

CATALOGUE DESCRIPTION OF STUDY PLAN COURSES

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.			

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, hypothesis testing, confidence intervals and simple regression			

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
General Introduction, Comments, Variables, Statements, and Expressions, Debugging, Python Modules, Python Turtle, Sequences, Iteration, Conditionals, transforming sequences, files, dictionaries, functions, classes and objects, building programs, inheritance.			

Course No.	Course Name	C.H.	Pre-requisite
IE 234	Statistics and Excel Lab	1	803232 Statistics and Probability 2
Learn Basic Excel operations and functions. Making Charts and figures in Excel. Data Exploration and Analysis in Excel. Use application Packages in the field of Probability and statistics to solve real life problems exercises in Minitab.			

Course No.	Course Name	C.H.	Pre-requisite
IE 310	Manufacturing Processes 1	3	ME 205 Engineering Materials
To introduce the students with the fundamentals of: mechanical behavior of materials, metal forming, bulk deformation processes like rolling, forging, extrusion, and wire and bar drawing, and sheet metal working processes like cutting operations, bending and deep drawing.			

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.

Mathematical modeling, feasible solutions, Linear Algebra, Linear programming LP. Graphical solution, selected LP applications, simplex method, Big M method, two phase method. Dual problems. Sensitivity analysis, transportation and assignment models, Network models.

Course No.	Course Name	C.H.	Pre-requisite
IE 331	Operations research (2)	3	IE 330 Operations research (1).

Integer programming, Goal Programming, decision systems, Markov chain, Dynamic programming, Applications in Search algorithm, probabilistic inventory models.

Course No.	Course Name	C.H.	Pre-requisite
IE 334	Work Measurement	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

Course No.	Course Name	C.H.	Pre-requisite
IE 370	Quality control	3	IE 231 Statistics and Probability I

Quality, quality assurance and quality management, statistical quality control, control charts for variables and attributes, lot sampling and acceptance sampling plans, process capability assessment, six sigma and Zero Defect Quality, ISO 9000, 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	ME 337 Discrete Math

Introduces concepts, data analysis techniques and tools for how to prepare data, deal with missing data and create custom data analysis solutions for different industries. 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. The steps in the Data mining process.

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 439	Systems Modeling and Optimization Lab	1	803331 Operations Research (2)

Use application Packages in the field of Operations Research to solve exercises related to the topics covered by these subjects. Such Packages are CPLEX, and Excel

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, stress at work

Course No.	Course Name	C.H.	Pre-requisite
IE 465	Automation and Control	3	0803310

This course contains basic introduction to process control theory and sequence industrial automatic control systems including many topics: transfer function, block diagram, closed loop and open loop control systems, the PID controller, ON-OFF control systems, hydraulic control circuits, relay contactors control, PLC control of production lines

Course No.	Course Name	C.H.	Pre-requisite
IE 466	Automation and Control Lab	1	IE 465 Automation and Control.

The lab contains different topics related to control and automation systems: ON- OFF control, open loop and closed loop control systems, PID controller, Directional control valve types, Hydraulic systems, Pneumatic systems, Relay contactors control, PLC control of production lines

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

Conduct experiments that measure the human abilities to do certain type of jobs and recommend assignment of most skillful person to do the job.

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. Use of CAD/CAM software in CNC programming, sheet-metal design, Plastic Mould design and manufacturing, 3d printing machines and FEM analysis.

Course No.	Course Name	C.H.	Pre-requisite
IE 556	Computer Aided Design and Manufacturing Lab	1	IE 551 Computer Aided Design and Manufacturing

The lab contains different topics related to Computer aided design and manufacturing: CNC Milling, CNC Turing, sheet-metal, 3d printer, Casting, and Mold design and FEM project.

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. Feasibility study. Application of CPM techniques in networks for project planning, monitoring, control and resource allocation. Risk management

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 574	Product Development and Entrepreneurship	3	co-requisites: IE 565 Industrial Facility Planning

What is entrepreneurship and innovation, Benchmarking QFD, concurrent engineering, reverse engineering, and value engineering, design of production system. Material selection, engineering drawing, optimization, safety engineering, human factors, Business pitch, cost analysis, market analysis, presentation skills.

Course No.	Course Name	C.H.	Pre-requisite
IE 583	Intelligent Systems Lab	1	co-requisites: IE 565 Industrial Facility Planning
Introducing Arduino as a programming language associated with micro-controls such as ESP. Introducing different sensors. Connecting sensors to the a sever through a website and a mobile application.			

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 311	Manufacturing Processes 2	3	IE 310 Manufacturing Processes 1

To introduce the students with the fundamentals of: theory of metal machining, machining operations and machine tools, cutting tool technology, economic and product design considerations in machining, grinding and other abrasive processes, and non-traditional machining and thermal cutting processes.

