Brief description of all courses including the number of credit hours and prerequisites.

Basic Applied Science Courses (BA)

BA 113 – Physics (1)

Cr.3. Prerequisite: None

Introduction to static electricity and Coulomb's law - Introduction to static electricity and coulomb's law - Electric field. - Electric potential. – Capacitors - Electric current, ohm's law resistors in series and parallel - Kirchhoff's rule - Introduction to theory of magnetism and different applications - Electromagnetic induction - Optics and waves (nature of light, properties of light waves) - Young's double slit 'polarization of light waves.

BA 114 – Physics II

Cr.3. Prerequisite: BA 113

Introduction to thermodynamics - Reversibility and reversible work - First law of thermodynamics' Non-flow equation - Steady flow equation - Working Fluid (steam, perfect gas) - Reversible processes.(constant volume, constant pressure, constant temperature, adiabatic) - Reversible process (polytropic) - Second law of thermodynamics - Heat transfer.

BA 118 - Chemistry

Cr.2. Prerequisite: None

Electrochemical reactions and cells, volumetric analysis (practical) - Principles of corrosion, titrate technique, determinate of acidity (practical) - Metals and corrosive environments, determinate of alkalinity and chloride (practical) - Forms of corrosion uniform, galvanic and differential aeration cell, determination of hardness (practical) - Pitting, stress corrosion cracking and intergranular corrosion forms, determination of dissolved oxygen (practical) - Atmospheric and erosion corrosion, spectrophotometer analysis (practical) - Coating and inhibitors as protection methods, determination of nitrite and nitrate (practical) - Cathodic protection, determination of phosphate and silica (practical) - Classification of fuel, properties of liquid fuel, determination of some heavy metals (practical) - Combustion of fuel, determination of fluorine and chlorine (practical) - air supply and exhaust gases, determination of turbidity (practical) - Classification of lubricants advantages and disadvantages of different types, oil analysis determination of viscosity and T.B.N (practical) - Properties of lubricants and additives, determination of insoluble and saltwater (practical) - Nature of impurities in water, soft and hard water effect of using impure water on boilers performance, determination of acidity and water content (practical) - Water treatment, determination of ph (practical) - Air and water pollution, determination of TDS and salinity(practical).

BA 123 – Mathematics (1)

Cr.3. Prerequisite: None

Basic techniques and rules of differentiation - Trigonometric function: properties, basic identities and their derivatives - Inverse of trigonometric and their derivatives - Logarithmic functions: their properties, basic identities and derivatives - Exponential functions: their properties, basic identities and derivatives - Derivative of hyperbolic functions and their inverse - Parametric differentiation and implicit differentiation - The Nth derivative - L' Hopital rule - Partial differentiation - Maclaurin's expansion. - Physical application - Curve sketching - Conic sections - General revision.

BA 124 – Mathematics II

Cr.3. Prerequisite: BA 123

Definition of indefinite integrals and table of famous integrals - Simple rules of integration and the fundamental theorem of calculus - Fundamental theorem of calculus and integration by parts - Integration by parts and integration of rational functions - Integration of rational functions - Integration of trigonometric powers - Trigonometric substitution and 7th week exam - Integration of quadratic forms and the reduction formulas - Definite integration - Area and volume - Area, volume and length of curve - Average of a function, numerical integration - Matrix Algebra - Solution of systems of linear equations.

BA 141 – Engineering Mechanics (1)

Cr.3. Prerequisite: None

Rectangular components of a force - Parallelogram law - Equilibrium of particle – springs and cables - Moment of force - Free body diagram - Equilibrium of rigid body - Trusses "joint method – zero – force members" - Trusses "method of section" – Frames – Friction - Mass Moment of Inertia - Virtual work.

BA 142 – Engineering mechanics II

Cr.3. Prerequisite: BA 141

Kinematics of a particle – Rectilinear Kinematics - Curvilinear Motion –Projectile Motion - Force & Acceleration (Kinetics) - Work & Energy of a particle (Kinetics) - Rotation of a Rigid Body about a fixed Axis - General Plan Motion - Relative Motion (Velocity) - Relative Motion (Acceleration) - Planar Kinetics of Rigid Body – Equation of Translation Motion - Equation of Rotational Motion - Equation of General Plane Motion - Work and Energy.

