5.4 MECHANICAL ENGINEERING DEPARTMENT

The Department of Mechanical Engineering offers a range of basic mechanical engineering courses relating to the major mechanical engineering disciplines, to prepare the students to all educational programs of the department.

A student in the power program must successfully pass courses totaling of 177 credit hours while the industrial and manufacturing program must successfully pass courses totaling of 177 credit hours, through at least five academic years of study (or 10 academic semesters). Table 3.44/Chapter 3 summarizes the distribution of the total credit hours for the two specialties.

5.4.1 APPLIED MECHANICS COURSES

5.4.1.1 "EM203" MECHANICAL DRAWING: 2Cr [1-3-0]
Pre-requisites: EB142

Course Catalogue Description:
This course introduces the student to: Gear drives. ropes, belts, and chain drives. Clutches and brakes, sliding (journal), bearings, anti-friction (rolling element) bearings.

5.4.1.2 "EM210" COMPUTER-AIDED MECHANICAL DRAWING : 2Cr [1-1-3]
Pre-requisites: EM203

Course Catalogue Description:
This course introduces the student to: Projection and assembly of mechanical elements, fits and tolerances, 2D and 3D assembly mechanical drawings using AutoCAD and similar computer programs.

5.4.1.3 "EM211" MECHANICS OF MATERIALS: 4Cr [3-1-2]
Pre-requisites: EB111

Course Catalogue Description:
This course introduces the student to: Types and properties of materials, testing of materials (tension, compression, shear, bending, torsion, hardness, impact, creep, fatigue), principal stresses, thermal stresses, stress concentration, deflection and stiffness of mechanical members, statically indeterminate members.

5.4.1.4 "EM212" MECHANICS OF MACHINERY: 3Cr [2-1-1]
Pre-requisites: EB113

Course Catalogue Description:
This course introduces the student to: Joints, Mechanisms (kinematics and force analysis), cam mechanism (profiles, minimum cam size, cam dynamics), gear geometry, gear trains, flywheels, balancing of rotating and reciprocating masses.

5.4.1.5 "EM213" MECHANICAL DESIGN (1) : 3Cr [2-2-1]
Pre-requisites: EM211

Course Catalogue Description:
This course introduces the student to: The design considerations, factor of safety, material selection for different mechanical components, design of detachable joints (threaded joints, keys and splines), design of permanent joints (welding, riveting, adhesion, interference fitting), fatigue and theories of failure, column design, power screws, mechanical springs. Pressure vessels. Rotating disks.

5.4.1.6 "EM214" MECHANICAL VIBRATIONS: 3Cr [2-1-1]
Pre-requisites: EM212

Course Catalogue Description:
This course introduces the student to: Single and multiple degrees of freedom systems, free and forced vibrations, machine isolation, critical speeds, dynamic absorbers, vibration measurements, torsional vibrations, continuous systems, diagnoses of machine conditions, elimination of noise and vibrations, vibration system simulation project.

5.4.1.7 "EM215" MECHANICAL DESIGN (2) : 3Cr [2-2-0]
Pre-requisites: EM211

Course Catalogue Description:
This course introduces the student to: Gear drives, ropes, belts, and chain drives, clutches and brakes, sliding (journal) bearings, anti-friction (rolling element) bearings.

5.4.1.8 "EM219" DESIGN AND MECHANICS OF MACHINERY: 4Cr [3-2-1]
Pre-requisites: EB112

Course Catalogue Description:
This course introduces students to: simple stress, principal stress, deflection of mechanical members, design of shafts, sliding and anti-friction bearings, gear train, gear and belt drivers, flywheels and balancing of rotating masses.

5.4.1.9 "EM221" AUTOMATIC CONTROL: 3Cr [2-2-1]
Pre-requisites: EM214

Course Catalogue Description:
This course introduces the student to: Definitions, control terminology, classification of control systems, Leplace transform, modeling of the physical systems and process description: mechanical, electric, hydraulic, pneumatic, and thermal. Block diagrams, time response to standard inputs, stability analysis, error analysis, frequency response, Polar plot, Bode plot, root locus, basic control actions, compensation techniques, logic circuits, Mat-lab simulation.

