

B.Sc. in Industrial Engineering Study Plan

University Compulsory Courses 16 C.H Page (64)

University Elective Courses 9 C.H Pages (64 & 65)

Faculty Compulsory Courses 32 C.H

Line No.	Code	Course	
224000	CHE400CH	PROFESSIONAL ETHICS FOR ENGINEERS	1
242020	EE202EE	COMMUNICATION SKILLS FOR ENGINEERS	2
901010	MATH101	CALCULUS(1)	3
901020	MATH102	CALCULUS (2)	3
902010	MATH201	INTERMEDIATE ANALYSIS	3
902030	MATH203	ORDINARY DIFFERENTIAL EQUATIONS	3
911010	CHEM101	GENERAL CHEMISTRY(1)	3
911020	CHEM102	GENERAL CHEMISTRY (2)	3
911072	CHEM107B	GENERAL CHEMISTRY LAB	1
921010	PHY101	GENERAL PHYSICS (1)	3
921020	PHY102	GENERAL PHYSICS (2)	3
921072	PHY107B	GENERAL PHYSICS (LAB)	1
1731150	CS115	C++ PROGRAMMING LANGUAGES	3

Department Compulsory Courses 93 C.H

Line No.	Code	Course	
243031	EE303	PRINCIPLES OF ELECTRICAL ENGINEERING	3
243051	EE305	NUMERICAL METHODS FOR ENGINEERS	3
251010	ME101	ENGINEERING WORKSHOPS	2
251011	ME101A	ENGINEERING WORKSHOP (LAB)	0
252010	ME201	ENGINEERING DRAWING(B)	2
292110	IE211	MECHANICS OF MATERIAL	3
292120	IE212	DYNAMICS AND VIBATION	3
292140	IE214	FLUIDS AND THERMAL SCIENCES	3
293220	IE322	CAD LAB	1
293240	IE324	MACHINE COMPONENT DESIGN	3
293310	IE331	ENGINEERING MEASUREMENT	2
293330	IE333	ENG MEASUREMENT LAB	1
293410	IE341	ENGINEERING ECONOMY	2
293430	IE343	APPLIED ENGINEERING STATISTICS	3
293440	IE344	OPERATIONS RESEARCH (1)	3
293450	IE345	WORK MEASUREMENT AND ANALYSIS	3
293610	IE361	ENGINEERING MATERIALS	3
293643	IE3641	MANUFACTURING PROCESSES (1)	3
293650	IE365	ENGINEERING MATERIAL LAB	1
294200	IE420	DESIGN OF MACHINERY	2
294310	IE431	CONTROL AND AUTOMATATION	3
294320	IE432	CONTROL AND AUTOMATION LAB	1
294410	IE441	QUALITY CONTROL	3
294440	IE444	COST ACCOUNTING AND ANALYSIS	3
294480	IE448	SIMULATION	3
294520	IE452	PRODUCTION PLANNING AND INVENTORY CONTROL	3
294530	IE453	HUMAN FACTORS ENGINEERING	3

294540	IE454	HUMAN FACTORS LAB	1
294550	IE455	OPERATIONS RESEARCH (2)	3
294660	IE466	MANUFACTURING PROCESSES (2)	3
294670	IE467	MANUFACTURING PROCESSES LAB	1
294920	IE492	ENGINEERING TRAINING	3
295431	IE543A	MANUFACTURING INFORMATION SYSTEMS	3
295480	IE548	FACILITIES PLANNING	3
295740	IE574	RELIABILITY AND MAINTENANCE MANAGEMENT	3
295910	IE591	GRADUATION PROJECT (1)	1
295920	IE592	GRADUATION PROJECT (2)	3
295930	IE593	PRODUCT DEVELOPMENT LAB	1
902350	MATH235	PROBABILITY & STATISTICS (FOR ENGINEERING STUDENTS)	3

