Course Curriculum of the Department of Industrial and Production Engineering

Courses offered by IPE Department

Core Courses:

IPE 101: Economics for Industrial and Production Engineering.
3 credit hours

The basic ideas of microeconomics and macroeconomics in developing economy. Theory of firms, theory of production, consumption, costs, pricing and distribution of income, markets and their equilibrium, Comparative economic system, input-output, analyzing. Allocation of resources. Employment, Inflation, economic indicators of development, market economy.

IPE 104: Engineering Graphics Sessional
1.5 credit hours

Projection Graphics: Introduction, geometrical constructions, orthographic projections, axonometric projections and perspectives.

Spatial Graphics: Descriptive geometry: traces of lines, points, lines and planes, parallelism and perpendicularity, surfaces; Intersections and development, methods of revolution.

IPE 202: Computer Programming Sessional
1.5 credit hours

Introduction to computer and its system, Operating systems, Algorithms and flowcharts, Introduction to Programming Languages, FORTRAN, C++, Numerical solution of algebraic and transcendental equations, matrics, interpolation.

Computer applications in solving Industrial and Production Engineering Problems, computer packages: Introduction and use.

IPE 204: Engineering Graphics and Introduction to CAD Sessional
1.5 credit hours

Product Graphics: Drafting codes as per ISO, tolerances and dimensioning, ensuring co-axiality, perpendicularly and parallelism compatible to manufacturing and assembly requirements, schematic product symbols for welding and piping systems.

System Graphics: Working drawings of cumulative and non cumulative assemblies, dimensioning of assebled parts, use of standard parts threads, fasteners and springs, detailing of assembled parts.

CAD: Constructing geometry, transformation.

Viewing and clipping Perspectives, modeling: generation of curves and surfaces, an introduction to solid modeling, automatic dimensioning and generation of bill of materials.

IPE 205: Manufacturing Process I
3 credit hours

Classification of manufacturing processes, casting processes for ferrous and noon-ferrous metals; sand, die, centrifugal, slush, plaster mold, loam mold, precision investment casting etc. casting defects, design of moulds, riser, gate sprue and core, cost analysis.

Joining methods: Soldering, brazing, welding, conventional welding processes: gas, arc, TIG, MIG, thermit, resistance, friction, electroslag etc. Special welding processes: LASER, electron beam, submerged arc etc. Precision and non-precision surface finishing operation. Hot and cold extrusion, press working operations. Etc.

Manufacturing of ceramic and glass products, powder metallurgy.

IPE 206: Manufacturing Process I Sessional
0.75 credit hours

Sessional work compatible to course No. IPE 205.

IPE 207: Probability and Statistics
4 credit hours

Basic laws of probability, conditional probability, Random variables; Measures of central tendency and dispersion, Mathematical expection; Probabilitydistributions, transformation of variables; Moments and moment generating functions; Sampling; Central limit theorem; Chisquare distribution, t-distribution, F-distribution: Estimation and confidence interval; statistical hypothesis and testing; goodness-of-fit tests;

Correslation and regression analysis, analysis of variance; Experimental designs; Randomized block design, Factorial design.

Introduction to stochastic problems in engineering.

IPE 209: Engineering Economy
2 credit hours

Introduction to engineering economic decision making common to engineering, cash flow analysis and basic concepts of discounting, cost of capital, required ROR equivalence etc.

Business mathematics; Investment appraisal criteria for economic decisions, present worth, internal rate of return, social consideration in investment, benefit-cost ratio, etc.

Decisions involving taxes, depreciation and Inflation; sensitivity analysis.

IPE 301: Measurement, Instrumentation and Control
3 credit hours

Introduction to fundamentals of engineering measurements; study and use of instrumentation and control systems.
Linear measuring system, instruments Limits, fits and gauges: ISO system of limits and Fits. Precision dimensional measurement of length, and angles, roundness profiles and flatness, surface roughness and texture, wear Taylor's principles on limit gauges; abbey's principle, Measuring threads, gears; measurement; ultrasonic measurement, measurement by light-wave interference; Electrical and electronic measurement, Digital recording by LASER and LASER beam dimension measuring system. Opto-electronic dimensional gauging. Non-destructive testing methods (NDT methods) Inspection and kinds of inspection Testing and calibration testing; of gauges, dynamic measurement.

The characteristics and use of analogue and digital instrumentation applicable to industrial engineering problems, Statistical methods for developing system specifications; Basic concepts of modern instrumentation.

