Course Description

Materials Engineering Program Courses Description (catalog)

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**.** Two hours lecture per week.

Eng 134 – English Composition II
2(2, 0, 0)
Course Description (catalog): This course develops writing skills from the paragraph level to the level of the essay. It concentrates on the essential form and function of the writing unit (paragraph or essay) in order to prepare the ground for the academic essay. Specific types of composition are practiced: chronological, cause-effect, comparison/contrast and argumentation. In addition, work on paraphrase and summarizing is undertaken, along with back-up work in some specific structure areas. Two hours lecture per week. 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 hours lecture per week. Prerequisite: Eng 134

Eng 138 – Fundamental 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. Two one-hour lecture periods per week.
Co-requisite: Eng 134

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. Four one-hour lecture periods per week.

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**.** Four one-hour lecture periods per week. Prerequisite: Math 144**.**

Phys 140 – General Physics I
3(3, 0, 0)
Course Description (catalog): 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**.** Three one-hour lecture periods per week. Co-requisite: Math 144.

Phys 141 – General Physics II
3(3, 0, 0)
Course Description (catalog): 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. Three one-hour lecture periods per week. Prerequisite: Phys 140

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. Three hours lab per week. 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**.** Three hours lab per week. 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 Th., Liquids and Solids. Three one-hour lecture periods per week.

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**.** Three one-hour lecture periods per week. Prerequisite: Chem 140

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 complexometric titrations, hardness of water and its determination**.** Three hours lab per week. 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-hour lecture per week.

Engr 105-Engineering Computing Skills
2(2, 0, 0)
Course Description (catalog): Problem solving skills and computing using Matlab. Prerequisite: Engr 100, Co-requisite: Math 145.

Engr 106–Engineering Graphics
2(1-3-0)
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: drafting (sketching) and CAD. 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 a drawing software package used to create two-dimensional engineering drawings. Two hours lab/tutorial per week.

Engr 202- Strength of Materials
3 (3, 0, 0)
Course Description (Catalog): Basic Concepts in Strength of Materials, Direct Stress, Axial Deformation and Thermal Stress, Torsion, Shearing Forces and Bending Moments in Beams, Stress Due to Bending, Shearing Stresses in Beams, Combined Stresses, Deflection of Beams, Columns, Pressure Vessels. Prerequisite: Engr 223

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

Engr 205- Materials Science
3(3, 0, 0)
Course Description (Catalog): Mechanical, electrical and chemical properties of engineering materials, fundamentals of crystallography, crystal defects, Impurities and imperfections in solids. Atomic diffusion. Single-phase metals and alloys; elastic and plastic deformation, recrystallization and grain growth. Multi-phase materials; phase diagrams and equilibrium microstructural development, Heat treatment process, Studies of the widely used engineering metals, alloys, polymers, composites & ceramics. Prerequisite: Chem 142

Engr 206-Electric Circuits
3(3, 0, 0)
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

MAE 206-Organic & Biomaterials Chemistry
3(3, 0, 0)
Course Description (Catalog): Introduction to biomaterials, biological response to biomaterials, types of biomaterials (Metals, Ceramics ,Polymers), naturally-derived vs. synthetic polymers, important properties of biomaterials (degradative, surface and bulk properties of biomaterials), characterization techniques, principles of chemistry (bonding and structure of biomaterials), Alkanes and Cycloalkanes, Alkenes and Alkynes Aromatic Compounds, Classification of Polymers, Chain-Growth Polymerization, Polyacetylene and Conducting Polymers, Step-Growth Polymerization, Polyurethanes and Other Step-Growth Polymers. Prerequisite: Chem 142

Engr 209- Strength of Materials Lab
1(0, 0, 3)
Course Description (Catalog): Strength of materials lab contains many 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 materials lab will support student information in materials and its properties and strength of materials and types of loading and types of stresses induced in members due to this 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. Co-requisite: Engr 202

Engr 223-Engineering Mechanics
3(3, 0, 0)
Course Description (Catalog): Engineering Mechanics, covering both statics and dynamics. Topics include vector algebra, force systems, free-body diagrams, equilibrium of particles and rigid bodies, kinematics of particles and rigid bodies, Newton's laws applied to particles and rigid bodies, friction. Prerequisite: Math 145 & Phys 140.

Mgt 292-Management fundamental & Skills
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 240 -Differential 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.

Deic 301-Contemporary Culture 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. Student is required to memorize part of the holy Quran.

Engr 303-Thermo Fluids
3 (3, 0, 0)
Course Description (Catalog): Basic concepts of thermodynamics, properties of pure substances, energy transfer by heat, work, and mass, first and second laws of thermodynamics, basic principles and concepts

of fluid mechanics including fluid statics, momentum analysis of flow structures, Bernoulli and energy equations, flow in pipes, basic principles of heat transfer including modes of heat transfer, steady heat transfer. Prerequisite: Phys 140 & Chem 142

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 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 Eigenvalues 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

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.