BA 223 – Mathematics III

Cr.3. Prerequisite: BA 124

Solving first order differential equations: Separable of variables and Homogeneous equation - Solving first order differential equations: Exact and Linear equations - Solving first order differential equations: Bernoulli's equation and revision on first order differential equations - Solving second order homogeneous differential equations with constant coefficients, method of undetermined coefficients - Solving second order non-homogeneous differential equations with constant coefficients, method of variation of parameters - Continue method of variation of parameters, solving second order differential equations with variable coefficients (Euler's equation), Laplace transform: Basic definition, First shifting theorem, Laplace transform: Transform differentiation and integration, Unit step function, second shifting theorem, and convolution theorem - Inverse Laplace transforms - Solving differential equations by using Laplace transform - Fourier series: Fourier series for functions of period 2P - Fourier series for even and odd functions - Fourier series for harmonic functions.

BA 224 – Mathematics IV

Cr.3. Prerequisite: BA 223

Vector Algebra / Dot and cross product and Applications - Partial Differentiation / and Derivatives of vector functions - Gradient / Divergence/ curl/ Laplacian - Line Integrals / line Integrals Independent of the path / Exactness - Conservative vector fields - Double Integrals in Cartesian and polar coordinates / Green's Theorem - Surface Integrals / Stokes' Theorem - Triple Integrals / Divergence (Gauss' Theorem) - Review on Integrals Theorems - Complex numbers and functions / forms of representation - Analytic functions/ Harmonic functions - Line complex integrals / Cauchy's Integrals Theorem - Zeros and poles of Analytic functions/ Residues and their evaluation - Residue Theorem / Application to Real Integral - Introduction to Fourier Integrals and Transforms.

BA 323 – Mathematics (5)

Cr.3. Prerequisite: BA 224

Taylor's and Power series methods for solving ordinary differential equations - Differential equation with variable coefficients, ordinary and singular points, solution about ordinary points - Solution about singular points: Regular singular points, the method of Frobenius, Case I. - The method of Frobenius , Case II and Case III. - Gamma and Beta functions - Lengendre differential equation and Legendre polynomials - Bessel differential equation. - Bessel function of the 1st kind - Boundary value problems, partial differential equations and the method of separation of variables- Heat equation, heat transfer in a bar - Wave equation, vibration of a string - Laplace equation and potential fields - Conformal mappings, Complex functions as mappings - Bilinear transformations, linear fraction transformation - Schwarz Christoffel transformation.

Computer Engineering (CC)

CC 111 – Introduction to Computers

Cr.3. Prerequisite: None

This course provides an introduction to computers and computing .Topics of interest include the impact of computers on society, ethical issues, and hardware /software applications, including internet applications, system unit, storage and input/output devices, numbering systems, system and application software, presentation skills, program development, programming languages, and flow charts, Visual Basic, web page design using HTML, and communications and networks.

CC 112 – Structured Programming

Cr.3. Prerequisite: CC 111

An introduction to C-language Programming is provided in this course, Variable/Constant definitions, Basic Programmes, Sequential Programming, Conditional Programming, Looping and repetitions, Functions, Arrays as well as searching and sorting techniques.

CC 213 – Programming Applications

Cr.3. Prerequisite: CC 112

An advanced C-language Programming is provided in this course: two dimensional arrays, strings, pointers, recursion, structures, bitwise-operators, input-output interfacing as well as text and binary files are covered in details. Projects are required from students to increase their skills in C programming.

CC 413 – Numerical Analysis

Cr.3. Prerequisite: CC 112 and BA 224

Introduction to numerical methods and their applications - solve science and engineering problems - convergence - error analysis of numerical methods.

CC 442 – Digital Design and Introduction to Microprocessors

Cr.3. Prerequisite: CC 112

Number systems - binary arithmetic and codes - logic gates - Boolean algebra and logic simplifications - Design and realization of combinational circuits - Flip-Flops – Design of sequential circuits - Analysis and realization of counters – Computer aided engineering - Introduction to microprocessor.

EC 238 – Electronics I

Cr.3. Prerequisite: EE 328

Semiconductors - p-n junction - diode current components - junction capacitance – Si and Ge junction diodes - special p-n junctions - bipolar junction transistor - BJT as a switch- Regions of operation: Cut-off, saturation, reverse- and forward active regions - field effect transistor: structure, operation – I-V characteristics - large and small analysis - MOSFET as a switch.