Concepts and importance of control system, control system description; state variable and transfer function representation. Sensitivity, concepts of feedback-the feedback control system; electromechanical controls; digital computer control.

IPE 302: Measurement, Instrumentation and Control Sessional
0.75 credit hours

Sessional work compatible to course no. IPE 301

IPE 303: Production Design I
3 credit hours

Functional aspects of a product, environment and human factors in design, value engineering, Design morphology, standardization, ISO 9001. Understanding customer needs, Establishing product function specification, development, concept generation and evaluation.

Designing of machine parts for strength, deflection stiffness, fatigue Impact etc., Designing of Shaft, Key and Power Screw. Coupling, Clutches, Brakes.

IPE 304: Product Design I Sessional
1.5 credit hours

Sessional work compatible to course no. IPE 303

IPE 305: Manufacturing Process II
3 credit hours

Metal removing processes: Chip formation and tool design, tool geometry, chip breakers.

Theory of metal cutting: Cutting forces, metal cutting dynamometers, economics of metal cutting, tool life.

Different machining processes – turning, drilling, shaping, planning, milling, grinding, reaming, broaching, etc. Manufacture of threads and gears, modern machining processes: electro-chemical, electro-discharge, plasma etc, LASER beam, electron beam, ultrasonic and abrasive jet machining.

Plastics : plastic product manufacturing processes: compounding, extrusion, injection moulding, compression moulding, blow moulding, vacuum forming and hand lay up.

Selection of manufacturing processes on the basis of product characteristics and manufacturing economy.

IPE 306: Manufacturing Process II Sessional
0.75 credit hours

Sessional works compatible to course no. IPE 305.

IPE 307: Operation Research
4 credit hours

Introduction and scope of Operations Research, Introduction to Mathematical Modeling: Different kinds of modeling and their characteristics.

Classical optimization techniques involving single variable and multiple variables with and without constraints.

Linear models: Simplex algorithm, duality, Sensitivity analysis; Transportation and Assignment algotithm, duality, Sensitivity analysis, Transportation and Assignment algorithms; Game theory.

Integer programming; Dynamic Programming; Queuing models; Introduction to simulation.

Application: Engineering, business and other sectors of economy.

IPE 311: Materials Handling and Maintenance Management
3 credit hours

Issues and importance of handling of materials: Analysis of material handling problems Classification of materials, unit load, bulk loads, Study of material handling systems and their efficiency. Selection and classification of material conveying equipment.

Product handling: Design system configuration conforming to various kinds of product features and layout characteristics.

Designing concepts common handling and transfer equipment: different types of conveyors such as belt, screw, chain, flight, bucket elevators, pneumatic hydraulic,; cranes, and forklifts. Design of ware house facilities appropriate for relevant handling and transfer device. Automatic packaging devices: Testing procedure of packages: vibration test, drop test, performance limits and testing machines. Algorithms to design and analyze discrete parts material storage and flow system such as Automated Storage/Retrieval System (ASRS), order picking, automated guided vehicle system (AGVS).

Maintenance Management: Concept of maintenance and value of maintenance management; maintenance organization and department structure (resource and administration), Types of maintenance, Fixed time replacement, condition based maintenance, preventive and corrective maintenance, Replacement strategies, Documentation and computer control in maintenance management, Implementation of maintenance planning, plant asset management, human factors in motivation skills in a maintenance environment.

IPE 312: Materials Handling and Maintenance Management Sessional
0.75 credit hours

Sessional work compatible to course no. IPE 311.

IPE 313: Cost and Management Accounting
3 credit hours

Basic Concepts: Scope and application of cost and management accountancy. Costing methods and techniques. Income measurement in manufacturing companies.

Material costing and labour costing.

Overheads and their allocation. Marginal costing and decision making among alternative courses of action. Marginal costing vs. total absorption costing. Case study.

Financial statement analysis: Understanding the financial statement, Tests for probability liquidity, solvency and overall measure.

Budgets and their control.

IPE 315: Operations Management
3 credit hours

Integrated purchase-production-marketing system, production systems, product/service life cycle, forecasting models, bill of materials, material and inventory management: Inventory models, ABC analysis, coding and standardization. Aggregate planning, MPS, MRP, capacity planning, operating scheduling.

Work study: MRP II, Optimized Production Technology, Group Technology, TQC, and JIT.

IPE 317: Product Design II
3 credit hours

Reverse engineering, alternative solutions and their evaluation, designing for assembly and disassembly, reliability, product life cycle, cost analysis, use of standard parts, application of CAD software.