Specialization Elective Courses 9 C.H

Line No.	Code	Course	
295210	IE521	TOOL AND DIE DESIGN	3
295310	IE531	PL CS IN MANUFACTURING	3
295390	IE539	SPECIAL TOPICS IN DESIGN	3
295510	IE551	LEAN PRODUCTION SYSTEMS	3
295520	IE552	SUPPLY CHAIN MANAGEMENT	3
295530	IE553	ENTERISE RESOURCE MANAGEMENT	3
295540	IE554	HUMAN RESOURCE MANAGEMENT	3
295553	IE555C	SAFETY ENGINEERING AND MANAGEMENT	3
295560	IE556	TOTAL QUALITY MANAGEMENT	3
295570	IE557	INTRODUCTION TO PROJECT MANAGEMENT	3
295580	IE558	ENTREPREENURSHIP FOR ENGINEERIS	3
295590	IE559	SPECIAL TOPICS IN ENGINEERING MANAGEMENT	3
295700	IE570	SPECIAL TOPICS IN ENGINEERING MATERIALS	3
295710	IE571	COMPUTER- AIDED DESIGN&MANUFACTURING (CAD/ CAM)	3
295790	IE579	SPECIAL TOPICS IN MANUFACTURING	3

TOTAL 159 C.H

*** For prerequisite & equivalent courses see the Courses' Description.**

B.Sc. in Industrial Engineering

Courses' Description

IE 211 Mechanics of Materials 3C, 3H

The course covers force vectors, equilibrium of force systems, rigid body equilibrium, internal forces, and stress and strain. The course also covers generalized Hook's law, axial loading, torsion of circular shafts, bending and shear of beams, and combined loadings.

Pre-requisite: phys 101

IE 212 Dynamics and Vibrations 3C, 3H

The course covers planar kinematics of rigid bodies, relative motion analysis of velocity and acceleration, planar kinetics of rigid bodies: force and acceleration, work and energy methods. The course also includes an introduction to free vibrations: harmonic motion, viscous damping, response to harmonic excitation of undamped and damped systems, and an introduction to forced vibrations. *Pre-requisite: Math 203*

IE 214 Fluids and Thermal Sciences 3C,3H

The course covers fluid properties, flow classifications, fluid statics, conservation of mass equations, conservation of momentum equations, and conservation of energy equations. The course also covers properties of pure substances, P-V-T phase diagrams, property tables, first and second law of thermodynamics, one-dimensional steady-state conduction, free convection, and radiation heat transfer. *Pre-requisite: Chem 102*

IE 322 Computer-Aided Drafting (CAD) Lab 1C, 3H

The lab covers 3D modeling utilizing different CAD software packages, Drawing of key mechanical elements, Mechanical assembly, Projected and sectional views, Drawing documentation, and Practical implementations of learned CAD techniques in team project. *Pre-requisite: ME 201*

IE 324 Machine Component Design 3C, 3H

The course covers the design methodology, a review of mechanical properties, failure theories for machine elements under static and dynamic loadings, and the design of shaft, power screws, threaded fasteners, belt drives and chain drives, roller and journal bearings, and spur gears. *Pre-requisite: IE 211*

IE 331 Engineering Measurements 2C, 2H

The course covers the process of measurement, standards Common types of error, displacement and dimensional measurement, fixed and deviation types of gauges, strain and stress analysis and measurement, temperature, electrical and acoustical measurements. *re-requisite: ME 101*

IE 333 Engineering Measurements Lab 1C, 3H

The lab includes experiments on linear measurement, angular measurements, fixed and deviation types of gauges, optical measurements, temperature measurements, and electrical measurements. *Co-requisite: IE 331*

IE 341 Engineering Economy 2C, 2H

The course covers cost concepts, time value of money, interest formulas, cash flow and equivalence calculations, inflation and taxation, measures of investment worth, projects evaluation, depreciation, break-even analysis, and replacement analyses. *Pre-requisite: Math 201*

IE 345 Work Measurement & Analysis 3C,3H

The course covers basic traditional and modern IE methods with a focus on process mapping, Motion and Time Study (MTS), work methods and standards, work station design, lean techniques, labor efficiency, and Job evaluation. *Pre-requisite: EE 202*

