CATALOGUE DESCRIPTION OF STUDY PLAN COURSES

2019-2020

Faculty Requirements

Course No.	Course Name	C.H.	Pre-requisite
MATH 110	**Calculus I**	**3**	**-**
This course involves a study of limits, continuity, derivatives and integrals; computations of derivatives-sum, product, and quotient formulas, chain rule, implicit differentiation, applications of derivatives to optimization problems and related rate problems; mean-value theorem; definite integrals and fundamental theorem of calculus; application of definite integrals to computations of areas (length, surface) and volumes.			

Course No.	Course Name	C.H.	Pre-requisite
EE 112	**Calculus II**	**3**	**MATH 110 Calculus I**
Techniques of integration: integration by parts, trigonometric integrals, trigonometric substitutions, partial fractions, rationalizations, half-angle substitution, and improper integrals. Applications of definite integrals: areas between two curves, volumes by washers and cylindrical shells, arc length, and area of a surface. The concept of infinite series and tests of convergence. Power series: Maclaurin and Taylor. Polar coordinates, graphs in polar coordinates, and areas in polar coordinates			

Course No.	Course Name	C.H.	Pre-requisite
PHYS 120	**General Physics I**	**3**	**-**
Fundamental topics in classical physics (mechanics) motion in one dimension and two dimensions, circular motion, and energy			

Course No.	Course Name	C.H.	Pre-requisite
PHYS 121	**General Physics Lab I**	**1**	**PHYS 120 General Physics I or Simultaneously**
Experiments of various physical principles. Experimental procedures and scientific method. Comparison between experimental data and theoretical values.			

Course No.	Course Name	C.H.	Pre-requisite
PHYS 220	**General Physics II**	**3**	**PHYS 120 General Physics I**
Fundamental topics in classical physics(Electrostatics) electric fields, electric potential and capacitance, direct current, and magnetic fields.			

Course No.	Course Name	C.H.	Pre-requisite
PHYS 221	**General Physics Lab II**	**1**	**PHYS 220 General Physics II or Simultaneously**
A set of laboratory experiments related to the topics and principles of General Physics II.			

Course No.	Course Name	C.H.	Pre-requisite
EE201	**Computer Skills II**	**3**	**Computer Skills Test**
Language syntax, data types, the concept of variable scope, selection (if-then-else and switch), repetition control structures (for, while loops), array, functions, string manipulation, pointers, structures, classes, and file I/O.			

Course No.	Course Name	C.H.	Pre-requisite
ME 107	**Engineering Workshop**	**1**	**-**
Carpentry, black smith and welding, workshop manual skills, electrical wiring, sheet metal forming, and turning.			

Course No.	Course Name	C.H.	Pre-requisite
IE 323	**Economy and Engineering Management**	**3**	**Pass 56 hrs**
Fundamentals of engineering economy. Cost concepts. Time value of money. Economic analysis of alternatives. Replacement analysis. Engineering management.			

Course No.	Course Name	C.H.	Pre-requisite
CE 107	**Engineering Drawing**	**1**	**-**
Introduction to Engineering Drawing using AutoCAD, drawing layout, points, lines, layers, coordinate system, geometric construction, modifying tools, text and numerals, and isometric pictorials. Drawing applications in various engineering fields.			

Course No.	Course Name	C.H.	Pre-requisite
CE 203	**Ethics and Technical Writing**	**2**	**ENG 120 English Language**
Technical communication, process of writing, presentations, relationship between ethical standards and technology, analysis of ethical dilemmas.			

Course No.	Course Name	C.H.	Pre-requisite
PE 201	**Renewable Energy applications & sustainability**	**1**	**-**

Emerging renewable energy technologies and integrating sustainable building design practices.

Mandatory Department Requirements

Course No.	Course Name	C.H.	Pre-requisite
IE 231	**Statistics and Probability 1**	**3**	**EE 112 Calculus II**
Basic concepts and tools for non-deterministic systems, elementary and conditional probability, random variables, distribution theory, regression analysis, forecasting methods			

Course No.	Course Name	C.H.	Pre-requisite
IE 232	**Statistics and Probability 2**	**3**	**IE 231 Statistics and Probability I**
Probability, random variables, mathematical expectation, discrete and continuous distributions, sampling distributions, test of hypothesis, test of distribution, analysis of variance, reliability.			

Course No.	Course Name	C.H.	Pre-requisite
IE 233	**Object Oriented Programming for Industrial Engineering**	**3**	**0810201 computer skills 2**
Data types, variables, Logical Operators, Sequences, iteration, loops, Boolean Expressions, conditional execution, function calls, importing modules, Turtle graphics, classes.			