EC 339 - Electronics II

Cr.3. Prerequisite: EC 238

Electronic amplifier theory, power amplifiers, transistor switching, RC filters, Differential amplifiers, Operational amplifiers filters and Oscillators

EC 534– Analogue and Digital Signal Processing (Mechatronics Engineering Program)*

Cr.3. Prerequisite: EC 331

Simple analogue wave shaping circuits- Sinusoidal and square wave generators. Design of RC active filters- ADC's and DAC's. Discrete transforms. Digital filter design.

Electrical Engineering Courses (EE)

EE 218 – Instrumentation Measurements

Cr.3. Prerequisite: EE 238

Introduction to feedback control (1) - Introduction to feedback control (2)- Physical Measurements - Introduction to feedback systems - Liquid level instruments - Liquid flow instruments – PH + Viscosity - Displacement + velocity measurements - Force and torque measurements - Data analysis - Error detectors/comparators - Electric/pneumatic transducers - Amplifier – Actuation.

EE 238 – Electrical Engineering Fundamentals

Cr.3. Prerequisite: BA 124

Introduction– Basic d-c circuit– Resistance, voltage, current, and ohm's law, Kirchhoff's laws– Resistances in series or parallel– Mesh analysis– Nodal analysis– Source transformation– Superposition, voltage and current divider– Laws of magnetic force– Field strength, flux density– Relation between B,H,I,K– Alternating current generation – Waves, effective value and mean value– Phasor representation– Voltage, current and impedance as complex numbers– Phasor analysis– Instantaneous and complex power.

EE 329 – Electrical Machines

Cr.3. Prerequisite: EE 238

DC Generators principles and construction– Armature reaction and generation in parallel– DC Motors Principles and construction– Alternators principles and construction– Synchronous motor principles and method of starting– Transformer principles and construction– 3- phase induction motor– General revision.

EE 416 – Microcontroller Applications

Cr.3. Prerequisite: CC 442

Introduction to Microcontrollers and Architectures with a review of various types available in the market - C-language programming overview - AVR Microcontroller basic structure - AVR Microcontroller basic programming principles - Timers and Counters, PWM - Analouge interfacing of AVR Microcontrollers - Serial interfacing standards using RS-232 principles of the PC - Serial Interfacing of the AVR Microcontroller

EE 417 – Automatic Control Engineering

Cr.3. Prerequisite: EE 218 OR EE328

Introduction to open loop and closed loop control systems– Control system classification– Block diagram– System transfer function and signal flow graph– Standard input signal– Time domain specifications– Modeling of some physical systems– Time response of first and second order systems– Importance of feedback, sensitivity to parameter variations– System stability and effect of disturbance– Error analysis and error constants– Root locus techniques– Frequency domain analysis (Nyquist- Bode) Analog controllers– Controller tuning.

EE 419 – Modern control Engineering

Cr.3. Prerequisite: EE 417

General revision for root locus and frequency response– Lead compensator design by root locus method – Lag compensator design by root locus method – Lag lead compensator design by root locus method – Lead compensator design by frequency response technique– Lag compensator design by frequency response technique – Introduction to state space representation – Methods of writing state equation – Solution of the state equation– Controllability and observability – State variable feedback – Introduction to digital control systems – The z- transform– Block diagram representation digital systems – Time response of digital systems –Stability analysis for digital systems

Industrial Engineering & Management Courses (IM)

IM 111 – Industrial Relations

Cr.2. Prerequisite: None

Types of industries and production techniques – Management and organization structure –Production planning and control – Industrial cost estimation techniques – Industrial economy and breakeven analysis – Accidents at work – rules and regulations – Hazards classification, prevention, and personal safety – Fire hazards identification and prevention – Chemical hazards and prevention – accident reporting – Quality control and labour relations – Science, engineering, and technology – Industrial revolutions.

IM 112 – Manufacturing Technology

Cr.2. Prerequisite: None

Production of steel and cast iron – Forming operations – Heat treatment operations – Cutting tools – Mechanics of metal cutting and turning operations – Cutting fluids – Sand casting – Centrifugal casting, die casting and aspects of the casting process – Gas and Electric arc welding – Electric resistance and pressure welding and aspects of the welding process – Standards of measurements – Measuring Instruments – Measuring methods.

IM 212 – Manufacturing Processes

Cr.3. Prerequisite: IM 112

Fundamentals of chip-type machining processes – Cutting tools for machining – Turning and drilling processes – Milling Processes – Broaching and shaping processes – Abrasive machining processes – Numerical control machine tools – Non traditional machining processes – Measurements & Inspection – Quality Control.