IE 343 Applied Engineering Statistics 3C, 3H

This course begins with a review of statistical inference, covers the application of regression analysis in engineering problems, provides the tools necessary for the design of engineering experiments with single and multiple factors, introduces the method of analysis of variance (ANOVA), highlights the use of non-parametric statistics, and includes the use of related statistical software tools such as Minitab, Statistica, SAS, and SPSS. *Pre-requisite: Math 235*

IE 344 n Operations Research I 3C,3H

The course covers basic principles of Operations Research with a focus on formulating and solving mathematical models analytically and using software tools. Course topics include linear programming and its applications in production, logistics, and project management (Transportation, transshipment, Assignment, and Network models). *Pre-requisite: EE 305*

IE 361 Engineering Materials 3C, 3H

The course covers atomic structure and bonding, structure of materials (metal, polymer, ceramics, and composites), elastic and plastic deformation, solution hardening, dispersion hardening, introduction to phase diagrams, ferrous and non ferrous metals (steel, cast iron, aluminum and copper), and an introduction to advanced materials. *Pre-requisite: IE 211*

IE 365 Engineering Materials Lab. 1C, 3H

The lab includes experiments on tensile, hardness, fatigue, impact, and creep tests, macro and micro-examination of materials, effect of cold working and heat treatment on metals, hardening and tempering of steel, Jiminy test, Carburizing of low carbon steel, and Non-destructive tests.

IE 364 Manufacturing Processes (1) 3C,3H

The course includes an introduction to manufacturing processes with a focus on metal casting, rolling, forging, extrusion, drawing, machining, and joining (welding, brazing, soldering, adhesive bonding, and mechanical fastening).

IE 420 Design of Machinery 2C, 2H

The course covers Kinematics fundamentals, Mobility, Mechanism type diagrams, Position analysis, and introduction to graphical and analytical linkage synthesis, Velocity and acceleration analysis, Cam mechanisms, Indexing Mechanisms, and Gear Mechanisms.

IE 431 Control and Automation 3C, 3H

The course covers an introduction to linear feedback control theory, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graph, time domain analysis of control systems, test signals, transient response, time domain specifications, steady-state error and stability. The course also covers sensors, actuators, A/D and D/A conversion, hydraulic and pneumatic systems, Programmable Logic controllers (PLCs) and Computer Integrated Manufacturing (CIM). *Pre-requisite: IE 331, EE 303*

IE 432 Control and Automation Lab 1C,3H

The lab includes experiments and practical training on control of mechanical systems using P/PD/PID Controllers, control of x-y table using stepper motors, developing ladder logic programs for PLCs, pneumatic control and servo control systems, control system implementation using related engineering software applications such as Mat lab, Lab view, and Simulink, identifying different types of sensors, and CIM (Robotics, Conveyor, and Machine Tools). *Pre-requisite: IE 431*

IE 441 Quality Control 3C, 3H

The course covers the concepts and methods of quality, engineering specifications and tolerances, quality charts, statistical process control (SPC) using control charts of variables and attribute data, acceptance sampling, process capability indices, and cost and management aspects of quality. *Pre-requisite: IE 343*

IE 452 Production Planning and Inventory Control 3C, 3H

The course covers the concept of value chain with a focus on supply chain analyses, capacity planning, inventory models, and demand forecasting. The course also covers the development of a production plan using Master Production Scheduling (MPS) and Material Requirement Planning (MRP), job shop scheduling, and an introduction to lean manufacturing. *Pre-requisite: IE 344*

IE 4 Human Factors Engineering 3C, 3H

The course covers basics of ergonomics with a focus on anthropometric measurements, man-machine interaction, work space design using anthropometric data, design of hand tools, occupational hazards, and design of work environment. *Pre-requisite: IE 345*

IE 444 Cost Accounting and Analysis 3C, 3H

The course covers basic methods for cost accounting with a focus on product costing and pricing methods (job costing, process costing, and Activity Based Costing (ABC)) in addition to break-even analysis, cost-benefit analysis, performance measurement, and companies financial statements. *Pre-requisite: IE 341*