Prototype design, designing of engineering systems involving shafts, bearings, linkages, couplings, clutches, brakes, gears, power transmission, etc.

IPE 318: Product Design II Sessional
1.5 credit hours

Integrated design based on the knowledge of reverse engineering reliability, cost analysis, strength, etc.

IPE 319: Quality Management
3 credit hours

Emergence of modern concept of quality and its management, quality redefined, identification of quality characteristics: quality of design, conformance and performance; Deming's principle on quality and productivity. Quality costs and their interpretation.

Control and measurement concept of quality: Elementary SPC tools-PDCA cycle, Pareto's law, cause and effect (fishbone), control charts-attribute control charts and variable control charts, Measurement of variation and process capability analysis. Design of experiments- identification of key variables for major variations.

Acceptance sampling plans: OC curves, single and double sampling plants, sequential and rectifying inspection plans AOQ.

Quality and Reliability: failure and survival probability; hazard rate, component and system reliability and its prediction; failure mode and fault tree analysis, reliability testing.

Quality standards and their compliance, ISO 9000 and ISO 14000. Foundations of quality revised – Total Quality Management (TQM), application of TQM philosophy, Frontiers of quality.

IPE 320: Quality Management Sessional
0.75 credit hours

Sessional work compatible to course no. IPE 319.

IPE 300: Industrial Practice
6 weeks, 1.5 credit hours

IPE 401: Machine Tools
4 credit hours

Characteristics of machine tools, recent development in the design of machine tools. Drive system of machine tools, design of mechanical drive, speed gear boxes, feed gear boxes, infinitely variable drives, PIV and other mechanical stepless drives, hydraulic drives, electrical drives, Bearings, spindles, slide ways of machine tools, machine tool structure. Location principles and locations, clamps

Detailed case study of engine, turret and automatic lathes, drilling machines, shaper machines, planer machines, milling machines, grinding machines, gear shaping and gear hobbing machines, forging machines. Dynamics of machine tools, installation and acceptance tests of machine tools, automatic transfer lines.

IPE 402: Machine Tools Sessional
1.5 credit hours

Sessional work compatible to course no IPE 401

IPE 403: Project and Environment Management
3 credit hours

Project: identification, planning, apprasal, project unplementation project organization, budgeting, scheduling, using bar diagram, CPM, PERT, resource allocation, information system and project control, project termination, project organizations, matrix organization, project manager, contract negotiation and conflict resolution, Case study: planning and evaluation of an investment project.

Environmental impact assessment of projects

Source of degradation of earth's eco0cystem technological development, green house gases, ozone layer depletion, toxic gases and industrial wastes, Montreal protocol, remedies Noxout China-sun refrigerant technologies and use of catalysts, Environmental economics and accounting system.

IPE 405: Theory of Machine Tool Mechanisms
2 credit hours

Introduction, Mechanisms of Machine Tools: Spindles, clutches, Brakes, gearing systems, etc Torques and power consumption in Machine Tools, Forced Vibrations of Machine Tool mechanisms: Torsional vibrations, balancing of rotary parts of machine tools, vibration absorption, isolation and vibration dampers.

Theories of low and high frequency chatter formation in machine tools, Methods of damping chatter of machine tool mechanisms.

IPE 407: Ergonomics and Safety Management
3 credit hours

Man-Machine-Material interfaces in manufacturing: physical and cognitive aspects, Comparative advantages of man and machine, Physical work and human muscular effort, Bio-mechanics and bio-engineering.

Anthropometry, work place design and work place layout, human performance under environment temperature, illumination, vibration, noise, pollution radiation static and dynamic conditions.

Evolution of modern safety concepts, Industrial hazard, safety and risk management, productivity, worker health and safety, proactive management techniques for safety management, safety standards and regulations for engineering works, case studies.

IPE 408: Ergonomics and Safety Management Sessional
0.75 credit hours

Sessional work compatible to course no. IPE 407

IPE 409: CAD/CAM
3 credit hours

CAD: fundamental concepts, application, hardware and software, types of CAD systems, common 2D CAD software features, basic 3D CAD features.

CAM: Fundamental concepts, trend of development of NC, principles of NC, types of NC sytems and machines, NC manual part programming, CNC part programming using APT language, interfacing CAM software with CNC machines, implementing the CAD/CAM system Principles of FMS.

Robotics: Industrial Robots, robot anatomy (structure) and robot configuration, robot drive and control systems, robot sensors, robot applications.

IPE 410: CAD/CAM Sessional
0.75 credit hours

Sessional work compatible to course no. IPE 409

IPE 411: Industrial and Business Management
3 credit hours

Business and Management process, managerial function of business and then relative importance, managerial skills and development.