IM 400 – Practical Training

Cr.0. Prerequisite: None.

This course is a non-credit course and is a college graduation requirement. Students are asked to undertake a minimum of four weeks of practical training in off-campus sites recommended by the college and the department in order to pass this course. Students are required to submit a recognition letter from the site where they received their training; in addition, a report and a presentation are submitted. Course is a Pass/Fail course.

IM 423 – Operations Research

Cr.3. Prerequisite: 90 Credit Hours.

Introduction to linear programming – Development of linear programming models – The graphical and simplex method – Transportation and assignment methods – Network models and analysis (minimal spanning tree, shortest route, and maximal flow) – Critical path method – Probabilistic approach, project evaluation and review technique (PERT) – Project crashing.

IM 535 – International Operations Management

Cr.3. Prerequisite: 126 Credit Hours.

International business environment – Cultural and legal environment – Political environment – Economic environment facing business – International trade theories – Governmental influence on trade – Regional economic integration – Factor mobility and foreign direct investment – The foreign exchange market – The determination of exchange rates – Global manufacturing and supply chain management.

Language, Humanities and Social Science (LH)

LH 131 - ENGLISH FOR SPECIAL PURPOSES I

Cr.2. Prerequisite: None

Orientation - Personal Computing - Portable Computers - The process of academic writing - An overview of paragraph writing - Suffixes - Programming and Languages - Graded workshop - Unity and Coherence - Writing workshop - Computer Software - Computer Networks - Graded workshop - Computer Viruses- Computers in the Office.

LH 132 - ENGLISH FOR SPECIAL PURPOSES II

Cr.2. Prerequisite: LH 131

Orientation - Computers in Education - Paragraph writing (Concrete Support I) - Computers in Medicine - Essay writing (Analysis) - Graded workshop - Robotics - Summary writing - Virtual Reality - Machine Translation - Graded workshop - CVs & letters of application - Interviewing skills - Multimedia.

LH 231 – Technical Report Writing

Cr.3. Prerequisite: LH 132

Orientation - Overview of technical report writing - Background reports - Process reports - Instructions and manuals - Primary research reports - Feasibility reports - Report format - Dictionary skills - Paraphrasing - Summarizing - Further practice on summarizing and paraphrasing - Discussion of report outlines - Presentation skills (CD viewing I) - Quotations and source documentation - Report writing workshop - Use of visual aids in technical writing - Presentation skills (CD viewing II) - Report writing workshop - Mini presentations - Report writing workshop - Rehearsals - End of term presentations.

Projects – (ME X0X)

ME 501 – Senior Project I

Cr.3. Prerequisite: Senior Standing – Completion of 138 Credit Hours and a GPA of at least 2.00.

Application-oriented project to show competence in major academic area. Where, an independent research project is conducted under the guidance of a faculty member in the Department of Mechanical Engineering. The research should contribute to the advancement of knowledge in the field. Written report and formal presentation are required.

ME 503 – Senior Project II

Cr.6. Prerequisite: IM 501

Application-oriented project to show competence in major academic area. Where, an independent research project is conducted under the guidance of a faculty member in the Department of Mechanical Engineering. The research should contribute to the advancement of knowledge in the field. Written report and formal presentation are required.

Power Plant Engineering Courses – (ME X2X)

ME 423 - Steam Plant Engineering

CR: 3. Prerequisite: ME 431

Steam processes, steam charts - Steam software - Steam flow through nozzles, Continuity equation, energy equation, subsonic and supersonic nozzles. - Steam jet deflections - Super saturationand thermal equilibrium flow - Types of steam turbines, single stage, multistage velocity compounded, multistage pressure compounded and reaction turbines - Steam flow through single stage impulse turbine. - Steam flow through multistage velocity compounded and pressure compounded - Steam flow through reaction turbine, steam turbine governor. - Types of steam boilers, fire tube and water tube constructions. - Fuel combustion, and boiler components - Boiler efficiency calculation, gas loop temperature calculations - Steam condensers types and constructions - Steam condenser calculations.

ME 425– Power Plant Technology

CR: 3. Prerequisite: ME 333 or ME 234

Thermodynamics Review (1st, 2nd laws of thermodynamics) - Steam Formation - Steam Properties and Process - Simple Rankine Cycle – Modified Rankine Cycle – Reheat and Regeneration Cycle – Steam Turbine, Steam Generator and Steam Condenser – Power Plant Control – Simple Gas Turbine Cycle – Gas Turbine Cycle with Reheat, Intercooling and Regeneration – Combined Cycle Power Plant – Nuclear Power Plant – Renewable Power Generation, Solar Energy – Wind Energy – Geothermal Energy.