Course No.	Course Name	C.H.	Pre-requisite
IE 310	**Manufacturing Processes 1**	**3**	**ME 205Engineering Materials**
The basic fundamentals of some Manufacturing processes by which materials can be shaped into useful products are described. These bulk deformation processes include (forging, rolling, extrusion, rod and wire drawing) and sheet-metal deformation processes such as (blanking, deep drawing and bending)..			

Course No.	Course Name	C.H.	Pre-requisite
IE 312	**Manufacturing Processes Lab**	**1**	**CO-erequisite: IE 310 Manufacturing Processes**
Differences between forming and machining processes. Safe use of industrial manufacturing equipment, materials and processes. The effects of these processes on material properties and surface quality.			

Course No.	Course Name	C.H.	Pre-requisite
IE 330	**Operations research (1)**	**3**	**IE 231 Statistics and probability I.**
Introduction to operations research, formulation of linear programming problems, simplex methods, duality theory, sensitivity analysis, transportation models and network models and integer linear programming.			

Course No.	Course Name	C.H.	Pre-requisite
IE 331	**Operations research (2)**	**3**	**IE 330 Operations research (1).**
Nonlinear programming problems, unconstrained optimization search techniques , quadratic programming, separable programming, metaheuristics, goal programming, and dynamic programming.			

Course No.	Course Name	C.H.	Pre-requisite
IE 334	**Work measurements**	**3**	**IE 231 Statistics and Probability I**
Method study, time-motion study, design of the work place using ergonomic principles, job description and job evaluation, operations timing study, standard times and activity- sampling. Charting and diagramming. Basic lean principles and tools/ techniques such as Value Stream Mapping (VSM), 5S-process, Quick changeover, Zero defect quality control, Set up time reduction.			

Course No.	Course Name	C.H.	Pre-requisite
IE 370	**Quality control**	**3**	**IE 233 Statistics and Probability** 2
Introduction to Lean and Six Sigma, principles of statistical quality control, variable and attribute control charts, acceptance sampling, type one and type two error, Taguchi loss function			

Course No.	Course Name	C.H.	Pre-requisite
IE 413	**Data Analytics And Machine Learning**	**3**	**803233 object oriented programming for IEs**
What machine learning is and how it is related to statistics and data analysis. How machine learning uses computer algorithms to search for patterns in data. How to use data patterns to make decisions and predictions with real-world examples. How to prepare data, deal with missing data and create custom data analysis solutions for different industries.			

Course No.	Course Name	C.H.	Pre-requisite
IE 420	**Engineering Cost Analysis**	**3**	**803323 Economy and Engineering Management**
Cost behavior, cost analysis, job costing, process costing, Activity Based Costing (ABC), departmental costing, by-product and Joint product costing, variance analysis.			

Course No.	Course Name	C.H.	Pre-requisite
IE 421	**Statistics and Operations Research Lab**	**1**	**803330 Operations Research I**
Use application Packages in the field of Probability and statistics and Operations Research to solve exercises. Such Packages are Minitab and excel.			

Course No.	Course Name	C.H.	Pre-requisite
IE 439	**Systems Modeling and Optimization Lab**	**1**	**803331 Operations Research (2)**
Use application Packages in the field of optimization and modeling to solve exercises.			

Course No.	Course Name	C.H.	Pre-requisite
IE 440	**Engineering Metrology**	**3**	**IE 311 Manufacturing Processes II**
Pressure gauges, Angular measurement, Surface finish, Electrical measurements and sensing devices, Data acquisition devices.			

Course No.	Course Name	C.H.	Pre-requisite
IE 441	**Engineering Metrology lab**	**1**	**IE 440 Engineering metrology or simultaneously**
Instruments used for linear and angular measurements. Measurements of surface texture, roundness test, telescoping measurement, the coordinate measurement system, alignment test with auto-collimator, temperature and flow measurements.			