Emergence of management thought and the patterns of management analysis scientific management and Taylor's Principle, Modern operational-management theory, emergence of the behavioral sciences, recent contributors to management thought.
Management and Society: the external environment, social responsibility and ethics.

Organization and management: system approach to organization, organization theory and organizing practices, basics of organizing.

Personnel and human resource management in business human factors and motivation, leadership, group decision making and communication, Job gradation, process of performance appraisal and reward systems.

Managing information for decisions and management information systems.

Management in operations and business: systems approach to operation management and business, managing the marketing of goods and service, total marketing activity, marketing mix, some selected topics of marketing such as, Industrial and consumer selling, advertising, new product strategy and decisions.

Management in the international selling, management revisited and challenges for management in the twenty first century.

IPE 415: CNC Machine Tools
3 credit hours

CNC concepts: hardware, input-output systems and interfacing in CNC machine tools.

Principles of CNC machine tool elements: actuators, feedback devices, interpolators, machine control unit, micro-electro-mechanical devices.

Control systems of CNC machine tools: point-to-point system, contouring system, adaptive control.

Case-study of a CNC machine tool.

IPE 419: Computer-Integrated Manufacturing
(3 Credits)

Role of computers in manufacturing; Computer aided process planning; Hardware and software components of computer automations: PLC, robots, and software: Automated

material handling and storage systems; Computer control of manufacturing systems; Flexible manufacturing system, Factory of the future.

IPE 421: Modern Machinery and Machining Processes
(3 Credits)

Modern machining processes: ultrasonic machining, abrasive jet machining, abrasive flow machining, orbital grinding, water jet cutting, electrochemical machining, electrical discharge machining, electron beam machining, laser beam machining, plasma arc machining, chemical machining; working principles of the related machines.

IPE 423: Advanced Materials and Processing
(3 Credits)

Super alloys; Metal matrix composites, Ceramic matrix composites, Other composites; Polymers; Biodegradable plastics: Ceramics: Electronic materials

Powder metallurgy and particulate materials

IPE 425: Micro-Manufacturing
(3 Credits)

Micro elements: design and fabrication; Basics of micro-fabrication technology: thin film growth and deposition, photolithography, X-ray lithography, wet and dry chemical etching, electrochemical machining, ultrasonic machining, plasma machining and laser machining.

IPE 427: Marketing Management
(3 Credits)

Marketing concepts: market orientation, relationship marketing, market segmentation and measurement, buyer behavior; Marketing planning and budgeting.

Concept of marketing mix: product, price, place and promotion; Strategic and tactical decisions; New product planning processes; Global marketing; Case studies.

IPE 429: Technology Management
(3 Credits)

Introduction to technology; Growth of technology; Types and components of technology; Technology and environment; Technology forecasting; Technology assessment, Transfer of technology; Technological development and planning.

IPE 445: Entrepreneurship Development and Micro Industries
(3 Credits)

Entrepreneurship: definition and importance and its role; Characteristics and skills of entrepreneurs; Entrepreneurial process; Self assessment; Managers, leader, innovators and entrepreneurs.

Small Business: nature and importance, methods for generating ideas, creativity process, product planning and development process; Merger, acquisition & joint venture; Business plan; Marketing plan; Market research; Financial plan; Organizational and human resource plan; Production plan; Financing the business, Managing early operations and growth.

IPE 451: Supply Chain Management
(3 Credits)

Introduction to Supply chain management: Supply chain, systems approach to management, materials management, major areas of supply chain management, forward and backward linkage.

Materials planning: Role of forecasting, market demand estimation.

Procurement management: Procurement cycle, materials sourcing, vendor evaluation and selection, make-buy decision, multi-criteria decision, making in supplier selection, negotiation, transportation, logistics, incoming materials inspection.

Inventory systems management: Different types of product structures for materials planning, management of raw materials, Work-in-Process (WIP), finished good and spare parts inventories, lead time management, cycle time reduction.

Stores management: Stores layout planning, addressing systems, codification systems, traceability, physical verification and counting, surplus and was management.

Physical distribution: Network planning, packaging, materials handling, carrier systems, distribution inventory, legal aspects and common rules of transportation.

IPE 461: Organizational Behavior
(3 Credits)

Behavior of individuals in organizations: values and attitudes, motivation; Group and group processes: group dynamics, communication, power & conflict; Organizational system: structure, job design, appraisal of performance; Processes of organizational change and development.