ME 520– Thermal Plant Engineering

CR: 3. Prerequisite: ME 423

Thermodynamics Review- Steam Plant Components- Modifications of Steam Plant Cycle- Design of Feed water Heater- Gas Turbine Power Plant- Modifications of Gas Turbine Cycle- Combined Cycle- Nuclear Power Plant- Pressurized Water Reactors- Boiling Water Reactors.

ME 524– Renewable Energy Resources

CR: 3. Prerequisite: 126 Credit Hours

The Current Energy Sources - Environmental Impact of Energy Production - Need for Renewable Sources + Introduction - Solar Energy: Photovoltaic Cells - Solar Energy: Thermal Energy Production - Wind Energy - Hydropower - Wave & Tidal Energy - Ocean Thermal Energy Conversion - Geothermal Energy - Breeder Nuclear Reactors - Fusion Energy - Environmental Impact of Renewable Energy Production.

Heat, Thermodynamics, Refrigeration & Air conditioning Courses – (ME X3X)

ME 232- Thermodynamics (1)

CR: 3. Prerequisite: BA 114

Heat Engine Cycles - Steam Plant - Heat Transfer – Combustion - Practical Analysis of Combustion Products - Positive Displacement Machine.

ME 234 Thermo-fluids (Electrical)

CR: 3. Prerequisite: BA 114/ CR: 3

Heat Engine Cycle-Steam Cycles-Positive Displacement Machine-Gas Turbine- Fluid Properties-Manometers-Hydrostatic Forces-Flow Characteristics-Continuity Equation-Bernoulli's Equation.

ME 333- Thermodynamics II

CR: 3. Prerequisite: ME 232

Mixtures – Psychrometry – Refrigeration - Gas Turbine – Nozzles - Design of a selected topic.

ME 431- Heat Transfer

CR: 3. Prerequisite: ME 231or ME 333

Review of Heat Transfer - Steady State Conduction in One Dimension - General Conduction Equations - Steady State Conduction in Two Dimensions - Principles of connections - Empirical Relations for Forced Connection - Natural Convection Systems - Radiation Heat Transfer - Design of surface heat exchangers - Design of compact heat exchangers.

ME 434- Refrigeration & Air conditioning

CR: 3. Prerequisite: ME 431/ CR: 3

Vapour compression cycles - Refrigeration systems -Air conditioning systems - Insulation and marine insulation requirements - Cooling and heating load calculation - Refrigerant choice – Choice of refrigeration cycle - Design of cycle elements- Refrigeration control - maintenance and trouble shooting.

General Mechanical Courses – (ME X4X)

ME 241- Experimental Methods

CR: 3. Prerequisite: None

Introduction - Generalized Measuring System, Significant Digits, Rounding, Truncation - Data Acquisition, Signals, Signal Conditioning, Sampling - Lab View – Lab View Tutorial - Back ground and Introduction to thermal experiments - Background and Introduction Fluid mechanics experiments - Background and introduction to Material experiments - Background and Introduction to solid mechanics experiments - Presentation & communication skills - Accuracy, Precision, Error in Measurement, Calibration - Lab Work - Uncertainty Analysis - Displacement and Dimensional Measurement - Library Exercise - Oral Presentation for Selected Topic.

ME 542- Maintenance Planning

CR: 3. Prerequisite: 126 Credit Hours

Introduction - Maintenance situation - Maintenance cycle - Working examples on cycle schedule - Computer aided maintenance - Economic aspects of maintenance engineering - Diagnostic capabilities of Predictive maintenance - Vibration Analysis (introduction, Types of Equipment, system Applications - Case study - Motor Analysis ((introduction, Types of Equipment, system Applications, case study) - Organization of different maintenance type -Investigation of failure - Reliability in maintenance - Case study.