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(s): Department Approval

MAE 304-Thermodynamics of Materials
3(3, 0, 0)
Course Description (Catalog): Basic knowledge of chemical thermodynamics and thermal behavior of materials, introduction and definition of thermodynamics terms, laws of thermodynamics and their consequences, statistical interpretation of entropy, auxiliary functions, mass and energy balances, phase equilibrium in a one-component system, behavior of gases, behavior of solutions, Gibbs free energy-composition and phase diagrams of binary systems, gas reactions and reactions involving pure condensed phases and gaseous phase, reaction equilibria in systems containing components in condensed solutions, phase diagrams for binary systems and electrochemistry.

MAE 315-Mechanical Behavior of Materials
3(3, 0, 0)
Course Description (Catalog): Comprehensive treatment of the principles of the mechanical behaviour of materials. It focuses on the relationship between macroscopic properties, materials microstructure and fundamental concepts of bonding and crystal structure, which covers structural deformation in materials, mechanical testing, yielding and fracture, stress-strain analysis, fatigue, plastic deformation, creep and damping. Prerequisite: Engr 202

MAE 316-Materials Lab I
1(0, 0, 3)
Course Description (Catalog): Mechanical testing; tensile testing, impact testing and hardness. Heat treatment and microstructures; annealing, quenching and tempering of steel. Crystallography and X-ray diffraction; phase identification. Temperature measurement and Calorimetric Physical property measurement, Co-requisite: MAE 330

MAE 320-Transport Phenomena in Materials
3(3, 0, 0)
Course Description (Catalog): Explanation and Common applications of the fundamentals governing fluid flow and the transport of heat and mass to specific systems in materials engineering. Engineering Units and Pressure in Static Fluids, Momentum Transport and Laminar Flow of Newtonian Fluids, Equations of Continuity and Conservation of Momentum and Fluid Flow Past Submerged Objects, Turbulent Flow, Mechanical Energy Balance and Its Application to Fluid Flow, Transport of Heat by Conduction, Transport of Heat by Convection, Transient Heat Flow, Heat Transport by Thermal Radiation, Mass Transport in the Solid State by Diffusion, Mass Transport in Fluids. Prerequisite: MAE 350

MAE 325-Metals & Alloys
3(3, 0, 0)
Course Description (Catalog): An introduction to the structure of metals and alloys in the solid state. Description of the metals and alloys processing fundamentals (solidification, deformation, diffusion). Review of the commercial metallic alloys (steels, cast irons, aluminum and magnesium alloys) production, properties and uses. Study of the influence of structure, chemistry, and processing upon the properties of metals. Alloy selection procedure. Description of mechanical, electrical, thermal and chemical characteristics of ferrous and nonferrous alloys. Prerequisite: MAE 315

MAE 330-Characterizations of Materials
3(3, 0, 0)
Course Description (Catalog): Comprehensive up-to-date coverage of materials characterization techniques including computational and theoretical methods as well as optical metallography, quantitative image analysis, crystallography, mechanical testing, electron microscopy, thermal analysis, X-Ray diffraction, optical imaging and spectroscopy. Prerequisite: Engr 205

MAE 340-Physical Metallurgy
3(3, 0, 0)
Course Description (Catalog): Structure of Metals, Characterization Techniques, Crystal Binding, Introduction to Dislocations, Dislocations and Plastic Deformation, Elements of Grain Boundaries, Vacancies, Annealing, Solid Solutions, Phases, Binary Phase Diagrams, Diffusion in Substitutional Solid Solutions, Interstitial, Solidification of Metals, Nucleation and Growth Kinetics, Precipitation Hardening, Deformation Twinning and Martensite Reactions, The Iron-Carbon Alloy System, The Hardening of Steel, Selected Nonferrous Alloy Systems, Failure of Metals. Prerequisite: MAE 330

MAE 341-Materials Lab II
1(0, 0, 3)
Course Description (Catalog): Sample preparation for materials characterization techniques including various types of microscopy, spectroscopy, diffraction, and hardness testing. Instruction in the use of heat-treating equipment and polishing and chemical etching procedures**.** Three hours lab per week. Prerequisite: MAE 316

MAE 350-Materials Processing
3(3, 0, 0)
Course Description (Catalog): Classical chemical thermodynamics as applied to single and multicomponent materials systems. Topics include heat and mass balance, enthalpy, entropy, free energy, chemical reactions and equilibria, mass action, solution thermodynamics, phase diagram, stability/Pourbaix diagrams and electrochemistry. Fundamental theories and equations governing transport phenomena. Topics include fluid flow, heat flow, diffusion, and chemical kinetics. Prerequisite: MAE 304

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), Family problems and remedies (women's work, alimony, stewardship). Student is 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, State building blocks: homeland, society, authority, goals of state, foundations of state, 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.

