENIOR DESIGN I 2 (1, 0, 3)**

**Course Description (catalog):** This is the first phase of the senior design project that is a continual project comprise of two semesters. It involves a group of students, where numbers of students in the group are selected based on the type of the assigned project. Students are required to work as a team tackling different aspects of the civil engineering works in an efficient manner. This phase mainly introduces policies, identifying problems, statement formulation, knowledge of ethical responsibilities, and conceptual design. It also includes project selection, conceptual design evaluation, data collection, identification of real-life constraints (e.g. economy, environmental, global, and contemporary issues), generation of possible design alternatives considering client needs, selection of the preferred alternative, and preparation of a work plan for implementing and completing the project. All work conducted during the semester must be compiled in a final report and orally presented to the examining committee which is comprised of project advisor, departmental faculty and senior design coordinator. *Prerequisite: ENGR 307 & (Level 7 or above).*

**CEE 496- SENIOR DESIGN II 2 (1, 0, 3)**

**Course Description (catalog):** This is the second and final phase of the senior design project, where students are required to implement their plan, devised at senior design-I level. It includes designing a system, component, or process to meet set objectives. Students mainly carry out design calculations and use of experimental tools to design, and or do data analysis for the preferred alternative. The final report to be submitted by the team includes project title, description, objectives and constraints, data and assumption; design alternatives and analyses, details of preferred design along with pertinent drawings, abstract, conclusions and recommendations. In addition, the student team should orally present the project to the examining committee. *Prerequisite: CEE 495.*