Applied Mechanics Courses – (ME X5X)

ME 151- Engineering Drawing & Projection

CR: 2. Prerequisite: None

Drawing practices and techniques (Exercises on geometrical construction) - Methods of object projection (Exercises on geometrical construction – Exercises on object projection) - Orthogonal projection (Exercises on orthogonal projection) - Missing views, dimensioning and free hand sketching (Exercises on projection and free hand sketching) - Sectioning and conventions (Exercises on sectional views) - Intersection of geometrical surfaces and development (Exercises in intersection of geometrical surfaces and development) - Standard metal sections and metal structures (Exercises on metal structures) - Compound metal sections and welds (Exercises on metal structures) - Isometric projection & Surface intersections (Exercises on Isometry and surface intersections) - Perspective projection (Exercises on Perspective projection) - Computer Aided drafting using AutoCAD (General Introduction) - Drawing and editing commands in AutoCAD - Writing texts, Dimensioning and viewing commands

ME 252- Mechanical Engineering Drawing

CR: 3. Prerequisite: ME 151

AutoCAD basics – Object construction and manipulation – Geometric construction – Layers, text generation and dimensioning – Section views, hatching and construction of blocks – Solid modeling – Assembly drawing with applications in Mechanical, Industrial and Marine Engineering – Free hand sketching – Conventional representation of Mechanical elements – Surface finish and machining symbols – Fits and tolerances – Welding and hydraulic symbols.

ME 255 – Computer Aided Drafting (Construction)

CR: 3. Prerequisite: CB 221

AutoCAD Basics- Object Construction and Manipulation-Geometric Construction-Layers and Text -Section Views and Hatching-Dimensioning Technique- Analyzing 2-D Drawings, Plot and Configure- Construction of Blocks-Isometric Drawings- 2-D Assembly Views- 3-D Modeling.

ME 355- Theory of Machines

CR: 3. Prerequisite: BA 142

Types of motion – Velocity analysis – Acceleration analysis – Dynamic force analysis – Balancing of rotating masses – Balancing of reciprocating masses – Kinetic energy storage and flywheel – Gear geometry – Gear trains – Gyroscopic couples

ME 356- Machine Design (1)

CR: 3. Prerequisite: ME 276 and ME 252

Stresses in machine parts – Material selection and factor of safety – Application to design of machine elements – Fatigue in metals – Stress concentration and design of members subjected to fatigue loading – Power screws types and applications – Bolted joints and pressure vessels – Welded and adhesive joints – Springs – Miscellaneous design problems

ME 357- Machine design II

CR: 3. Prerequisite: ME 356

Power transmission systems, Specifications of different types of belts (Belt selection) - Belt selection (Cont.), Chains. Types and selection - Wire Rope selection - Gear types and spur gear force analysis - Design of spur gears - Helical gear force analysis - Bevel and Worm Gears - Introduction to Anti-Friction Bearings - Selection of Ball and Roller Bearings - Introduction to sliding bearings - Design and Selection of Sliding Bearings - Design of shafts based on strength and rigidity - Design of shafts based on strength and rigidity - Clutches and Brakes

ME 455 - Computer Aided Design

CR: 3. Prerequisite: ME 356 or 454

Introduction to computer aided drafting and analysis – 2D and 3D Drafting (parametric solid modeling) – Introduction to the software "Solid Edge" – 2D and 3D parametric modeling – Introduction to finite element analysis – The finite element software "FEMAP" – Application to different machine element problems – Simulation of dynamic systems – MATLAB analysis and graphics – Application to different Mechanical, Hydraulic and Thermal systems (MATLAB 'Simulink') – Introduction to optimization – System and element optimum design problems.

ME 554 - Optimum Design

CR: 3. Prerequisite: 138 Credit Hours

Conventional versus optimum design process - Optimum design problem formulation - Graphical optimization - Optimum design concepts - Gradient vector and Hessian matrix - Concept of necessary and sufficient conditions - Unconstrained optimum design problems - Optimality conditions for functions of single variable - Optimality conditions for functions of several variables - Constrained optimum design problems - Necessary conditions with equality constraints - Necessary conditions with inequality constraints - Numerical methods for unconstrained optimum design - Linear programming methods for optimum design - Optimum design selected projects.

ME 458 – Mechanical Vibrations

CR: 3. Prerequisite: ME 355

Harmonic and periodic motions – Free vibrations – Forced vibrations – Transmissibility and isolation – Vibration measurements – Vibration under general forcing conditions – Two degree of freedom systems – Multi-degree of freedom systems – Eigen value and eigen vector problems.

