Second Year First Semester Prod/Math/T/211 MATHEMATICS-VS

Complex Analysis: Functions of a complex variable, Limit, Continuity and differentiability, Cauchy-Riemann Equations, Complex integration, Cauchy's

fundamental theorem, Cauchy's integral formula, Taylor's theorem, Laurent's theorem, Singularity Pole Residue theorem, Contour integration.
Series solution of differential equations: Ordinary point and regular singularity of second order linear differential equations, Generating functions and recurrence relation, Orthogonal property of Legendre polynomials.

Prod/CSE/T/212 COMPUTER PROGRAMMING & NUMERICAL ANALYSIS

1. Introduction to Computer System: Computer Organization - CPU, Memory (ROM,RAM), input-output units: Different levels of languages - High level, assembly and machine languages, Assemblers, Compilers, interpreters; Operation system, bits, bytes, words, serial and parallel communication.
2. Programming Logic Algorithms and flow-charts, Programming in a high level language (C/C++ &VB) - Data types, constants and variables; Expressions - numeric & non-numeric, library function, input-output and control statements, loops, arrays, functions, subroutines, file handling; Miscellaneous other features.

3. Numerical Analysis Successive approximations and errors; Differentiation and integration formulae: Simpson's and trapezoidal rules, lines and quadratic interpolations and extrapolations: Solution of algebraic equations - Newton-Rhapson method. Simple initial value problems - Runge Kutta method.

Prod/T/213 DEFORMATION OF SOLIDS

Definitions of stress and strain : Stress tensor; Differential equations for equilibrium; Linear stress-strain laws and strain energy; Problems of strength and stiffness of circular and non-circular sections subjected to axial load, torsion and bending; Analysis of composites; Transformation of stresses and strains; Mohr's circle; Yield and fracture criteria and theories of failure; Statically indeterminate systems; Virtual work equations; Stability of columns.

Prod/T/214 PRIMARY PRODUCTION PROCESSES

(A) Types of production and production processes; Product configuration and manufacturing requirements; Casting of ferrous and non-ferrous metals including die casting. Loam moulding, investment casting, centrifugal casting, transfer moulding, etc. (B) Designing moulds, risers, sprues and gating system, casting defects, (C) Joining methods: welding brazing and soldering: Welding processes like fusion welding, electric arc welding, resistance welding, TIG, MIG submerged arc welding processes, friction welding: welding defect. (D) Hot and cold working of metals, Bending, Wire/Tube Drawing, Deep drawing, spinning flow turning, stretch forming, forging defects etc.

Prod/T/215 ANALYSIS AND SYNTHESIS OF MECHANISMS

1. Mechanisms and machines, Kinematic elements and chain, condition of movability and Grubbler criteria, Higher order linkages, Kinematic inversion.Velocity and acceleration

analysis of link systems. Various Mechanisms: Slider Crank, Differential, Pentograph quick returns Automatic Steering gear etc.
2. Synthesis of linkages; Kinematic analysis of machine elements Frudenstein's equation, path generation, Cam Synthesis.
3. Belt Drive; Chain Drives, Gear & Gear elements Gear Drive, Gear Train, Cam follower Motion analysis etc.

Prod/T/216 PRODUCT & SYSTEM GRAPHICS

Introduction to various product features: Identification of functional and non functional surfaces, Representation of products and its features through graphics, Selection of datum for manufacturing and assembly requirements, auxiliary views, Cumulative and non- cumulative assembly; Dimension of assembled elements; Use of standard parts; Detailing of assembled systems; Representation of assembled systems through graphs; Line diagrams and symbolic representation of engineering systems and construction of exploded diagram from basic schemes for: a) Mechanical Systems b) Welding Systems c) Priping Systems Product representation through computers: 2D and 3D representation, Solid model creation, 3D surface generation, viewing transformation Exchange of graphics data: DXF, IGES, STEP format Specification, Extraction of graphic entities from these data file.

Prod/CSE/S/211 COMPUTER PROGRAMMING & NUMERICAL

ANALYSIS LABORATORY Use of digital computers for solving matrix problems of various dimensions: Use of algorithm for matrix inversion, generation of random numbers for simulation studies, Programming for numerical differentiations and integration Programming Applications to be carried out in high level languages (C/C++ & VB).

Prod/S/212 ENGINEERING EXPERIMENTATION LABORATORY

Experiments leading to: (a) Energy Balance, (Boiler & Refrigeration system); (b) Performance evaluation of Pumps, Engines, Heat exchanger; (c) Equlibrium of trusses and structures; (d) Deformation characteristics of solids; (e) Kinematic synthesis; (f) Fluid laws and equations, study of hydraulic system; (g) Tribology; (h) Balancing & Stability; (i) Vibrations & noise; (j) Experimental stress analysis; (k) Thermal properties of material.

Prod/S/213 MANUFACTURING SYSTEMS LABORATORY-II

(A) Simple machining operations involving Lathe, Drilling, Shaping, Milling etc. (B) Simple machining operations with production of flat surfaces, surface of revolution, conicoids; Internal holes; Slots and threads. (C) Simple measurements and inspection of product features, like, shafts, slots, holes, tapers etc.