Course No.	Course Name	C.H.	Pre-requisite
IE 454	**Industrial Automation**	**3**	**0802227+**

			0803310
This course contains many subjects related to the industrial control of systems such as: Relay contactors control, PLC control of production lines and robotic systems, CNC Milling and CNC Turning. the definition of the smart sensors, hart protocol and industrial field bus and the wireless industrial communication networks			

Course No.	Course Name	C.H.	Pre-requisite
IE 455	**Industrial Automation Lab**	**1**	**IE 454 Industrial Automation.**
Relay contactors control, PLC control of production lines and robotic systems, CNC Milling and CNC Turning. Arduino IOT controllers			

Course No.	Course Name	C.H.	Pre-requisite
IE 457	**Human Factors Engineering and Safety**	**3**	**803334 Work Measurements**
Anthropology, anthropometry, human biomechanics, skeletal, respiratory circularity and metabolic systems. Human senses, body interacts with environment. Design for sitting or standing, foot operation, hand use, controls, displays, Computer workstation, load handling, safety, accidents and human error. introduction to safety and accident prevention prevention, safety legislation, factors that cause or contribute to accidents, hazard identification and control, safety management and risk- taking and warnings			

Course No.	Course Name	C.H.	Pre-requisite
IE 471	**Production planning and control**	**3**	**IE 330 operations Research**
Introduction to supply chain management, Forecasting techniques, capacity and aggregate planning, inventory management, Economic order Quantity, safety stock, Bill of material, material requirement planning, Master production scheduling, special production management systems.			

Course No.	Course Name	C.H.	Pre-requisite
IE 478	**Human Factors Eng. and Time and Motion Study lab.**	**1**	**Co-requisites 803457 Human factors engineering and safety**
Human manual skills such as: Finger dexterity, Wrist finger-speed, Arm-hand steadiness; body strength including hand, back and legs; circulatory system assessment using tread mill.			

Course No.	Course Name	C.H.	Pre-requisite

IE 482	Simulation	3	IE 330 operation research 1
Discrete event simulation , generate random numbers using Excel, input distribution modeling, review of probability and statistics, Monte Carlo simulation, Queuing systems, simulation modeling using ProModel, simulation output analysis, verification and validation of simulation models			

Course No.	Course Name	C.H.	Pre-requisite
IE 551	**Computer Aided Design and Manufacturing**	**3**	**IE 310 Manufacturing Processes 1+ 802230 Machine Elements Drawing Lab***
Principles of CAD/CAM including engineering drawing, geometric and surface modelling, and feature-based design. CAD/CAM concepts in product design and manufacturing. Use of CAD/CAM software to realize product design.			

Course No.	Course Name	C.H.	Pre-requisite
IE 561	**Project Management**	**3**	**IE 330 Operations Research + IE323 Economy & Eng. Management**
Introduction to project management. Project life cycle: initiation, project selection, organization, planning and negotiation, implementation (budgeting, scheduling, resource allocation and control) and termination. Application of CPM techniques in networks for project planning, monitoring, control and resource allocation			

Course No.	Course Name	C.H.	Pre-requisite
IE 565	**Industrial Facility Planning**	**3**	**IE 323 Engineering Economy & Management**
Product, process and schedule design. Space, flow and activity planning. Layout Planning Modules and Algorithms. Material handling systems (MHS), warehousing and Kanban systems.			

Course No.	Course Name	C.H.	Pre-requisite
IE 570	**Supply chain management**	**3**	**co-requisites: IE 471 Production Planning and Control**
Supply chain drivers and metrics, distribution networks, uncertainty in a supply chain., transportation, sourcing decisions, information technology, green supply chain.			

Course No.	Course Name	C.H.	Pre-requisite
IE 573	**Data Science Applications For Engineering And Business Intelligence**	**3**	**co-requisites: 803413 Data Analytics And Machine Learning**
Integrating big data with the work in the manufacturing systems, servicing system and business system. Studying core processes and supporting systems for management and control. Design of intelligent systems that support the transformation of operation, monitoring, evaluation, reviews and improvement systems to the digital age.			

Course No.	Course Name	C.H.	Pre-requisite
IE 574	**Product Development and Entrepreneurship**	**3**	**co-requisites: IE 565 Industrial Facility Planning**
Principles and practices in the development, design, marketing and introduction of new products and services. Integrate the customer and end-consumer into the new product process and its legal considerations. The product development cycle. Product development tools such as QFD, AHP, FMEA, Fishbone, product assembly and function flow diagram. Reverse engineering, forward engineering, and concurrent engineering.			

Course No.	Course Name	C.H.	Pre-requisite
IE 585	**Graduation Project 1**	**1**	**Pass 120 hrs and dept. Approval**
Proposal generation of graduation project as a team effort. Design process, project management and decision making.			

Course No.	Course Name	C.H.	Pre-requisite
IE 587	**Graduation Project 2**	**2**	**IE 585 Graduation Project I**
Continuation of Graduation Project 1. Final product and project deliverables.			