IPE 463: Total Quality Management
(3 Credits)

TQM definition; Origins and growth of TQM; Benefits of TQM; Philosophies of TQM: quality circle approach, Deming's approach, Juran's approach, Philip Crosby's approach.

Planned implementation of TQM: Planning and commitment, participation, continuous improvement.

IPE 465: Intelligent Manufacturing
(3 Credits)

AI Technologies and expert system: components and features, knowledge system, knowledge engineer, domain expert, knowledge engineering languages.

Artificial neural network and fuzzy logic

Expert manufacturing systems: CIM, manufacturing communication system and intelligent manufacturing, flexible manufacturing system, case study of EMS.

IPE 467: Energy Management
(3 Credits Hours)

Energy Systems: commercial-noncommercial, rural-urban, renewable-no-renewable energy; Energy planning, Energy generation and distribution systems management; generation mix, dispatch system Energy policy: national energy policy and tariff policy.

Phy 102 (N): Physics Sessional
1.5 credit hours

Sessional based on Phy 105 (N) and Phy 117 (N).

Phy 105 (N): Structure of Matter, Electricity and Magnetism, and Modern Physics
3credit hours

Structure of Matter, States of Matter, solid, liquid and gas, Classification of solids: amorphous crystalline ceramics & polymers. Atomic arrangement in solids, different types of bonds in solids; metallic. Vander Waals, covalent and ionic bond, packing in solid, inter atomic distances and forces of equilibrium, x-ray diffraction, Bragg's law. Plasticity and electricity. Distinction between metal insulator and semi-conductor.

Electricity and magnetism: Electric charge, Coulomb's law. The electric field; calculation of the electric flux and Gauss's law, some application of Gauss's law, electric potential V, relation between E and V, electric potential energy, Capacitors; capacitance, dielectrics and atomic view, dielectrics and Gauss's law: current and resistance; current and current density, Ohm' law, resistivity; an atomic view, Ampere's law. Faraday's law, Lenz's law, self inductance and mutual inductance. Magnetic properties of matter: magneto-motive force, magnetic field intensity and permeability, susceptibility, classification of magnetic materials, magnetization curves, Modern physics.

Michelson Morley's experiment, Galilean transformation, special theory of relativity. Lorenz transformation, relative velocity, length contraction, time dilation mass-energy relation. Photo-electric effect, Compton effect, de Broglie wave, Bohr's atomic model. Radioactive decay, half life, mean life, isotopes, nuclear binding energy, alpha, beta, gamma decay.

Phy 117: Waves & Oscillations, Geometrical Optics and Wave Mechanics
3 credit hours

Waves & Oscillations: Differential equation of a simple harmonic oscillator, Total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, Spring- mass system, Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping co-efficient. Forced oscillation, Resonance, Two-body oscillation, Reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

Geometrical Optics: Combination of lenses: Equivalent lens and equivalent focal length, Cardinal points of a lens, power of a lens: Defects of images: Spherical aberration,

Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Optical instruments; Compound microscope, Polarizing microscope, Resolving power of a microscope, Camera and photographic techniques.

Waves Mechanics: Principles of statistical physics, Probabilities, Classical statistics; Quantum statistics; Base-Einstein statistics, Fermi-direct statistics and their application; Fundamental postulates of wave mechanics, Time dependent Schrödinger equation, Schrödinger equation for one-electron atom and its solution.

Reflection, Transmission and intensity of sound waves, Variation of sound intensity with distance, Units of sound intensity: Decibel and other units, Doppler's principle.

Light: Illumination and photometry, luminous intensity; Their measurements and units, Phosphorescence, Fluorescence, Discharge lamps, Theories of light: Interference: Young's double slit experiment, Determination of thickness of a film, Diffraction: Diffraction due to a single slit, Polarization: Different methods of polarization, Intensity of polarized light.

Heat: Humidity; Vapor pressure, Temperature related humidity; Transmission of heat: Conduction, Conductivity, Rectilinear flow of heat, Determination of thermo-conductivity of good and bad conductors, Heat flow through compound walls; Convection; Free and forced convection, Domestic and industrial applications, Ventilation; Radiation; Different laws of radiation, Black body radiation, Radiation from surfaces, Solar radiation.