Hydraulics & Fluid Mechanics Courses – (ME X6X)

ME 362 – Fluid Mechanics I

CR: 3.Prerequisite: BA 114

Introduction - Physical properties of fluids – Fluid statics – Forces on submerged surfaces and buoyancy – Introduction to fluids kinematics – Dynamics of incompressible flow – Flow and velocity measurement – Similitude and dimensional analysis – Flow through pipes – Pumps (Types and performance)

ME 461 – Fluid Mechanics I I

CR: 3.Prerequisite: ME 362

Differential analysis of fluid flow – Kinematics of fluid flow – Liner motion, angular motion and deformation – Conservation of mass and stream function – Velocity potential and irrotational flows – General equations of motion (Navier-Stokes equations) – Euler's equations of motion – Basic two-dimensional potential flows – Superposition of plane potential flows – Introduction to compressible fluid flow - Mach Number and speed of sound – Isentropic and Non-isentropic flow of an ideal gas – Normal shock waves.

ME 464- Hydraulic and pneumatic systems

CR: 3.Prerequisite: ME 362

Introduction to Fluid Power System - Hydraulic Fluids and Transmission Lines -Hydraulic Pumps - Fluid Power Actuators (Cylinders, Rotary Actuators, Motors) - Control Components of Hydraulic Systems - Accumulators and Pressure Intensifiers - Hydraulic Circuit Design and Analysis – Introduction to pneumatic system – Compressors – Pneumatic valves - Pneumatic Circuit Design and Analysis

ME 465- Computational fluid dynamics (CFD)

CR: 3.Prerequisite: ME 461 and ME 431

Introduction – The finite difference method (FDM) – Solution of fluid flow problems using FDM with MATLAB – The finite element method (FEM) - Solution of fluid flow problems using FEM with MATLAB (PDE Tool) – The finite volume method (FVM) - Solution of fluid flow problems using FVM with MATLAB – Thermofluid problems using the FVM with FLUENT software.

ME 565 - Turbo machinery

CR: 3.Prerequisite: ME 461

Main Types of Turbo machines and Performance Basic Laws - Main Types of Turbomachines and Performance Basic Laws - Dimensional Analysis and Model Testing - Hydraulic Pumps (Centrifugal and Axial Pumps) - Hydraulic Turbines - Centrifugal Compressors and Fans - Axial Compressors and Fans

Materials Science Courses – (ME X7X)

ME 274 - Materials Science

CR: 3.Prerequisite: BA 114 and BA 142

Classification of Engineering Materials – General Introduction - Atomic Bonding in Solids - The Crystalline Structure of Materials - Properties, Testing, and Inspection of Engineering Materials - Introduction to Thermal Equilibrium Diagrams -Non-Destructive Testing - Heat Treatment of Metals -Corrosion: An Introduction -General Revision

ME 276 – Stress Analysis

CR: 3.Prerequisite: ME 274

Concept of stress and strain, Normal stresses and strains, shearing stresses and bearing stresses, Stresses due to torsion, Normal forces, and shearing forces and bending moments in beams, Stresses due to bending, Stress and strain transformations, Thin and thick walled cylinders, Stress concentration, Experimental stress analysis, Deflection and buckling of beams and columns.

Automotive & Internal Combustion Engines Courses – (ME X8X)

ME 385 – Internal Combustion Engines

CR: 3.Prerequisite: ME 232

Modern Development in SIE – Classification of ICE – Heat Balance - Air Standard Cycles Applied to ICE - Analysis of Actual Cycle - Combustion in SIE - Carburettor Performance - Carburettor Calculations and Fuel Injection - Ignition System - Engine Friction - Engine Lubrication - Engine Cooling - Engine Test - Engine Performance - Engine Performance – Review.

ME 481 – Automotive Technology

CR: 3.Prerequisite: ME 385

Introduction, history of automotive industry, automotive tools & measuring instrument - Engine construction - Engine lubrication - Engine cooling systems - Engine fuel systems - Engine electrical systems - Engine ignition systems - Exhaust and emission control systems - Suspension and steering systems - Automotive brakes – Clutches - Transmission systems - Tires - Heating and air conditioning systems - Safety systems.

ME 483 - Alternative Fuels and Power Systems

CR: 3.Prerequisite: ME 382

Natural gas engine theory of operation - Natural gas engine construction and maintenance - Hydrogen engine theory of operation - Hydrogen engine construction and maintenance - Methanol & ethanol theory of operation - Gas Turbine theory of operation - Gas turbine construction - Gas turbine fuel systems - Striling engines - Steam engines - Rotary engine - Electrical vehicles - Hybrid vehicles-Bio-Diesel & vegetables oil engines - Bio-Gas engines.