5.4.1.10 "EM321" ROBOTICS: 3Cr [2-1-1]
Pre-requisites: EM221

Course Catalogue Description:
This course introduces students to: Basics of Robotics. Homogeneous transformation. Arm kinematics. Inverse kinematics. Arm dynamics. Trajectory planning. Robot control system. Position, speed and force control of robot grippers. Practical examples.

5.4.1.11 "EM328" INTRODUCTION TO MECHATRONICS: 3Cr [2-1-1]
Pre-requisites: EB142

Course Catalogue Description:
This course introduces students to: Mechatronics as interdisciplinary system. Digital systems, signal processing and data acquisition systems, sensors, actuators. Design of mechatronics systems using PLC, PC, and microcontrollers (hardware and software).

5.4.1.12 "EM376" PRODUCT DESIGN AND INNOVATION: 3Cr [2-2-0]

Pre-requisites: None

Course Catalogue Description:
This course introduces students to: Fundamentals of concurrent engineering, product life cycle, product specification, standardization, functional requirements and datum features, selection of materials and manufacturing processes, cost analysis, case studies on designing for quality, economy, manufacturability and productivity. Applications of reverse engineering.

5.4.1.13 "EM377" CONDITION MONITORING AND DIAGNOSTICS: 3Cr [2-1-2]

Pre-requisites: EM371

Course Catalogue Description:
This course introduces students to: Basic methodologies of condition monitoring and diagnostic tools. Vibration signal measurement and analysis. Noise assessment and analysis. Thermograph. used oil and wear debris analysis.

5.4.2 FLUID MECHANICS COURSES

5.4.2.1 "EM251" FLUID MECHANICS (1):3Cr [2-2-1]

Pre-requisites: EB111

Course Catalogue Description:
This course introduces students to: fluid properties, pressure measurements and applications, total pressure on surfaces, buoyancy; fluid masses subjected to acceleration, kinematics of fluid flow, equation of continuity, euler, bernoulli and energy equations and their applications.

5.4.2.2 "EM252" ENGINEERING FLUID MECHANICS):3Cr [2-2-1]

Pre-requisites: EM251

Course Catalogue Description:
This course introduces students to: Similarity and model testing. It covers flow through pipes and networks of pipes. It covers also topics of pumps.

5.4.2.3 "EM253" FLUID MECHANICS (2)):3Cr [2-2-1]

Pre-requisites: EM251

Course Catalogue Description:
This course introduces students to: elementary hydrodynamics, three-dimensional continuity equation, navier-Stokes equations and applications, boundary layer theory and applications, introduction to turbulent flow.

5.4.2.4 "EM254" COMPRESSIBLE FLOW):2Cr [2-1-0]
Pre-requisites: EM251

Course Catalogue Description:

The main topics are: mach number and speed of sound, basic equations for one-dimensional compressible flow, adiabatic frictionless nozzle flow, adiabatic flow with friction in a duct, isothermal gas flow in pipes and channels, shock waves, frictionless flow in a constant area duct with heat transfer, compressible flow through nozzles, applications.

5.4.2.5 "EM255" PIPELINE FUNDAMENTALS):3Cr [2-2-1]
Pre-requisites: EM252

Course Catalogue Description:

This course introduces students to the introduction, single-phase incompressible and compressible flow in pipes, unsteady flow, none-Newtonian fluids in pipes, flow of solid/liquid mixture, solid/air, and capsules in pipes, pipe fittings, valves, and pressure regulators, pumps, compressors and blowers, flow meters, sensors and automatic control systems.

5.4.2.6 "EM256" POWER GENERATION BY FLUIDS):3Cr [2-2-0]
Pre-requisites: EM252

Course Catalogue Description:

This course introduces students to: the hydraulic turbines (types, construction, operation and control). Hydraulic power stations, pumped-storage system. None-classical methods for energy production from fluids, wind energy and windmills, sea wave energy, tidal energy, and innovations in designs for energy production from fluids.