Math 191: Differential and Integral Calculus
4 credit hours

Differential Calculus: Limit, continuity and differentiability, Differentiation of explicit and implicit functions and parametric equations. Differential, Successive differentiation of various types of functions. Leibniz's theorem Roll's and Mean-Value theorems. Taylor's theorem infinite and infinite forms. Maclaurin's theorem in finite and infinite forms. L'Hospitals rule. Tangent and normal, sub tangent and subnormal in Cartesian and polar coordinates. Partial differentiation, Euler's theorem, Maxima and Minima for functions points of inflection, applications, Curvature, evaluation & involute. Asymptotes. Envelopes. Curve tracing.

Integral Calculus: Integration by parts. Integration by the method of substitutions. Standard integrals. Integration by the method of successive reduction. Definite integrals, kits properties and uses. Wally's formula. Improper integrals. Beta function and Gamma function. Area under plane curves in Cartesian and polar coordinates. Area of the region enclosed by two cures in Cartesian and polar coordinates. Arc-lengths of curves in Cartesian & polar coordinates, parametric, pedal and intrinsic equations. Volume of

solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution.

Math 193: Vector, Matrix and Co-ordinate Geometry
4 credit hours

Structure of Matter: States of matter: solid, liquid and gas. Classification of solids: amorphous, crystalline, ceramics and polymers. Atomic arrangement in solids. Different types of bonds in solids: metallic, Vander Waals, covalent and ionic bond, packing in Solids, Interatomic distance and forces of equilibrium, X-ray diffraction. Bragg's law. plasticity and elasticity. Distinction between metal, insulator and semi-conductor.

Electricity and magnetism: Electric charge, Coulomb's law. The electric field: calculation of the electric field strength, E. A dipole in an electric flux and Gauss's law. Some application of Gauss's law. Electric potential V. Relation between E and V. Electric potential energy. Capacitors. Capacitance, Dielectrics; An atomic view, Dielectrics and Gauss's law; Current and resistance: Current and current density, Ohm's law. Resistivity: and atomic view, Ampere's law, Faraday's law, Lens's law. Self-Inductance and Mutual Inductance, Magnetic properties of matter: magnetomotive force, magnetic field intensity. Permeability, Susceptibility, Classifications of magnetic materials, Magnetization curves.

Modern Physics: Michelson Morley's experiment. Galilean transformation. Special theory of relativity. Lorentz-transformation. Relative velocity. Length contraction. Time dilation. Mass-energy relation. Photoelectric effect. Compton effect, de-Broglie wave. Bohr's atom model; radioactive decay, half-life, mean life, isotopes. Nuclear binding energy, alpha, beta, gamma, decay.

Math 291: Differential Equation, Vector Calculus and LaplaceTtransform
3 credit hours

Ordinary differential equation: Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher orders with constant coefficients. Solution in series by Frobenious method. Bessel function. Legendry polynomials and their properties.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar function. Divergence and curt of a vector function. Physical significance of gradient, divergence and curt. Gauss's theorem, Stocke's theorem, Green's theorem and their applications.

Laplace Transform: Definition of Laplace transform. Elementary transformation sand properties. Convolution. Solution of differential equation by Laplace transform. Evaluation of improper integrals by Laplace transforms.

EEE 167: Basic Electrical and Electronic Circuits
4 credit hours

Direct Current circuits: laws and theorems. DC network analysis. Alternating current: AC quantities and sinusoidal waveforms, Phasors, AC cirtuit analysis: series and parallel branches-RL, RC, and RLC Balanced three-phase circuits.

Semiconductor diode: operation, characteristics and applications. Introduction to Bipolar Junction transistors (BJTs), characteristic. Common-Emitter (CE), Common-Base (CB) and Common-Collector (CC) amplifier configurations.

EEE 168: Basic Electrical and Electronic Circuits Sessional
1.5 credit hours

Laboratory experiments based on EEE 167.

EEE 271: Electrical Machines and Electronics
3 credit hours

Single phase transformer. DC motor: principle and applications. Three phase induction motor: principle and applications. Introduction to synchronous motors and fractional horse power motors. Introduction to operational amplifiers (OP-AMPs) and applications. Silicon Controlled Rectifiers (SCR): operation and characteristics. Power control using SCR. Transducers: strain, temperature, pressure, speed and torque measurements.

EEE 272: Electrical Machines and Electronics Sessional
1.5 credit hours

Laboratory experiments based on EEE 271

CSE 441: Information Technology
2 credits, Compulsory Course

The role of Information Technology in changing world. Computer Architecture: Basic Computing Concepts, Computing Platforms, Operating Systems: Basic Concepts, What does Operating System Provide, Examples of Operating Systems. Database Concepts. Computer Network and Data Communications: Evaluation of the Networking Concept,

Networking Architecture, Modern Networks Case Study, Client-Server Architecture, Mobile and Wireless Communication, Internet, Email, E-Commerce, Group ware, Intranet.