Mechatronics Engineering Courses – (ME X9X)

ME 591 – Mechatronics

CR: 3.Prerequisite: CC 442

Introduction to Mechatronics and Measurement Systems- Mechatronics Key Elements-Introduction to Sensors and Transducers-Position and Motion Sensors -Temperature Sensing Devices - Pressure, Flow, Stress, and Strain Sensors-Actuating Devices-Analog Signal Processing - Digital Circuits and Systems -Analog to Digital and Digital to Analog Conversion -Data Acquisition Systems- Case Studies I-Case Studies II

ME 592 – Mechatronics Systems

CR: 3.Prerequisite: ME 591

Introduction to Mechatronics Systems- Mechatronics of System Performance-Computer Control-Z-transform -Discrete Controllers I -Discrete Controllers II -Interfacing Sensors and Actuators to Computer - Real-Time Interfacing -Computer I/O Cards and Software I-Computer I/O Cards and Software II -Data Acquisition and Control Case Studies -Liquid Level Control - Robotics Applications

ME 593 – Electromechanical Systems

CR: 3.Prerequisite: ME 591

Introduction to Power Electronics and Industrial Control Systems, Devices and characteristics (diodes, thyristors, triacs, power BJT, MOSFETS, IGBTs)-Power Diodes, single phase rectifiers, free-wheeling action-Power Thyristors, Delay Angles, single phase controlled rectifiers-Three phase circuits for diodes and thyristors-DC Motor Speed Control using thyristors and Diode Circuits-Triacs, AC Controllers and Dimmer Circuits, AC Motor Speed Control-IGBTs, Chopper Circuits, DC Motor Control-Inverters, AC control-PWM, AC Motor Control, UPS-: Introduction to Sensors and Transducers (Position, Motion, Pressure, Flow, Stress, and Strain Sensors, …)- Relay Logic Control- PLCs – 1 - PLCs – 2

ME 594 – Robotics Applications

CR: 3.Prerequisite: ME 355

Introduction and field of applications of robotics. Basic concepts in robotics. Homogeneous transformation and coordinate frames. Direct kinematics and forward kinematic algorithm. Inverse kinematics. Control circuits and path control of robots. External and internal sensors for robots. Fluid and electric actuator for robotic applications.

ME 595 – Automation of Mechanical Systems

CR: 3.Prerequisite: ME 593

Introduction to Programmable Logic Controllers-Relay Logic- PLC Basics - Hardware Architectures-Bit Logic- Ladder Diagram-Application – 1-Application – 2- Timers/Counters-Flow chart and state diagram conversion to Ladder Diagram-Application – 3-Application – 4-SCADA and HMI interfaces- DCS Systems

Non Engineering Courses (NE)

NE 264 – Scientific Thinking

Cr.3. Prerequisite: None

Thinking Patterns Development - Nature and postulates of scientific thinking - Meaning and objective of Science - Scientific values and directions - Science, non-science and other-than science - Engineering and Technology - Properties of science - Mental operations used in science and Scientific Guessing - Types of deductions and Representation - Research methods in natural sciences: definitions, Experiments, Observations, Scientific postulates and their conditions - Verification of scientific postulates - General methods of problems solving - Creative and critical Thinking - Fluency types – Flexibility - Originality and Basics of Brain Storming.

NE 364 – Engineering Economy

Cr.3.Prerequisite: 54 Credit Hours.

Introduction and overview – Cost concepts and the economic environment – Principles of money, time relations – Concept of economic equivalence – Cash flow diagrams interest formulas and uniform series – Cash flow diagrams uniform gradient series and geometric sequence – Nominal and effective interest rates continuous compounding and continuous cash flows – Applications of engineering economy methods of investment assessment – Comparing alternatives useful life is equal to the study period – The imputed market value technique – Depreciation historical methods and cost recovery systems.

NE 466 – Environmental Science & Technology

Cr.3. Prerequisite: None

The biosphere – the natural built environment – ecosystem components and their properties – Environmental resources – properties of ecosystems and equilibrium – The evolution of mankind's relation with the environment throughout different eras – The development of human awareness regarding environment problems – Population growth – Development & Sustainable development – Poverty and the environment – Environment and consumer Life styles – Relation between human health and environmental degradation – Environmental improvement – Economic and social returns/benefits of pollution abatement – Risk analysis – Environmental management.