5.4.2.7 "EM257" COMPUTER APPLICATIONS IN FLUID MECHANICS):3Cr [2-0-2]
Pre-requisites: EM253, EC207

Course Catalogue Description:

This course introduces students to: the use of numerical methods and programming for solving applied problems in various areas of fluid mechanics.

5.4.2.8 "EM258" ENVIRONMENTAL FLUID MECHANICS):3Cr [2-2-1]
Pre-requisites: EM251

Course Catalogue Description:

This course introduces students to: the introduction and fundamental concepts, review of basic principles of fluid mechanics and heat transfer, energy balance of the environment, static equilibrium of the environment, kinematics and dynamics of the environment, geotropic motion, boundary layer, applications.

5.4.2.9 "EM350" PUMPS TECHNOLOGY):2Cr [2-1-0]
Pre-requisites: EM252

Course Catalogue Description:
This course introduces students to : types, constructions, materials, control and valves. pump systems, pump services 'Intake and suction piping. selection and purchasing pumps. Installation, operation and maintenance, pump testing.

5.4.2.10 "EM352" PIPELINE TECHNOLOGY):3Cr [2-2-0]
Pre-requisites: EM252

Course Catalogue Description:
This course introduces students to : planning, construction and operation of pipelines. design of pipeline, load consideration, protection of pipelines. Legal, safety and environmental issues on pipelines, code, standards and government regulations.

5.4.2.11 "EM353" FLUID POWER SYSTEMS):3Cr [2-2-0]
Pre-requisites: EM252

Course Catalogue Description:

This course introduces students to: hydraulic fluids and transmission lines, fluid power actuators, hydraulic pumps, control valves, accumulators and pressure intensifiers, hydraulic circuit design and analysis, pneumatic systems and applications.

5.4.2.12 "EM355" HYDRAULIC EQUIPMENTS):3Cr [2-2-0]
Pre-requisites: EM353

Course Catalogue Description:
This course introduces students to: basic design and construction of at least two kinds of hydraulic equipment (hydraulic cranes, lift loaders, graders, shovels, or excavators). Hydraulic systems (planning, operation, maintenance, and troubleshooting).

5.4.2.13 "EM356" TECHNOLOGY OF MULTI PHASE FLOW):3Cr [2-2-0]
Pre-requisites: EM253

Course Catalogue Description:
This course introduces students to: introduction to flow patterns, one-dimensional flow, empirical methods for pressure drop, void fraction, draft flux model, vertical bubble and slug flow, gas particle flow.

5.4.2.14 "EM357" APPLIED PIPING SYSTEMS):3Cr [2-2-0]
Pre-requisites: EM252

Course Catalogue Description:
This course introduces students to : one or more of the following piping systems: water, fire protection, steam, building services, oil, process, cryogenic, refrigeration, hazardous, slurry and sludge, wastewater, plumbing, ash handling, compressed gas and vacuum, and fuel gas distribution.

5.4.2.15 "EM358" MAINTENANCE OF FLUID SYSTEMS):3Cr [2-0-2]
Pre-requisites: EM350

Course Catalogue Description:
This course introduces students to: introduction, maintenance approaches. Maintenance of: pumps, compressors, valves, and hydraulic equipment. Seals, lubrication and oil analysis.

5.4.2.16 "EM359" VALVES TECHNOLOGY):3Cr [2-1-1]
Pre-requisites: EM252

Course Catalogue Description:
This course introduces students to : overview of valves: types, selection, specifying, installation, and operation. Valve performance and characteristics. Control valves, actuators. Valves maintenance and troubleshooting

5.4.3 THERMO AND HEAT COURSES

5.4.3.1 "EM202" ENERGY AND ENVIRONMENT : 3Cr [2-1-1]
Pre-requisites: EM251

Course Catalogue Description:
This course introduces students to: conservation laws, air quality standards, meteorological phenomena, gaseous emissions from power plants and motor vehicles, emission measurements, emission-control systems, global warming, ozone depletion, water treatment, wastewater treatment, solid waste management, nuclear waste management and noise control.