CSE 443: Digital Logic and Microprocessor Technology
3 credits, Optional Course

Logic gates, flip-flops, counters, Registers, Memory systems, A/D and D/A Converters, Multiplexers and Demultiplexers, Address Memory, Control Unit. Digital System Design. Introduction to different types of microprocessors, Microprocessor Architecture, Instruction Set, I/O Operations, Interrupt structure, Interfacing & Interfacing ICs, Micro-processor based system design.

MME 195: Engineering Materials – I
3 credit hours

Properties of metals, ceramics and polymers; processing of materials from liquid, solid and paste; choosing materials for products. Atomic, molecular, crystalline and amorphous structures for metals, ceramic and polymers. Elastic and plastic behavior of materials in service: fracture, ductile-brittle transition, fatigue, creep, oxidation and degradation, corrosion and corrosion protection. Materials as mixtures of elements: mixtures nears and far from equilibrium, phase diagrams, phase changes. Non-ferrous metals: production and uses, Iron and steel production: Production and uses: types of cast iron, effects of impurities. Plain carbon steel: the iron-iron carbide phase diagram, constituents and structures of plain carbon steels; Head treatment of steels. Alloy steels: principles and effects of alloying, different alloy steels and their uses.

MME 295: Engineering Materials – II
2 credit hours

Ceramic: Ceramic raw materials, preparation, characterization and processing; principles and mechanisms of ceramic drying and firing processing; principles and mechanisms of ceramic drying and firing process; defects and properties of ceramics: glazing and decoration; conventional and engineering ceramics; newer industrial ceramics. Glasses: Kinetics of crystallization and phase separation of glass transition; viscosity, chemical durability and thermal, electrical, optical, and mechanical properties of commercial glasses; relation of physical properties to glass structure and composition; tests of glass. Polymers: Structure and properties of polymers and copolymers; thermoplastics and thermo sets; product design; commercial processing of polymers: properties and testing

polymers; polymers and the environment. Composites: Theory of composites; fabrication structure and uses of different types of composites; properties of composites.

MME 296: Engineering Materials Sessional
1.5 credit hours

Metallographic sample preparation. Micro study of ferrous and nonferrous materials. Micro study of clay-based ceramic materials and semi crystalline polymers. Study of the manufacturing processes of ceramic and glasses. Anisotropic properties of composite materials.

MME 391: Fundamentals of Metallurgy

History of the development of metallurgy. Production of pig iron and steel. Extraction of copper and aluminum. Mechanical and physical properties of metals. Crystalline structure of metals. Metallographic. Phase diagram of the Fe-C system. Heat treatment of steel. Metals and metallic alloys such as cast iron, plain carbon steel, low alloy steels, stainless steels, copper and copper alloys, aluminum, lead, nickel and nickel alloys, titanium and titanium alloys, Numerical designation of alloy steels. High temperature alloys, metal forming, non-destructive testing.

Hum 102: English Languages Practice (Sessional)
1.5 credit hours

English phonetic: Ways of correct English pronunciation. Dialogue: Improving speaking skill. Composition: Spoken composition on general topics. Vocabulary: Improving stock of words. Listening Comprehension: Improving listening skill through audio-visual methods. Correspondence: Business communication including writing for mass media. Report writing: Writing technical report on different topics.

Hum 211: Sociology

Scope: Some Basic Concepts. Social evolution and techniques of production. Cultural and civilization. Social structure of Bangladesh. Population and world resources. Oriental and occidental societies. Industrial revolution. Family-urbanization and industrialization. Urban Ecology. Co-operative and Socialist movements. Rural Sociology.

Hum 313: Principles of Accounting
2 credit hours

Principles of accounting: accounts, transaction, the accounting procedures and financial statements. Cost in general: objectives and classifications. Overhead costing. Cost sheet under ob costing, operation costing and process costing. Marginal costing: tools and techniques, cost-volume-profit analysis. Relevant costing: analysis the profitability within the firm. Guideline for decision making. Long-run planning and control capital budgeting.

ME 160: Mechanical Engineering Drawing-I
1.5 credit hours

Introduction; Instruments and their uses; First and Third Angle Projections; Orthographic Drawings; Isometric Views, Missing Lines and views; Sectional views and conventional practices; auxiliary views.

ME 223: Fluid Mechanics and Machinery
3 credit hours

Fluid properties; Fluid statics; basic hydrostatic equation, manomerty, pressure variation in static incompressible and compressible fluids.