MAE 415-Non Destructive Evaluation
3(3, 0, 0)
Course Description (Catalog): Covers nondestructive methods and their application to engineered structures and components: liquid penetrant; ultrasound testing; magnetic particle; eddy current; acoustic emission, radiology, active thermography; vibration, impact-echo, visual inspection, frequency response, microwave; optical methods, discussions of techniques and mathematical bases for methods involving mechanical, thermal, and electromagnetic phenomena; design for inspect- ability; technique selection criteria; information processing and handling; materials response measurement, modeling and signal analysis. Prerequisite: Engr 206 , MAE 315

MAE 416-Non Destructive Evaluation Lab
1(0, 0, 1)
Course Description (Catalog): Introduce effective strategies for maintenance services and systems based on the application of non-destructive evaluation methods. Familiarization of some commonly used non-destructive tests, their required instruments, set up and measurement techniques on real applications; such as X-ray inspection, Eddy current inspection, Ultrasonic inspection, Liquid penetrant inspection, Magnetic flux inspection and other conventional methods. Co requisite MAE 415

MAE 420-Phase Transformation and Kinetics
3(3, 0, 0)
Course Description (Catalog): Equilibrium, Binary Phase Diagrams, Computation of Phase Diagrams, Kinetics of Phase Transformations, Atomic Mechanisms of Diffusion, Interstitial Diffusion, Substitutional Diffusion, Tracer Diffusion in Binary Alloys, Diffusion in Ternary Alloys, Interfacial Free Energy, Solid-Vapor Interfaces, Boundaries in Single-Phase Solids, Interface Migration, Nucleation in Pure Metals, Growth of a Pure Solid, Alloy Solidification, Solidification of Ingots and Castings, Nucleation, Precipitation, Transformation Kinetics—TTT Diagrams, Characteristics of Diffusionless Transformations and Martensite Crystallography. Prerequisite: MAE 304

MAE 430-Polymer science and Technology

3(3, 0, 0)
Course Description (Catalog): Introduction to polymer Science, polymer synthesis, confirmation, solutions, and molecular weight, solid-state properties, viscoelasticity and rubber elasticity, polymer degradation and the environment, additives, blends, and composites, biopolymers, natural Polymers, and Fibers, thermoplastics, elastomers, and thermosets, engineering and specialty polymers, polymer rheology and processing, polymers for advanced technologies. Prerequisite: MAE 206

MAE 460-Nanomaterial synthesis
3(3, 0, 0)
Course Description (Catalog): Comprehensive introduction to nanomaterials, properties, processing techniques and applications. Characterization of nanomaterials. Synthesis and Manipulating Materials in the Nanoscale, Fullerenes, Carbon Nanotubes, Self-Assembled Nanolayers, Gas-Phase Clusters, Semiconductor Quantum Dots, Monolayer-Protected Metal Nanoparticles, Core-Shell Nanoparticles, Nanoshells, Nanobiology, Nanosensors, Nanomedicines, Molecular Nanomachines, Nanotribology, Societal Implications, Chemical, physical, mechanical, and electrical properties of nanomaterials. Prerequisite: MAE 206, Co-requisite: MAE 475

MAE 465-Corrosion and Wear of Materials
3(3, 0, 0)
Course Description (Catalog): Electrochemical theory of corrosion. Corrosion kinetics and applications Mechanisms of corrosion, electrochemical reduction reactions, and environmentally assisted cracking (including stress corrosion cracking, corrosion fatigue, hydrogen-assisted cracking, and fretting corrosion). Methods of corrosion mitigation. Influenced Corrosion, Materials Selection, Testing, and Design Considerations. Monitoring of corrosion of engineered structures. Prerequisite: MAE 315

MAE 475-Composite Materials
3(3, 0, 0)
Course Description (Catalog): Structure, processing and properties of composite materials based on combinations of metals, ceramics, and polymers. Principles of composites and composite reinforcement. Fiber reinforced composites. Laminated composites. Role of fiber, matrix and fiber-matrix interface in composite behavior. Continuous and discontinuous fiber strengthening. Calculation of thermoelastic properties and strength. Tensile and compressive behavior. Fracture behavior and toughness. Corrosion and degradation of composites. Mechanical testing and applications of composite materials. Prerequisite: MAE 206

MAE 495-Senior Design I
2(2, 0, 0)
Course Description (Catalog): Planning, design, construction and/or management of an engineering project that handles contemporary engineering problems under the supervision of one or more faculty members. The course allows the student to apply the knowledge attained from the various courses of the undergraduate program to prepare the proper approach of solution to his project problem. Prerequisite: Senior standing in MAE. Prerequisite: MAE 350, Engr 307