5.4.3.2 "EM230" THERMODYNAMICS (1) : 3Cr [2-2-0]
Pre-requisites: EB121

Course Catalogue Description:
This course introduces the student to: Thermodynamics concepts and definitions, working substance, perfect gas laws. Properties of pure substance, forms of energy, first law of thermodynamics for closed and open systems, second law of thermodynamics and its applications, entropy, Carnot principles, air standard cycles, gas compressors.

5.4.3.3 "EM231" HEAT TRANSFER (1) : 3Cr [2-1-1]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces the students to: Modes of heat transfer, steady one-dimensional heat conduction in: plane walls, cylinders and spheres, heat conduction with energy generation, heat transfer from finned surfaces, heat transfer in common configurations, transient heat conduction. Forced convection: over flat plate, across cylinders, tube-banks and inside tubes. Natural convection: over surfaces and inside enclosures. Radiation heat transfer: radiation properties, view factors and radiation exchange between gray surfaces course project.

5.4.3.4 "EM232" THERMODYNAMICS (2) : 3Cr [2-2-1]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces the student to: Reciprocating machines, gas turbine power cycles, steam turbine power cycles, combined gas-vapor power cycles, flow through nozzles, types of steam turbines, turbine governing and control, course project.

5.4.3.5 "EM233" HEAT TRANSFER (2) : 3Cr [2-1-1]
Pre-requisites: EM231

Course Catalogue Description:

This course introduces the students to: Thermal insulations: Selection and design problems, multi-dimensional problems, numerical methods in heat conduction, boiling and condensation, radiation heat transfer through gases, radiation heat transfer in enclosures, mass transfer by diffusion and convection, simultaneous heat and mass transfer, course project..

5.4.3.6 "EM234" HEAT EXCHANGERS: 3Cr [2-1-1]
Pre-requisites: EM231

Course Catalogue Description:

This course introduces the students to: Classification of heat exchangers, overall heat transfer coefficient, heat exchanger analysis using: LMTD method/ ε-NTU method. Design and rating of: double pipe heat exchangers, shell-and-tube heat exchangers, air-cooled heat exchangers and compact type heat exchangers, Materials of construction and corrosion, flow-induced vibration, testing and inspection, maintenance, worked examples of heat exchangers.

5.4.3.7 "EM331" THERMAL POWER PLANTS EQUIPMENT: 3Cr [2-1-1]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces students to: Introduction, feed lines, feed water heaters, pumps, feed water tank, evaporators, cooling towers, steam pipeline design, steam traps, boiler controls, optimum selection of thermal power equipment, energy saving in thermal equipment, course project.

5.4.3.8 "EM332" POWER PLANT OPERATION AND MANAGEMENT: 3Cr [2-2-0]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces students to : Introduction, load curves, Part load problems, power plant economics, selection of plant-place- number and type of units, network linkage, forced outage, economical load distribution on units and plants, operation, maintenance and inspection of steam generators, steam turbines, condensers and cooling towers, accessories and gas turbine plant components, course project.

5.4.3.9 "EM333" RENEWABLE ENERGY SYSTEMS AND ENERGY STORAGE: 3Cr [2-1-1]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces students to: Principles of nuclear energy, nuclear reactors and power plants, geothermal energy, types of geothermal energy systems, solar energy, solar collectors, solar- thermal power systems, solar electric conversion systems, wind energy, thermal storage systems: types and characteristics, course Project.

5.4.3.10 "EM334" WATER TREATMENT AND DESALINATION: 3Cr [2-2-0]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces students to: methods of desalination and water treatment, technologies of thermal and membrane units, basic calculations of thermal and membrane units, other desalination and water treatment units. Water treatment of: boilers, condensers, cooling towers and water chillers. Pre- and post treatment, economics of desalination and water treatment technologies, operation and maintenance of desalination and water treatment units, treatment of corrosion and scale deposits, industrial waste water treatment.