Prod/S/214 GRAPHICS LABORATORY-II

Selected problems on Nomography; Path generation. Selected drafting problems involving consideration of steriometric features and technological processing parameters: Dimension and geometrical tolerancing; Partial views and sectioning problems, auxiliary sections; Schematic product symbols for standard parts of electrical, mechanical and electronics systems; welding symbols and pipe joints.

Second Year Second Semester

Prod/T/221 THERMODYNAMICS AND HEAT TRANSFER

1. Basic concept and the first law of thermodynamics and its applications Non-flow and flow processes; Second law; Concept of Entropy; Equation of states for gases; Properties of steam and mixture of gas; Thermodynamic relations.
2. Thermodynamics Systems; Steam boilers; Thermal power plant Cycle; Air standard Cycles; Reversed Cycle principles: Heat pump and refrigerator.

3. Heat flux and Fourier's law of conduction; convection and radiation heat transfer; Performance of Heat exchangers and Fins; Use of dimensionless Parameters in solving heat transfer problems.

Prod/T/222 MATERIALS SCIENCE AND TECHNOLOGY

1. Nature and properties of materials, packing and crystal structure, crystal imperfections; Phase equilibrium and phase transformation; Mechanical properties, Non-destructive testing (NDT)
2. Metallography; Binary phase equilibrium; Iron carbon equilibrium diagram and characteristics of alloy microstructure; Ternary phase diagram.

3. Heat-treatment processes; Furnaces applications, Heat-treatment cycles & Evaluation. 4. Non-metallic materials: Plastic and other polymers, Introduction to Powder metallurgy, Ceramics and Composite materials.

Prod/T/223 MICROPROCESSOR CONTROL AND MECHATRONICS

Binary Arithmetic, Flip Flops, Registers, Counters and Memory Elements; RAM, ROM etc: Microprocessor architecture and assembly language programming, Microcontroller, P.L.C. & its applications: Interfacing, memory and peripheral devices. Introduction to Mechatronics: Drives and Actuators; mechanical, hydraulic, pneumatic, electrical, drive circuits: Sensors and Trasducers: Measurement of position & displacement, velocity, force, temperature, proximity and range. Concept of feed-back: Open loop and closed loop control systems: linear systems: transfer functions, block diagrams, Servo systems.

Prod/T/224 FLUID SYSTEMS

(A) Review of fluid properties; Hydrostatic; Fluid Kinematics, Fluid Dynamics, Basic principles of flow of fluids through closed conduits, open channel and weirs. (B) Fluid Machinery: Pumps and turbines. (C) Hydraulic and pneumatic circuits, power nits,

accumulators and intensifires: Valves for pressure, flow and direction controls and compensations; (D) Fluid logic systems.

Prod/T/225 MACHINE DYNAMICS

1. Static and dynamic force analysis of constrained kinematic systems: Dynamics of rotary and reciprocating machines; Critical speeds, Precessional motions and gyroscopic stability. Balancing of rotating and reciprocating masses, flywheel, governor mechanism. 2. Simple Harmonic Motion vibration of single degree freedom system: Force & undamped, damped &

forced vibration systems, Two degrees of freedom systems, Mode coupling, Vibration Damper.

Prod/T/226 INDUSTRIAL STATISTICS

(A) Basic laws of probability, conditional probability; Random variable, sample distribution, statistical hypothesis; Statistical tests of significance, correlation, regression analysis; Auto-correlation, analysis of variance. (B) Analysis of basic experiment designs; Randomized block design; Latin and orthogonal squares; Factorial designs. (C) Markov chains: Poisson's process; Diffusion process. (D) Introduction to stochastic problems in engineering.

Prod/S/221 MICROPROCESSOR CONTROL & MECHATRONICS LABORATORY

Laboratory experiments involving the following are to be done. Use of logic gates & circuits, Microprocessor Programming - for simple control operations. Measurements of Position, Displacement, Velocity, Force, Temperature, Proximity and range. Open loop position control; Closed loop position control using position and velocity feed back; Use of analog and digital servo systems. Experiments on actuators and drives; PLC

Prod/S/222 GRAPHICS LABORATORY-III
Drafting exercise involving: (A) Preparation of product assembly details. (B)

Aggregation for assembly. (C) Exploded machine kinematics, (D) Computer drafting

Prod/S/223 MANUFACTURING SYSTEMS LABORATORY - III
Laboratory exercises involving: (A) Machining of complex product configurations, (B)

Machining of spur and helical gears, (C) Advanced Welding Processes

Prod/S/224 VACATIONAL PRACTICAL TRAINING AND VIVA-VOCE I - 200 hrs

In-Plant training involving various production processes like: (A) Foundry, forging, welding and fabrication (B) Organisational hierarchy (C) Product handling features (D)

Specialized toolings and set-ups. Students will be required to submit a report on the in- plant training and appear for a Viva-Voce on the said training and report.