MAE 496-Senior Design II
2(2, 0, 0)
Course Description (Catalog): Completion of Graduation Project I in planning, design, construction and/or management of an engineering project that handles contemporary engineering problems under the supervision of one or more faculty members. Similar to MAE 491 the course allows the student to apply the knowledge attained from the various courses of the undergraduate program to prepare the proper approach of solution and completion to his engineering project. Prerequisite: MAE 495

MAE 404-Ceramic Materials
3(3, 0, 0)
Course Description (Catalog): Classification of ceramic products with respect to their functions. Classical and modern Ceramics. Methods of ceramic production: Natural and synthetic raw materials, shaping methods, drying and firing of ceramic articles. Effect of processing on the development of microstructures and properties. Examples of ceramics selected from the major groups of triaxial white-wares, electrical ceramics, magnetic ceramics, refractories, cements and mortars, abrasives, glasses and glass ceramics. Prerequisite: MAE 330

MAE 407-Electronic, Optical, and Magnetic Prop of Materials
3(3, 0, 0)
Course Description (Catalog): Fundamental physical properties and description of different materials as well as new developments in the fields. Background necessary to understand how electrons and electromagnetic waves interact with materials. Topics include waves, bonding, phonons, bands, basics of semiconducting, metallic; dielectric/ferroelectric, optical, superconductors and magnetic materials properties, and how elementary devices made from these materials operate. Prerequisite: Engr 206

MAE 409- Welding and Joining Processes
3(3, 0, 0)
Course Description (Catalog): The physical principles of fusion welding; heat flow; thermal cycles; physical metallurgy and mechanical properties of welded joints; applications of welding to large structures; testing of welds; nondestructive testing; design, economics, and weld specifications; and workshop experiments in welding. Prerequisite: MAE 325

MAE 440- Metal Forming
3(3, 0, 0)
Course Description (Catalog): Deformation processing of metallic and nonmetallic materials; metal forming theory and practice, including forging, rolling, extrusion, drawing, sheet metal forming; techniques for analysis of deformation; mechanics of yielding. Prerequisite: MAE 315

MAE 472-Biomaterials
3(3, 0, 0)
Course Description (Catalog): Biomaterials and their physiological interactions. Materials used in medicine/dentistry: metals, ceramics, polymers, composites, resorbable, smart, natural materials. Materials used to mimic/replace body functions. Material response/degradation, mechanical breakdown, corrosion, dissolution, leaching, chemical degradation, wear, applications of the fundamental concepts of mechanics, elasticity, and plasticity to multiphase and composite materials Host responses: foreign body reactions, inflammation, wound healing, carcinogenicity, immunogenicity, toxicity, infection and systemic effects. Prerequisite: MAE 206

MAE 480-Glass Science and Technology
3(3, 0, 0)
Course Description (Catalog): Structure of glass. Glass formation. Nucleation and crystallization in glasses. Oxide and chalcogenide glasses. Glasses for various applications. Viscosity of glasses. Glass melting. Principles of glass working. Forming processes in glass technology. Stresses and stress relaxation in glass; annealing and tempering. Corrosion and weathering of glasses strengthening of glasses. Optical and elastic properties of glasses. Glass defects. Prerequisite: MAE 404

MAE 483-Materials Selection
3(3, 0, 0)
Course Description (Catalog): Introduction to the selection and design of materials for structural applications. Procedures for material selection in mechanical design, design of hybrid materials, environmental factors and industrial design. Prerequisite: MAE 315

MAE 485-Concrete Materials
3(3, 0, 0)
Course Description (Catalog): Examines the influence of constituent materials (cements, water, aggregates and admixtures) on the properties of fresh and hardened concrete, concrete mix design, handling and placement of concrete, and the behavior of concrete under various types of loading and environment. Laboratory exercises, which utilize standard concrete test methods, are an integral part of the course. A few field trips are held during scheduled laboratory sessions. Prerequisite: Engr 202

MAE 488-Asphalt Materials
3(3, 0, 0)
Course Description (Catalog): Properties and control testing of bituminous materials, aggregates for bituminous mixtures, and analysis and design of asphalt concrete and liquid asphalt cold mixtures; structural properties of bituminous mixes; surface treatment design; and recycling of mixtures. Prerequisite: MAE 485

MAE 408-Materials Processing Safety
3(3, 0, 0)
Course Description (Catalog): Safety Mathematics and Reliability Basics. Workplace Accidents and Safety. Safety Management and Control. Safety Analysis Methods and Techniques. Risk Management. Human Factors in Safety. Safety Costing. Maintenance Safety. Software Safety. Robot Safety. Safety in Health Care System. Prerequisite: Prerequisite: Senior Standing