5.4.3.11 "EM340" THERMAL SYSTEM DESIGN AND OPTIMIZATION: 3Cr [2-2-0]
Pre-requisites: EM234

Course Catalogue Description:

This course introduces students to: Introduction, thermodynamics modeling and design analysis, energy analysis, heat transfer modeling, and design analysis. Applications with thermodynamics, heat and fluid flow, economics and thermo-economics analysis, optimization, worked problems.

5.4.3.12"EM341" CONTROLS AND SAFETY OF THERMAL SYSTEMS: 2Cr [2-0-1]
Pre-requisites: EM221

Course Catalogue Description:

This course introduces students to: Definition of control and safety devices, electric, electronic & microprocessor (direct digital control DDC) controls, design of control circuits for thermal equipment. Performance of control system at part-load operation, case studies for different applications: chilled water system, central heating system.

5.4.3.13 "EM220" MECHANICAL MEASUREMENTS AND SENSORS: 3Cr [2-2-1]
Pre-requisites: EB122

Course Catalogue Description

Principles and applications of measurement methods and instrumentation techniques. General measuring concepts and techniques. Uncertainty analysis. Instrument characteristics. Analog and Digital Signal analysis . Signal Conditioning and Data acquisition. Specific devices and sensors for measuring: displacement, strain, Torque, pressure, flow, temperature, and acoustics. laboratory experiments and evaluation of mechanical parameters, LabVIEW, Effective communication.

5.4.3.14 "EM347" TROUBLE SHOOTING AND MAINTENANCE OF THERMAL SYSTEMS: 3Cr [2-2-0]
Pre-requisites: EM240

Course Catalogue Description:

This course introduces students to : Trouble shooting & preventive maintenance of : simple compression refrigeration cycle, multi-pressure cycles, air handling units, fan coil units, filters, pumps, cooling towers. Weekly, monthly, quartile/hafly and yearly maintenance of thermal systems

5.4.4 COMBUSTION ENGINES COURSES

5.4.4.1 "EM201" FUNDAMENTALS OF COMBUSTION ENGINEERING: 3Cr [2-1-1]
Pre-requisites: EM230

Course Catalogue Description:

This course introduces the student to: Continuous and timed combustion, fuel and ignition systems in reciprocating and rotary engines, types of combustion chambers. fuels and ignition quality, thermodynamics of combustion, chemical kinetics, flame theory and flammability limits.

5.4.4.2 "EM303" PERFORMANCE AND EMISSIONS OF AUTOMOTIVE ENGINES: 3Cr [2-1-1]
Pre-requisites: EM201

Course Catalogue Description:

This course introduces students to: The thermodynamic analysis of fuel-air cycles, combustion charts, chemical equilibrium and dissociation, control of exhaust emissions, engine friction, heat transfer, engine energy balance, and testing and performance maps.

5.4.4.3 "EM306" GAS TURBINES: 3Cr [2-1-1]
Pre-requisites: EM232

Course Catalogue Description:

This course introduces students to: Types of axial and radial turbines and compressors, Fuel systems, combustion chambers, design considerations and performance maps, Emission control.

5.4.5 AIR CONDITIONING COURSES

5.4.5.1 "EM240" REFRIGERATION AND AIR CONDITIONING : 3Cr[2-1-1]
Pre-requisites: EM232

Course Catalogue Description:
This course introduces students to: Introduction of refrigeration cycles, simple vapor compression cycle, multi-pressure compression cycles, cooling load calculations, psychometric chart, moist air psychometric processes, air conditioning cycles, cooling load calculations.

5.4.5.2 "EM342" INDUSTRIAL VENTILATION : 3Cr[2-2-0]
Pre-requisites: EM240

Course Catalogue Description:
This course introduces students to: Natural and forced ventilation, general and local ventilation, calculations of ventilation loads, ventilation systems, hood design and selection, fans, air filtration systems; case studies.

