IE Department - B.Sc. Course Description

0906111 Engineering Workshops **(1 Cr. Hr.)**

General safety, materials and their classifications, measuring devices and their accuracy, fits and tolerances, theoretical background for the practical exercises including fitting, forging, carpentry, casting, welding, mechanical saws, shearers, drills, lathes, milling machines, shapers and grinders.

0906201 Technical Writing **(1 Cr. Hr.)**
Prerequisite: 1502102

Basic technical writing concepts and techniques including report writing. Presentation skills.

0906251 Engineering Statistics-1 **(3 Cr. Hrs.)**
Prerequisite: 0301102

Quantitative and graphical descriptive statistics, probability concepts, discrete and continuous random variables and distributions, joint probability distributions, covariance and correlation of random variables, point and interval estimation, sampling distributions, hypothesis testing, introduction to simple linear regression. Practical exercises on the application of statistical methods in engineering.

0906273 Properties of Engineering Materials **(3 Cr. Hrs.)**
Prerequisite: 0303101

Bonding forces and energies. Classification of engineering materials. Crystallography. X-ray diffraction. Imperfection in solids and strengthening mechanisms. Diffusion. Metallography. Mechanical properties of materials. Material testing evaluation and failure. Thermal equilibrium diagram. Corrosion of metals and their protection. Case studies in material selection. Relative cost of materials.

0906274 Properties of Engineering Materials Lab **(1 Cr. Hr.)**
Prerequisite: 0906273

Destructive testing, hardness test, tension test, nondestructive testing, metallic composition testing using optical microscope, electrical and thermal conductivity testing.

0906303 Engineering Analysis **(3 Cr. Hrs.)**
Prerequisite: 1901102+0301202

Linear algebra, vectors, matrices, linear equations and their solution. Transformation methods, Fourier, Laplace, practical applications using MATLAB.

0906311 Manufacturing Processes-1/metal forming **(3 Cr. Hrs.)**
Prerequisite: 0904372
Mechanical behavior and forming of metals, different types of mechanical behavior and main factors affecting it. Yield criteria, representative stress and representative strain, work due to plastic deformation, classification of forming processes with respect to strain rate and temperature. Temperature rise in dynamic forming. Bulk deformation processes: forging, extrusion, rolling, rod and wire drawing. Sheet forming processes: blanking, deep-drawing and bending.

0906312 Manufacturing Processes (1) Lab **(1 Cr. Hrs.)**
Prerequisite: 0906310
Laboratory experiments dealing with basic material processing operations.

0906345 Systems Dynamics and Control (3 Cr. Hrs.)

Prerequisite: 0301202
Systems dynamics and modeling. Time response of systems. System stability. Design and analysis of closed-loop control systems using root locus techniques. Control by microprocessors. System characteristics. ID controllers, open-loop and closed control of systems.

0906346 Systems Dynamics and Control Lab (1 Cr. Hr.)

Prerequisite: 0906345
Lab experiments that include using existing System control packages such as MATLAB and LabView. PID controllers. Systems characteristics and stability.

0906352 Quality Control **(3 Cr. Hrs.)**
Prerequisite: 0906251
Concepts and statistical methods employed in the assurance of product conformance to specifications. Control charts for attributes and variables. Process capability analysis. Acceptance sampling plans
and military standards.

0906353 Operations Research-1 **(3 Cr. Hrs.)**
Prerequisite: 0906303
Mathematical modeling and operations research. Linear programming. Simplex algorithm. Duality. Transportation and assignment problems. Network models.

0906355 Engineering Statistics-2   **(2 Cr. Hrs.)**
Prerequisite: 0906251
Analysis of Variance, linear regression, full and fractional factorial design of experiments.

0906384 Methods Engineering & Work Measurements   **(3 Cr. Hrs.)**
Prerequisite: 0906251
Study of manufacturing and service methods and processes, analytical techniques of process flow and efficiency, improving processes study of time and movement, standardization of methods and time measurements, project.

0906401 Organization Design & Control   **(3 Cr. Hrs.)**
Prerequisite: 0906421
Strategic planning in organizations. Organization structures. Philosophies and models for organizing. Dynamics of organization. Change & self-organization. Organizational behavior & culture.

0906411 Manufacturing Processes-2/metal cutting   **(3 Cr. Hrs.)**
Prerequisite: 0906311
Fundamentals of material removal processes, cutting tools, cutting fluids, mechanics of chip formation and types of chips: Merchant's theory for determining different forces involved in the orthogonal cutting, power Consumption, different material removal processes, turning, drilling, shaping, milling, grinding, broaching, planning, reaming, vibration and chatter in material removal processes.

0906412 Manufacturing Processes Lab   **(1 Cr. Hr.)**
Prerequisite: 0906411
Experiments on metal Forming: extrusion, forging, blanking and deep drawing. Machining, welding and casting.

0906421 Production Planning and Control   **(3 Cr. Hrs.)**
Prerequisite: 0906353
Strategic issues in designing production planning and control systems. Supply Chain Management, Forecasting, Inventory Management, Aggregate Planning, Master Production Scheduling, and Materials Requirements Planning.