Course No.	Course Name	C.H.	Pre-requisite
IE 463	Maintenance management	3	0803310

The effect of reliability on the maintenance management, How to measure reliability, different arrangement of system components such as series, parallel, and complex, how to test and measure system life, how to build maintenance management systems, total productive maintenance, predictive maintenance, proactive maintenance, and maintainability

Course No.	Course Name	C.H.	Pre-requisite
IE 498	Computer Application in IE	3	IE 323 Economy & Eng. Management + IE 233 Object Oriented Programming for Industrial Engineering

AviX is a lean tool. It has many modules that target continuous improvement and development of People – Processes – Products within the manufacturing industry worldwide

Course No.	Course Name	C.H.	Pre-requisite
IE 557	Additive Manufacturing	1	IE 551 Computer Aided Design and Manufacturing

Fundamental knowledge of Additive Manufacturing and Reverse Engineering (RE) and their applications in manufacturing, medical and other sectors. Design for additive manufacturing. Additive manufacturing feedstock materials. Post Processing and post treatment requirements. Material Properties of parts produced using additive manufacturing

Course No.	Course Name	C.H.	Pre-requisite
IE 560	Management Information Systems	3	IE323Engineering Economy & Management and EE201 Computer Skills II
Design & analysis of information systems for management of all types of organizations. Programming & design of Data base management systems. Computer networks & distributed databases, Selections of software and / or hardware for information systems. E-commerce and digitization			

Course No.	Course Name	C.H.	Pre-requisite
IE566	Total quality management	3	803370 Quality Control
Introduction to Total Quality Management (TQM), Leadership, Customer Satisfaction, Employee Involvement, Continuous Process Improvement, Supplier Partnership, Performance Measures, Tools and Techniques of TQM, ISO 9000 and Excellence Awards.			

Course No.	Course Name	C.H.	Pre-requisite
IE 572	Lean Production Systems	1	co-requisites: IE 565 Industrial Facility Planning
Basic lean principles and tools/ techniques such as Value Stream Mapping (VSM), Just in Time (JIT) and Kanban, 5S- process, Quick changeover, Zero defect quality control, Set up time reduction, continuous improvement (kaizen).			

Course No.	Course Name	C.H.	Pre-requisite
IE 573	Data Sci. Applications For Eng. And Business Intel.	1	IE 413 introduction to data analytics and machine learning
This course aims to build student competence in digital transformation, digital factory modeling, and digital factory analysis.			

Course No.	Course Name	C.H.	Pre-requisite
IE 575	Design of Experiments	3	IE 232 Statistics and probability 2
Design fundamentals, completely randomized design; randomized complete blocks; Latin square; multiclassification; factorial; nested; incomplete block and fractional replications for 2^n , confounding; general mixed factorials; split plot; analysis of variance in regression models.			

Course No.	Course Name	C.H.	Pre-requisite
IE 576	Enterprise Resource Planning	3	IE 471 Production Planning and Control
Evolution of ERP; what is ERP? Reasons for the Growth of ERP; Scenario and Justification of ERP; Evaluation of ERP; Various Modules of ERP; Advantage of ERP.			

Course No.	Course Name	C.H.	Pre-requisite
IE 577	Risk Management	3	IE 457 Human factor and safety
Approaches to Defining Risk, Impact of Risk on Organizations, Types of Risks, Scope of Risk Management, Enterprise risk management, project risk management, Principles and Aims of Risk Management, Risk Classification Systems, Risk Analysis and Evaluation, risk in Supply Chain Management			

Course No.	Course Name	C.H.	Pre-requisite
IE 578	Artificial Intelligence	3	IE 413 introduction to data analytics and machine learning
Introduction to AI, Propositional logic, Fuzzy logic, Pattern recognition, neural networks, Decision trees, Population based search.			

Course No.	Course Name	C.H.	Pre-requisite
IE 579	IoT Applications For Industrial Engineering	3	IE 413 introduction to 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 language and 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
IE 582	Safety Management Systems	3	IE 457 Human factor and safety
This course will explain how to apply concepts, principles, elements, tools of prevention and develop interventions, and initiatives to mitigate occupational injuries, illnesses and deaths. It addresses the philosophical basis for all of the varied components and elements needed to develop and manage a safety and health program.			

Course No.	Course Name	C.H.	Pre-requisite
IE 592	Special Topics in Industrial Engineering I	3	Department approval

Selected topics of current interest in industrial engineering, designed to give the student an opportunity 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 approval

Selected topics of current interest in industrial engineering, designed to give the student an opportunity 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

To introduce the students with the fundamentals of atomic bonding, crystal structure and crystal defects, diffusion in solids and solid solutions, equilibrium phase diagrams in binary alloys, Iron-carbon phase diagram, and principles of heat treatment of 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), hardenability test (Jominy end 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. Center 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 .

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 337	Discrete Math	3	IE 330 operation research 1

Mathematical logic, proof techniques, especially mathematical induction, set theory, functions, and relations, procedures, recursion, and operation counts, recurrence relations, analysis of algorithms, counting methods, permutations and combinations, graphs and trees.

Course No.	Course Name	C.H.	Pre-requisite
ME 345	Thermal Fluid Sciences	3	CEE 203 Advanced Engineering Math I

Thermodynamics: basic concepts, energy, energy transfer by work, first law of thermodynamics, properties of pure substances, thermodynamics cycles. Fluid mechanics: viscosity, fluid statics, fluid kinematics. Heat transfer: mechanisms of heat transfer, and heat exchangers.

Course No.	Course Name	C.H.	Pre-requisite
ME 461	Measurements and Instrumentations	3	IE 310 Manufacturing Processes 1

Principles of measurements and the analysis of experimental data, the basics of electrical measurements and sensing devices, the measurements of pressure, temperature, level, speed, torque, fluid flow and others

Course No.	Course Name	C.H.	Pre-requisite
ME 462	Measurements and Instrumentations Lab	1	IE 461 Measurements and Instrumentations

The lab contains different topics related to measurements: Principles of measurements and the analysis of experimental data, the basics of electrical measurements and sensing devices, the measurements of pressure, temperature, level, speed, torque, fluid flow and others

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.			