5.4.5.3 "EM343" AIR CONDITIONING SYSTEMS : 3Cr[2-2-0]
Pre-requisites: EM240

Course Catalogue Description:
This course introduces students to : All air central system, all water central system, air-water central system, air handling units, fan coil units, design of supply and return air ducts, hot and cold water piping system design, fans, ventilation and exhausters; case studies

5.4.5.4 "EM345" APPLICATIONS IN REFRIGERATION : 3Cr[2-2-0]
Pre-requisites: EM240

Course Catalogue Description:
This course introduces students to: Cold stores, cold trucks, freezing tunnels, freezers, deep freezing, ice manufacturing, skating ring, liquefaction of gases; case studies.

5.4.5.5 "EM346" APPLICATIONS IN AIR CONDITIONING : 3Cr[2-2-0]
Pre-requisites: EM240

Course Catalogue Description:
This course introduces students to: Cinema, theaters, museums, houses, hospitals, vehicles and industrial air conditioning, clean area, ventilation: garages, W.C., wood factories, flour factories, metal forming factories and labs.

5.4.6 MANUFACTURING PROCESSES COURSES

5.4.6.1 "EM170" INTRODUCTION TO MANUFACTURING PROCESS: 2Cr [1-1-2]
Pre-requisites: None

Course Catalogue Description:
This course introduces the student to: Basics of manufacturing processes, engineering materials, machinery, and tooling, methods of joining metals, basic measurement techniques, and cost analysis.

5.4.6.2 "EM172" MANUFACTURING PROCESSES AND MODELING: 3Cr [2-0-3]
Pre-requisites: None

Course Catalogue Description
Students will learn to prepare a massing model of many projects. A series of practical workshops during which the different modeling techniques will be practiced is offered.
Practicing students to design and make three-dimensional (3D) scale architectural models. Practicing students to use a variety of techniques including laser cut, wood machining, metal working and sculpting with clay, finishing processes such as hand coloring and spray painting.

5.4.6.3 "EM271" MANUFACTURING PROCESSES (1) : 3Cr [2-1-2]
Pre-requisites: EM170

Course Catalogue Description:
This course introduces students to: Metal casting processes and equipment, metal forming and shaping processes, fabrication processes for plastic and ceramic products, discussion of the principles and methods of heat treatment, different industrial applications.

5.4.6.4 "EM272" MANUFACTURING PROCESSES (2) : 3Cr [2-1-1]
Pre-requisites: EM170

Course Catalogue Description:
This course introduces students to: Mechanics of metal cutting. Force models for practical processes including turning, facing, boring, milling, drilling, shaping and grinding, Introduction to CNC machines, Quality control for machining processes.

5.4.6.5 "EM327" NUMERICALLY CONTROLLED MACHINES: 3Cr [2-1-1]
Pre-requisites: EM221

Course Catalogue Description:
This course introduces students to: The Components of CNC machines. Command generation in machine: linear interpolation, cubic polynomials, point-to-point motion, controlled rate of change of acceleration, feed forward control, programming of CNC machines.

5.4.6.6 "EM370" ANALYSIS OF METAL-CUTTING PROCESSES: 3Cr [2-1-1]
Pre-requisites: EM272

Course Catalogue Description:
This course introduces students to: Advanced study of metal cutting involving the mechanics of metal cutting including cutting forces, tool-wear/tool-life, temperature analysis, surface finish and integrity, chip control, machinability assessments and advances in cutting tool technology.

5.4.6.7 "EM371" MANUFACTURING PROCESS MACHINE DESIGN: 3Cr [2-2-0]
Pre-requisites: EM272

Course Catalogue Description:
This course introduces students to: Applying machine design principles to manufacturing process machines and tooling; integrating machine elements; precision machine design, polymer processing, sensors applied to process machines

5.4.6.8 "EM373" NONTRADITIONAL MANUFACTURING PROCESSES: 3Cr [2-2-1]
Pre-requisites: EM370

Course Catalogue Description:
This course introduces students to: Fundamentals of nontraditional manufacturing processes. Theory and implementation of the nontraditional manufacturing processes, such as laser cutting and welding, electro discharge machining, abrasive water jet machining, rapid prototyping, etc.