0906422 Facilities Planning   **(3 Cr. Hrs.)**
Prerequisite: 0906421
Strategic Facilities Planning, Location Selection. Product, Process and schedual Design. Flow, Space and Activity Relationships, Personnel Requirements. Material Handling. Layout, Computer-Aided Layout. Warehouses.

0906423 Cost Accounting   (3 Cr. Hrs.)
Prerequisite: 0906421
Concepts and theories in accounting and cost accounting, financial statements, product cost accounting models and methods, product cost accounting systems and computerized cost accounting systems.

0906437 Industrial Machines Design   (3 Cr. Hrs.)
Prerequisite: 0906411
Transmission mechanisms and kinematics. Joints, pulleys, and belts. Gears, gear trains, cams, clutches, brakes and flywheels. Hydraulic components and circuits, bolts, shafts, keys, and springs. System integration. Design project is part of the course.

0906441 Metrology Engineering and Measurements   (3 Cr. Hrs.)
Prerequisite: 0906411
Errors, linear, angular contour measurements, sine bar, rotating table. Fits and tolerances: interchangability, ISO shaft and hole systems of fits and tolerances. Thread metrology. Gear metrology; surface texture, out of roundness and flatness measurements. Flow and temperature measurements. Basic electrical measurements and sensing devices DC, AC bridge, and measuring systems, transducers, smart sensors and transmitters. Force, torque and strain measurements, design of load cells.

0906442 Metrology & Engineering Measurements Lab   (1 Cr. Hr.)
Prerequisite: 0906441
Experiments on alignment, angular measurements, diameters, surface roughness, out of roundness, screws, gears, thermocouples and oscilloscope.

0906445 Microprocessors in Industrial Engineering   (3 Cr. Hrs.)
Prerequisite: 0903207
Digital logic design, combinatorial logic, and sequential logic. Elements of microprocessor design. Microprocessors software and hardware. Real-time applications of microprocessors.

0906454 Algorithm Design and Programming   (3 Cr. Hrs.)
Prerequisite: 0906353
Advanced programming techniques. Introduction to Industrial Engineering algorithms and their programming. Sorting algorithms, search algorithms, shortest path, matrix operations, curve fitting.

0906481 Human Factors in Engineering (3 Cr. Hrs.)
Prerequisite: 0906384
Physical work and physical and physiological capacity and lumination, improving worker efficiency, anthropometry mental work and information input processing and decision making, design of displays and control, study of physical and social environment the work place.

0906482 Human Factors & Work Measurements Lab (1 Cr. Hr.)
Prerequisite: 0906481
Physical work and physical and physiological capacity and lumination, improving worker efficiency, anthropometry mental work and information input processing and decision making, design of displays and control, study of physical and social environment the work place.

0906483 Engineering Safety (3 Cr. Hrs.)
Prerequisite: 0906481
Study of hazards in the workplace, analytical tools of hazards and accidents, probabilistic concepts, safety and health syloms, national regulations and requirements, hazard control, safety and health management syloms.

0906500 Special Topics in Engineering Management (3 Cr. Hrs.)
Prerequisite: 0906598 (or co-requisite)
Course offered in special topics related to general areas of interest in engineering management.

0906501 Special Topics in Manufacturing (3 Cr. Hrs.)
Prerequisite: 0906598 (or co-requisite)
Course offered in special topics related to general areas of interest in manufacturing.

0906503 Industrial Engineering Information Systems (3 Cr. Hrs.)
Prerequisite: 0906422
Concepts of information systems, analytical tools, organization concepts, computer hardware and software, systems design and analysis, computer and communication systems.

0906513 Metallurgical Processes (3 Cr. Hrs.)
Prerequisite: 0906411
Metallurgy, heat treatment of materials, casting processes, welding processes and methods. Powder metallurgy.

0906522 Project Management   **(3 Cr. Hrs.)**
Prerequisite: 0901420

Basics of project management and its importance in project success and the achievements of objectives within constraints of time, Budget, and standards. Comprehensive integrated planning for all the activities required for project success using the project life cycle. Gantt chart, activity on arrow, activity on node for scheduling time, expenditure, and resources. Time/Cost analysis and resource allocation.

0906525 Logistics and Supply Chain Management   **(3 Cr. Hrs.)**
Prerequisite: 0906421

Analytic tools and their design, factory logistics management, forecasting methods, materials management algorithms, transportation management, transportation planning and scheduling. Design of supply chains.

0906526 Strategic Planning   **(3 Cr. Hrs.)**
Prerequisite: 0906421

Nature of strategic planning, development of a strategic plan. Setting vision, mission, and objectives. External evaluation, internal evaluation, analysis and selection of alternatives. Strategy implementation. Strategy review and evaluation.

0906527 Marketing Engineering   **(3 Cr. Hrs.)**
Prerequisite: 0906355

Market response models, sector decisions and direction, location decisions, strategic decisions based on market analysis, new product decisions, pricing and marketing decisions.