Course No.	Course Name	C.H.	Pre-requisite
IE 589	**Engineering Training**	**3**	**Passing 115 CH**
Field Training that addresses the courses learned.			

Elective Courses

Course No.	Course Name	C.H.	Pre-requisite
IE 498	**Computer application in Industrial Engineering**	**3**	**0803323+0803233**

Computer application in Industrial Engineering

a) MATLAB: introduction to MATLAB\ programming\ drawing curves\solving algebraic equations\ probabilities\statistics and creating curves\ differential equations\ using Simulink\ using symbolic math.

b) Programmable logic controller: hardware for PLCS7-200 \programming languages used in PLCS7-200 \examples on control systems using PLCS7-200.

Course No.	Course Name	C.H.	Pre-requisite
IE 560	**Management Information Systems**	**3**	**IE323Engineering Economy & Management and EE201 Computer Skills II**

Introduction to systems theory, System development life cycle, Systems engineering methodology applied to the design & analysis of information systems for management of all types of organizations. Programming & design of Data base management systems. Distributed and centralized systems. Direct management phase of system design and implementation, Computer networks & distributed databases, Selections of software and / or hardware for information systems.

Course No.	Course Name	C.H.	Pre-requisite
IE566	**Total quality management**	**3**	**803370 Quality Control**

This course examines the primary methods used to control quality in organizations and examines the tools with which quality can be improved .the topics included are: historical development of quality management, quality improvement tools, and strategies for implementing quality improvements such as ISO standards and six sigma.

Course No.	Course Name	C.H.	Pre-requisite
IE575	**Design Of Experiments**	**3**	**803232 Statistics and Probability 2**

Methods of experimental set up, data gathering, and data analysis. Application of Design of Experiments (DoE) to engineering Problems.

Course No.	Course Name	C.H.	Pre-requisite
IE576	**Enterprise Resource Planning**	**3**	**co-requisites: IE 471 Production Planning and Control**
Role of ERP systems within an organization. Integrated information systems. Hands-on activities of various business processes. Various business cases in which ERP concepts can be applied. An overview of Business Intelligence (BI) and analytics in the ERP context.			

Course No.	Course Name	C.H.	Pre-requisite
IE577	**Risk Management**	**3**	**Co-requisites 803457 Human factors engineering and safety**
Introduction to Risk Management; internal factors and external factors for both manufacturing industry and service industry; tools and techniques to reduce and prevent failure of the system.			

Course No.	Course Name	C.H.	Pre-requisite
IE578	**Artificial Intelligence**	**3**	**IE 413 Data Analytics And Machine Learning**
An introduction to Artificial Intelligence (AI): theories, mathematical formalisms, and algorithms, that capture the elements of computational intelligence; decision making under uncertainty with emphasis on expert systems, neural networks, fuzzy logic, genetic algorithm, simulated annealing, and their hybrid forms.			

Course No.	Course Name	C.H.	Pre-requisite
IE 579	**IoT Applications For Industrial Engineering**	**3**	**IE 413 Data Analytics And Machine Learning**
IoT course teaches students the basic knowledge of the IoT structure, communication networks, internet protocols such as HTTP, web server basics, Programming with C and python language and some applications with Arduino IOT kits. IOT applications in the industry and the network security. Cloud applications and some Case studies.			

Course No.	Course Name	C.H.	Pre-requisite
IE582	**Safety Management Systems**	**3**	**Co-requisites 803457**

			Human factors engineering and safety
Evaluation ,design, development of a workplace based on engineering rules with consideration of safety management and safety engineering usage. Hazard identification, Analysis and Resolution. Use of Failure Modes and Effects Analysis (FMEA)			

Course No.	Course Name	C.H.	Pre-requisite
IE 592	**Special Topics in Industrial Engineering I**	**3**	**Department approaval**
Selected topics of current interest in industrial engineering, designed to give the student an opportunely to pursue special studies not offered in other courses.			

Course No.	Course Name	C.H.	Pre-requisite
IE 597	**Special Topics in Industrial Engineering II**	**3**	**Department approaval**
Selected topics of current interest in industrial engineering, designed to give the student an opportunely to pursue special studies not offered in other courses.			