5.4.6.9 "EM374" MANUFACTURING SYSTEMS: 3Cr [2-2-0]
Pre-requisites: EM272

Course Catalogue Description:
This course introduces students to: Fundamentals of design, planning and control of manufacturing systems aided by computers. Concepts of control hardware, NC programming, software aspects related to NC manufacturing, programmable controllers, and performance modeling of automated manufacturing systems, group technology and flexible manufacturing systems. A detailed investigation of computer-aided manufacturing, robotics, and lean/agile manufacturing.

5.4.6.10 "EM378" MANUFACTURING METHODOLOGY: 3Cr [2-2-0]
Pre-requisites: EM272

Course Catalogue Description:
This course introduces students to: Design for manufacturing, concurrent design, human factors, cost analysis, and material selection. Topics include manufacturing methodology for different industrial applications, such as: food industry, fertilizers,.. etc.

5.4.7 INDUSTRIAL ENGINEERING COURSES

5.4.7.1 "EM261" ENGINEERING ECONOMY AND COST ANALYSIS: 2Cr [2-1-0]
Pre-requisites: None

Course Catalogue Description:
This course introduces students to: Basic principles and techniques of economic analysis, the time value of money and inflation, economic decision-making regarding short-term and long-term capital investment alternatives, depreciation models, replacement and procurement models and Public utilities. Cost analysis is made variously assuming certainty, risk and uncertainty

5.4.7.2 "EM262" OPERATIONS RESEARCH: 3Cr [2-2-0]
Pre-requisites: None

Course Catalogue Description:
This course introduces students to: Linear programming, model formulation, graphical and simplex methods, revised simplex method, transportation, assignment, duality, and sensitivity analysis. Goal programming, decision analysis, discrete state stochastic processes: Markov assumption, applications to queuing, inventory models and game theory.

5.4.7.3 "EM263" INTRODUCTION TO ENGINEERING MANAGEMENT: 3Cr [2-2-0]
Pre-requisites: None

Course Catalogue Description:

This course introduces students to: The importance of project management. project success factors, strategic management of projects, estimating project costs and duration, network Scheduling techniques: Graphical evaluation and review techniques (GERT), and total PERT/CPM planning, Project graphics, reducing project duration. managing quality on projects.

5.4.7.4 "EM324"ARTIFICIAL INTELLIGENCE: 3Cr [2-1-1]
Pre-requisites: EM221

Course Catalogue Description:
This course introduces students to: Introduction to intelligent control, fuzzy logic, structure and design of fuzzy controller, principles of neural networks, neural networks for control and modeling, fuzzy control systems, advanced applications.

5.4.7.5 "EM360" PRODUCTION PLANNING AND SCHEDULING: 3Cr [2-2-0]
Pre-requisites: None

Course Catalogue Description:
This course introduces students to: Applications of operations research methods to practical problems of production planning and inventory control. Forecasting; aggregate planning; deterministic and stochastic inventory models; MRP; JIT; variability; scheduling in production and service systems.

5.4.7.6 "EM361" FACILITIES DESIGN: 3Cr [2-3-0]
Pre-requisites: EM360

Course Catalogue Description:
This course introduces students to: Application of analytical methods to facility planning, facility layout design and equipment specification, the physical organization of work places and departments, economic selection of materials handling equipment and integration of equipment into the layout plan, computer solutions for layout problems and mathematical models for location problems.

5.4.7.7 "EM363" HUMAN FACTORS ENGINEERING: 3Cr [2-1-1]
Pre-requisites: EM360

Course Catalogue Description:

This course introduces students to: Basic ergonomic principles needed to recognize and evaluate workplace ergonomic problems; physiological, anthropometric, environmental factors and performance. work Measurement, facilities organization and work place design

5.4.7.8 "EM364" SYSTEMS SIMULATION: 3Cr [2-2-1]
Pre-requisites: EM262

Course Catalogue Description:
This course introduces students to: Simulation modeling of discrete stochastic processes, random number generation, random variants, and analysis of simulation results. Development of computer simulation models of real or conceptual systems. Interpretation of results of computer simulation experiments

5.4.7.9 "EM365" LINEAR AND NETWORK PROGRAMMING: 3Cr [2-2-0]
Pre-requisites: EM262

Course Catalogue Description:
This course introduces students to: Modeling and optimization of linear network problems. mathematical model design, network problems and algorithms, time/cost analysis, special types of networks, software for network problems.