0906531 Computer Aided Design and Manufacturing   **(3 Cr. Hrs.)**
Prerequisite: 0906411

Fundamentals of computer aided engineering and design. CAD applications. Geometric modeling. Engineering analysis and finite element technique. Fundamentals of computer aided manufacturing. CNC concepts and part programming. CAD / CAM integration.

0906533 Product Design   **(3 Cr. Hrs.)**
Prerequisite: 0906437

Product life cycle, value analysis and engineering, design and development approaches, feasibility study, market and competitive products analysis, analytical techniques of product design and development product quality, cost, and time parameters, QFD analysis.

0906534 Tool and Die Design and Manufacture (3 Cr. Hrs.)
Prerequisite: 0906411

Tools, jigs, and fixtures design. Principles of jig and fixture design. Tool design. Classification of dies, main parameters to be considered in die design, sheet metal forming dies, forming dies. Materials used in dies, manufacturing of dies and its heat treatment.

0906542 Automation (3 Cr. Hrs.)
Prerequisite: 0906421

Basic production concepts, analysis of serial production lines, assembly line balancing, computer numerical control, industrial robots, automated material handling systems, automated storage and retieval systems. Lab experiments concentrate on familiarizing the student with the concepts studied in class and on PLC programming and applications.

0906551 Quality Management (3 Cr. Hrs.)
Prerequisite: 0906352

Leadership, customer focus, employee involvement, suppliers partnership, performance measures, tools of TQM, quality assurance systems.

0906552 Operations Research-2 (3 Cr. Hrs.)
Prerequisite: 0906454

Probabilistic and stochastic models used in industrial engineering systems: Markov processes, stochastic processes, queuing and their applications. Discrete and continuous processes.

0906553 Simulation (3 Cr. Hrs.)
Prerequisite: 0906421

Probabilistic models, manual simulation, input modeling, simulation modeling, verification and validation of simulation models, output analysis, tools for reducing the variance of simulation outputs, applications and case studies.

0906561 Reliability & Maintainability (3 Cr. Hrs.)
Prerequisite: 0906352

Statistical and analytical concepts of failures, failure and reliability models, life-cycle of machines and its relation with reliability and maintainability, reliability and quality, project.

0906562 Business Systems Modeling and Design (3 Cr. Hrs.)
Prerequisite: 0906503

Systematic thinking and modeling, business process modeling, supply chain modeling, model evaluation and validation, decision analysis modeling, effect of feedback.

0906572 Biomaterials Engineering (3 Cr. Hrs.)
Prerequisite: 0906273
Introduction to Biomedical Engineering and biomaterials, Properties of biomaterials, Structure and Assembly, Classes of biomaterials, Applications.

0906573 Plastics Engineering (3 Cr. Hrs.)
Prerequisite: 0906273
Polymeric materials. Polymer microstructures, mechanical, chemical and physical properties, thermoplastic, thermoset, and elastomeric materials, polymer processing and molds, designing with plastics.

0906574 Nanomaterials Engineering (3 Cr. Hrs.)
Prerequisite: 0906273
Introduction to Nanotechnology, Characterization of Nanomaterials, Nanoscale structure in metals, polymers and ceramics. And applications of nanomaterials.

0906575 Surface Technology (3 Cr. Hrs.)
Prerequisite: 0906411
Principles of tribology. Surface failures (Corrosion, Oxidation, and wear). Surface treatments to control corrosion, oxidation, and wear. Metallic and conversion coatings (electrochemical deposition, hot dipping, anodizing, phosphating hard phasing). Organic coating. Surface hardening. Carbonizing (gas, liquid and pack), Nitriding induction hardenity and flame hardening.

0906576 Materials Testing (3 Cr. Hrs.)
Prerequisite: 0906311
Data collection, error analysis. Tension tests, bending tests, hardness tests, strain, nondestructive testing, ultrasonic testing, electrical testing, radiation testing.

0906577 Composite Materials and Powder Technology (3 Cr. Hrs.)
Prerequisite: 0906273
Classification of composite materials, hardening, metallic matrix, polymer matrix, ceramic matrix, powder technology, powder manufacture.

0906578 Design for Manufacturing (3 Cr. Hrs.)
Prerequisite: 0906411
Material and process selection, design for manufacture in forming processes, DFM in casting processes. Design for assembly.

0906579 Rapid Prototyping and E-Manufacturing (3 Cr. Hrs.)
Prerequisite: 0906437
Rapid prototyping techniques, rapid prototyping applications, e-manufacturing, integrated e-manufacturing.

0906580 Design of Manufacturing Systems   (3 Cr. Hrs.)
         Prerequisite: 0906421
Introduction to production systems and processes, analysis of production systems, cellular manufacturing, flexible manufacturing, computer integrated manufacturing.

0906581 Manufacturing Strategy   (3 Cr. Hrs.)
         Prerequisite: 0906411+0906421
Manufacturing strategy and operations management, process selection, technology management, product and process development, agile manufacturing, lean manufacturing, six-segma.

0906599 Graduation Project   (3 Cr. Hrs.)
          Prerequisite: Completion of 124 Credit hours
Graduation project in industrial engineering. A comprehensive project in which the student applies the knowledge and skills accumulated from different courses in some area of industrial engineering.