Support Mandatory Courses from other departments

Course No.	Course Name	C.H.	Pre-requisite
ME 108	**Descriptive Geometry**	**1**	**None**
Basic and advanced concepts in 2D and 3D geometrical modeling and design. Isometric and pictorial projections of solids/machine parts. , preparation of assembly drawings			

Course No.	Course Name	C.H.	Pre-requisite
ME 205	**Engineering Materials**	**3**	**Pass 26 hrs**
Atomic bonding, Crystal structure and crystal defects, Diffusion in solid and solid solutions, Equilibrium phase diagrams in binary alloys. Fe-carbon phase diagram, Principles of heat treatment, alloys			

Course No.	Course Name	C.H.	Pre-requisite
ME 206	**Engineering Materials lab**	**1**	**ME 205 Engineering Materials or simultaneously**
Identification of ferrous and nonferrous materials. Nondestructive tests. macroscopic examination (Macro etching), preparation of specimens for optical microscopic examinations, mechanical properties tests (hardness test, impact, creep), thermal analysis (construction of Pb-Sn phase diagram). Heat treatment of steel (Annealing, normalizing processes), harden ability test (Jominy and quench test)			

Course No.	Course Name	C.H.	Pre-requisite
ME 227	**Applied Mechanics**	**3**	**802107 Engineering Workshop**
Force and moment. Force system resultant. Equilibrium of rigid bodies. Internal forces. Friction. Centre of gravity and centroid. Moments of inertia. Stress and strain. Kinematics of rigid bodies			

Course No.	Course Name	C.H.	Pre-requisite
ME 228	**Applied Mechanics Lab**	**1**	**802227 Applied Mechanics**
Introduction to stress and deformation analysis of basic structural materials subjected to axial, torsional, bending, and pressure loads. Modeling and analysis of oscillatory phenomena.			

Course No.	Course Name	C.H.	Pre-requisite
ME 230	**Machine Elements Drawing Lab**	**3**	**802227 Applied Mechanics +** **805107 Engineering Drawing**
Theory and application of technical drawing using software (PTC CREO), drawing instruments and their use. Drafting techniques: geometrical construction, sectional views, basic techniques of dimensioning. Screws and fasteners, pictorials, working and assembly drawings			

Course No.	Course Name	C.H.	Pre-requisite
ME 345	**Thermal Fluid Sciences**	**3**	**CEE 203 Advanced Engineering Math I and PHY120 General Physics I**
Thermodynamics: basic concepts, energy, energy transfer by work, first law of thermodynamics, properties of pure substances. Fluid mechanics: viscosity, fluid statics, fluid kinematics. Heat transfer: mechanisms of heat transfer, and heat exchangers.			

Course No.	Course Name	C.H.	Pre-requisite
EE203	**Advanced Engineering Mathematics I**	**3**	**EE 112 Calculus 2**
Ordinary Differential Equation (ODE), ODE using Laplace transform. Matrices and matrix operations. Linear systems using Gauss Elimination and Cramer's rule.			

Course No.	Course Name	C.H.	Pre-requisite
EE 204	**Principles of Electrical Eng.**	**3**	**PHYS 220 General Physics II**
Circuit laws, Series and parallel circuits, Loop analysis, Nodal analysis, Super-position, Source transformation, Thevenin Theorem, Introduction to alternating current, RL, RC, and RLC Circuits. Introduction to electromagnetic theory , Magnetic field , Ampere law, magnetic flux density , magnetic circuit, Faradays Law , Lenz law.			

Course No.	Course Name	C.H.	Pre-requisite
EE 205	**Principles of Electrical Eng. Lab**	**1**	**810205 Principles of Electrical Eng. Lab**
Introduction to laboratory equipment and machinery , single phase transformer , 3-phase transformer, DC generators and motors , ac machines, Induction motors single and three phase.			

Course No.	Course Name	C.H.	Pre-requisite
EE 302	**Numerical Analysis**	**3**	**EE 201 Computer Skills II**
Introduction to approximation techniques, linear and nonlinear equations, interpolation and curve fitting, and numerical differentiation and			

Course No.	Course Name	C.H.	Pre-requisite
CHEM 130	**General Chemistry**	**3**	**-**
Fundamentals of chemistry including states of matter, atomic structure, bonding and molecular structure, chemical reaction. Reaction stoichiometry, rate of chemical reactions, equilibrium, thermodynamics and thermo chemistry.			

Course No.	Course Name	C.H.	Pre-requisite
CHEM 131	**General Chemistry lab**	**1**	**CHEM130 General Chemistry or simultaneously**
moles, molar ratio, empirical formula, titration calculations, calorimetric methods of analysis, equilibrium shifts, kinetics of a chemical reaction, properties of aqueous solutions.			