IE 454 Human Factors Lab 1C, 3H

This course aims to familiarize students with some experimental tools to understand the principles of workstation design. The student will learn how to apply ergonomics principles as well as motion and time study techniques to design an efficient and safe work place. The experiments include anthropometrics measurements, hand tool design, physical and physiological work load measurement, time measurements, application of motion economy, and human cognitive measurements. *Co-requisite: IE 453*

IE 455 Operations Research II 3C, 3H

The course is a continuation of the first course in Operations Research (OR I: IE 344). The focus is on complementary concepts and methods of Integer Linear Programming (ILP), Goal Programming (GP), Probabilistic Models (PM), Decision and Risk Analysis (DA), Queuing Systems (QS), and Simulation Modeling (SM). *Pre-requisite: IE 344*

IE 448 Simulation 3C, 3H

The course covers the development and analysis of Discrete Event Simulation (DES) models of production and service systems using a specialized simulation package. The focus is on simulation mechanics, model building, validation, and verification, statistical model input/output analysis, comparing simulated systems,

running simulation experiments and what-if analysis, and managing simulation projects. *Pre-requisite: IE 455*

IE 466 Manufacturing Processes (2) 3C, 3H

The course is a continuation of the first course in manufacturing processes (IE 363) with a focus on sheet-metal forming processes, forming and shaping of plastics and composite materials, forming and shaping of ceramics and glass, powder metallurgy, rapid prototyping technologies, and advanced manufacturing processes. *Pre-requisite: IE 364*

IE 467 Manufacturing Processes lab 1C, 3H

The lab includes practical experiments and training on sand casting process and defects, special casting processes, gas welding, electric arc welding, sheet metal forming and press working, machining, cutting force measurement, CNC machines, Robotics, wear measurement, plastic injection molding, blow molding, thermoforming, and rotational molding. *Co-requisite: IE 466*

IE 492 Engineering Training 3C, 3H

This is a practical training course in which the student selects a company approved by the department and spends the eight training period and writes a technical report on his training activities and results.

IE 548 Facilities Planning 3C, 3H

The course covers material flow analysis, plant layout design using specialized software, facility location, material handling systems (MHS), materials storage and distribution systems, and employee services and space requirements.

IE 543 Manufacturing Information Systems 3C, 3H

The course covers the basics of information engineering methods and techniques, enterprise database concepts and design, website development and internet processing, managerial and technical dimensions of information systems, and Telecommunications Implementation, integration of information technology in supply chain operations, data communications and LANs in manufacturing, and information flow control of networked flexible manufacturing.

IE 574 Reliability and Maintenance Management 3C,3H

The course covers basics of maintainability, availability, and safety of products and systems with a focus on maintenance role and types, building and analyzing reliability models, Fault Tree Analysis (FTA), and Failure Mode & Effect Analysis (FMEA). The course also covers concepts and methods of maintenance planning and management with a focus on reliability centered maintenance (RCM), total productive maintenance (TPM), and costing and scheduling of maintenance activities using computer maintenance management systems (CMMS).

IE 591 Graduation Project (1) 1C, 1H

This is a graduation project (1) course in which the student selects the topic and project and discuss it with his faculty advisor prepares a proposal of his graduation.

IE 592 Graduation Project (2) 3C, 3H

This is a graduation project (2) course in which the students apply his design and problem-solving skills in executing the proposal in graduation project(1) writing a technical report of project details and presenting results to department committee. *Pre-requisite: IE591*

IE 593 Product Development Lab 1C, 3H

The course is a team projects on product development with an emphasis on benchmarking QFD, concurrent

engineering, reverse engineering, and value engineering in addition to the design of production system and basics of product realizations. *Pre-requisite: IE 420*

B. Elective Courses

IE 521 Tool and Die Design 3C, 3H

The course discusses the role of tool design in manufacturing, design of cutting tools, design of dies for various manufacturing processes, clamping and work-holding principles, and design of jigs and fixtures. *Pre-requisite: IE 466*