5.4.7.10 "EM367" SUPPLY CHAIN SYSTEMS: 3Cr [2-2-0]
Pre-requisites: EM360

Course Catalogue Description:
This course introduces students to: Concepts related to the design, evaluation, and performance of supply chain systems. Information in the supply chain. transportation, vendor-managed inventories, analytical frame works, and case studies.

5.4.7.11 "EM368" E-BUSINESS APPLICATIONS: 3Cr [2-1-2]
Pre-requisites: EM360

Course Catalogue Description:
This course introduces students to: Web Site Models Overview, select the activities for e-Business, e-Commerce Models, choosing a company and a web Name, virtual funds vs. conventional funds, processing

orders offline and online. internet merchant accounts, web development tools, choosing a web host and domain registration, privacy and security issues, marketing, web site pricing

5.4.8 METROLOGY COURSES

5.4.8.1 "EM372" METROLOGY AND INSTRUMENTATION:3Cr [2-0-3]
Pre-requisites: EM170

Course Catalogue Description:
This course introduces students to: Principles of fits, dimensional and geometrical tolerances, primary-measuring tools, calibration process, types of errors, gauges, comparative measurements, mechanical, electrical, pneumatic and optical magnification, angle measurements, gears measurements, Screw thread measurements, surface texture.

5.4.9 QUALITY CONTROL COURSES

5.4.9.1 "EM362" QUALITY IMPROVEMENT FOR INDUSTRY:3Cr [2-2-0]
Pre-requisites: EM170

Course Catalogue Description:
This course introduces students to: Quality management philosophies (Deming,..Etc.), strategies for continuous improvement, graphical and numerical methods of data analysis, process control charts, total quality management.

5.4.10 MATERIAL SCIENCE COURSES

5.4.10.1 "EM270" ENGINEERING MATERIALS:3Cr [2-2-1]
Pre-requisites: EM170

Course Catalogue Description:
This course introduces students to: Introduction to materials, crystal structure of solids, imperfection in solids, dislocations and strengthening mechanisms, construction and use of phase diagrams in materials systems, microstructures of metals, types of steels, cast irons, copper alloys and aluminum alloys, heat treatment of steels, types of polymers, ceramics, and composite materials and their applications.

5.4.11 PROJECT COURSES:

5.4.11.1 "EM400-1, EM400-2" GRADUATION PROJECT (1) AND (2): 4Cr [3-0-3]
Pre-requisites: Departmental approval for EM400-1 and EM400-1 for EM400-2

Course Catalogue Description:
Students use all of their knowledge and previous design experience, particularly in the field of Specialization, and integrate all components of the curriculum together into one major project extending over the 9th and 10th semesters. Projects are industry-based. The design should take into consideration appropriate constraints such as economic factors, safety, reliability, ethics and environmental and social impact. Submission of a written .report is an essential requirement for completion of the course. Team design projects, where appropriate, are highly encouraged

5.4.12 COURSES OFFERED TO STUDENTS OF OTHER DEPARTMENTS (NON-MECHANICAL ENGINEERING STUDENTS)

5.4.12.1 "EM237" THERMOFLUIDS FOR ELECTRICAL ENGINEERS: 4Cr [3-2-1] Pre-requisites: EB112, EB122

Course Catalogue Description:

This course introduces students to: The introduction to fluid mechanics and hydraulics, pressure and flow measurements, pipe flow, pumps, basic concepts of thermodynamics, the first and second laws of thermodynamics, mechanisms and basic laws of heat transfer and applications.

5.4.12.2 "EM239" THERMAL POWER PLANTS FOR ELECTRICAL POWER ENGINEERING STUDENTS:3Cr [2-2-1] Pre-requisites: EM237

Course Catalogue Description:

This course introduces students to: Energy generation, Thermal power plants.