One dimensional flow of fluid: Equation of continuity; Bernoulli's equation; Fluid flow measurements; Real fluid flow; Frictional losses in pipes and fittings.

ME 224: Fluid Mechanics and Machinery Sessional
1.5 credit hours

Sessional based on ME 223

ME 243: Mechanics of Solids
3 credit hours

Stress analysis: statically indeterminate axially loaded member, axially loaded member, thermal and centrifugal stresses; stresses in thin and thick walled cylinders and spheres.

Beams: Shear force and bending moment diagrams; Various types of stresses in beams: Flexure formula; Deflection of beams: integration and area moment methods; Introduction to reinforced concrete beams and slabs.

Torsion formula; Angle of twist; Modulus of rupture; Helical springs; Combined stresses: principle stress, Mohr's Circle; Columns: Euler's formula, intermediate column formulas, the Secant formula; Flexure formula of curved beams.

Introduction to experiment stress analysis techniques, Stain energy; Failure theories.

ME 244: Mechanics of Solids Sessional
.75 credit hours

Sessional based on ME 243.

ME 245: Engineering Mechanics and Theory of Machines
4 credit hours

Basic concepts of mechanics; Force in trusses and frames; Friction; Centroids and moment of inertia; Kinetics of particles and rigid bodies.

Mechanisms: displacement, velocity and acceleration; Static and dynamic balancing of rotating components. Under damped and damped free vibration of one and two degrees of freedom, Forced vibrations; Whirling of shafts and rotors, Power transmission by ropes, bells chains; Gears and gear trains; Study of cams.

ME 265: Thermal Engineering and Heat Transfer
4 credit hours

Basic concepts and definitions: Sources of energy: conventional and renewable; Thermodynamics: fundamental concepts and laws, non-flow and flow processes; thermodynamic cycles; Introduction to: steam generating units, internal combustion engines, steam turbines, gas turbines, refrigeration and air conditioning systems. Introduction to heat transfer; Modes of heat transfer, Study and unsteady state heat conduction and radiation head transfer, Convection heat transfer, Natural and forced convection, Heat exchangers.

ME 266: Thermal Engineering and Heat Transfer Sessional
1.5 credit hours

Based on ME 265

ME 447: Robotics
3 credit hours

Introduction to robotics; Definitions; Plane, rotational and spatial motion with applications to manipulators; Geometric configurations: structural elements, linkages, arms and grippers; Kinematics of manipulators; Motion characteristics, trajectories, dynamics and control of manipulators; Actuators and sensors for manipulators; Application of industrial robots and programming; Teleoperators, mobile robots and automated guided vehicles. Special purpose robots.

ME 461: Control Engineering
3 credit hours

Introduction to control systems and their representation by different equations and Laplace transformations; Block diagrams and transfer functions; Analog computer solution of system equations; System response, control action, and system types; Frequency response; System analysis; System compensation, Analogues of control systems; Hydraulic and pneumatic control systems; Elements of electromechanical controls; Introduction to digital computer control.

Chem 143: Chemistry of Materials
2 credit hours

Glass: Classification, Manufacture and application. Paints, varnishes and metallic coating: composition and applications of paints, varnishes and paints, varnishes and metallic coatings, methods used in applying coating on metal surface.

Plastic: Fundamental characteristics, classification, raw materials and manufacture of plastics, some typical examples of plastics and their uses. Fibres: types of fibres, synthesis and application of synthetic fibres. Rubber: Source of natural rubber, chemical treatment of latex, synthesis and properties of synthetic rubber.

Lubricants: Chemistry of lubricants, sources, properties, refining, chemical treatment and industrial importance of lubricants.

Chem 109: Chemistry-I
3 credit hours

Modern Concepts of Atomic Structure, Advanced concepts of bonds and molecular structure, Crystal structures, Modern periodic table, Chemistry of Transition metals, Properties and uses of noble gases, Acids and bases, Chemistry of solutions, Properties of dilute solutions, Chemical Equilibrium, Thermochemistry, Electrochemical cells, Ionization of water and pH, Chemical Kinetics, Phase rule and phase diagrams, selected topics on organic chemistry. Introduction to organic polymer, Basic concepts of dyes color and constitution.

Chem 114: Inorganic Quantitative Analysis
1.5 credit hours

Volumetric Analysis: Volumetric Analysis: Acidimetry-alkalimetry, Titrations involving redox reactions, determination of Cu, Fe and Ca Volumetrically, Complexometric titration, determination of Ca, Mg in water.