IE 531 PLCs in Manufacturing 3C, 3H

The course covers principles of discrete control, modeling of discrete systems, discrete transfer functions and stability analysis, ladder logic principles, logic control, discrete PID controllers, and PLCs case studies. *Pre-requisite: IE 431*

IE 551 Lean Production Systems 3C, 3H

The course covers the contemporary techniques of lean manufacturing with a focus on lean thinking, lean principles, value stream mapping, waste and inventory reduction, transition from MRP push to JIT pull production systems, shop floor scheduling and control, Total Productive Maintenance (TPM), and Kaizen continuous improvement. *Pre-requisite: IE 452*

IE 552 Supply Chain Management 3C, 3H

The course focuses on studying and analyzing production supply chain, vendor relations, supplier assessment, transportation models, facility location, designing warehouses and material handling systems, and analyzing data and information flow to manage materials flow and controlling logistics. *Pre-requisite: IE 452*

IE 553 Enterprise Resource Planning 3C, 3H

The course covers topics related to integrating various business functions in an organization in addition to organizational behaviour. This includes organizational structure, behaviour of individuals and groups in organizations, interpersonal and organizational communication networks, planning and coordinating production resources and logistics, CRM, and ERP databases and software tools. *Pre-requisite: IE 452, IE 543*

IE 554 Human Resource Management 3C, 3H

The course is an introduction to human resource management with a focus on hiring, training, developing, and retaining employees. The course covers employee benefits, health, safety, rights, privacy and security, employee and labor relations, compensation, and performance evaluation. The course also discusses the role of personnel departments, organizational strategic planners, and line supervisors. *Pre-requisite: IE 453*

IE 555 Safety Engineering & Management 3C, 3H

This course covers the critical role of safety engineering with a focus on safety national and international regulations, standards, and codes, safety analysis and human errors, appraising plant safety, hazards recognition and control, accident losses and its effect on organizations and the national economy, workers' compensation, and developing and maintaining safety programs. *Pre-requisite: Completing 100 hours*

IE 556 Total Quality Management 3C, 3H

The course covers Quality improvement philosophies, Total quality management (TQM) pillars, principles, and tools, quality management systems. ISO 9000 requirements and certification. Benchmarking, quality

function deployment (QFD), six-sigma, and national and international quality awards.

Pre-requisite: Completing 100 hours

IE 557 Introduction to Project Management 3C, 3H

This course covers the fundamentals of managing projects. Topics include: organization structure, project selection and scope definition, project team selection and development, work breakdown structures and statements of work, project scheduling, and budgeting, resource allocation, risk management planning, project controlling, and the application of project management software. *Pre-requisite: Completing 100 hours*

IE 558 Entrepreneurship for Engineers 3C, 3H

The course introduces students to the concepts and practices of entrepreneurship thinking. The course uses a combination of lectures, case studies, student-led discussion and team business plan, and investor presentation format to course teach students life skills that student can utilize in careers ranging from starting companies to instigating cutting edge R&D projects. Major course topics include introduction to entrepreneurship, idea generation, feasibility analysis, business planning, and characteristics of an entrepreneur. *Pre-requisite: CHE 400*

IE 571 Computer Aided Design & Manufacturing 3C, 3H

The course is an introduction to the concepts of computer-aided design and manufacturing (CAD/CAM). Subjects include design process, CAD/CAM integration, parametric design, surface modeling, solid modeling, design assembly, documentation with computer-aided drawings, dimensioning, engineering analysis with finite element analysis (FEA), computer numerical controls, and computer integrated manufacturing (CIM). *Pre-requisite: IE 322, IE 364*

IE 539 Special Topics in Design 3C, 3H

Selected topics in design. *Pre-requisite: Department Approval*

IE 559 Special Topics in Engineering Management 3C, 3H

Selected topics in engineering management. *Pre-requisite: Department Approval*

IE 570 Special Topics in Engineering Material 3C, 3H

Selected topics in engineering management. *Pre-requisite: Department Approval*

IE 579 Special Topics in Manufacturing 3C, 3H

Selected topics in manufacturing. *Pre-requisite: Department Approval*