

PRODUCTION AND INDUSTRIAL ENGINEERING

Basic Mechanisms and Elements of Design: Mechanisms, Friction, Gearing and Cams, Balancing, Vibration, Fundamentals of Design, Design of Basic Machine Elements.

Casting, metal forming and metal joining processes: Casting Processes, Welding Processes, Special Casting Processes, Testing of Castings, Weldments - Fundamentals of Metal Forming, Forging and Rolling, Extrusion and Drawing Processes, Sheet Metal Forming Processes

Tool Engineering, Machine tool operation, Metrology and Inspection: Mechanics of Metal Cutting, Tool Material, Tool Wear and Tool Life, Gear Manufacture, General Concepts of measurements, Linear and Angular measurements, Measurement of Surface Finish Measuring Machines, Metrology of Screw Thread; Gears, Computer Aided Inspection and Laser Metrology - Strength and rigidity of machine tool structures, Sideways, Spindles and spindle supports, Machine Tool Dynamics.

Engineering Materials: Introduction and Constitution of Alloys and Phase Diagrams, Heat Treatment, Ferrous and Non Ferrous Metals, Mechanical Properties and Testing, Welding and Foundry Metallurgy.

Unconventional Machining Processes: Processes for Plastic, Mechanical, Chemical and Electro-chemical energy based processes, Electrical Energy based Waste Processes, Thermal Energy Process.

Composites: Polymer Matrix Composites, Metal Matrix Composites, Ceramics Matrix Composites.

Product and Process Design, Design of Jigs, Fixtures and Press Tools: Product and process Design Concepts, Process Planning, Estimating, Costing and Elements of Cost, Analysis of Overhead Expenses, Estimation of Costs for Forging, Casting and Welding, Estimation of Machining Time, Functions Of Jigs and Fixtures, Press working Terminologies and Elements of dies and Strip Layout, Design and Development of Dies.

CAD/CAM and CIM: Computer Aided Design, Computer Graphics, Geometric Modelling, Rapid Prototyping, Concept, Programming of CNC machines, Robotics-anatomy and specifications, Automated production lines, Geometric dimensioning and tolerancing and Flexible manufacturing system .

Fluid Power systems: Symbols, Control Elements, Hydraulic and Pneumatic actuators, Logic Functions

Mechatronics: Actuators, Sensors, Control systems and robotics

FEA: Basic concepts, line, planes, Elements, Governing equations, Shape functions.

Operations Research and Decision Analytics: Linear Programming: Formulation, graphical method, simplex method, duality, Transportation Models, Assignment Models, Network Analysis: CPM and PERT, Inventory Models (Deterministic and Probabilistic), Decision Analysis under Risk and Uncertainty, Game Theory, Waiting Line (Queuing) Models, Integer Programming and Mixed Integer Programming, Simulation Modelling and Monte Carlo Simulation, Optimization using Python / Analytics tools.

Operations Management and Production Systems: Productivity: Measurement and Improvement Techniques, Method Study, Work Measurement, Ergonomics and Human Factors,

Demand Forecasting Techniques, Aggregate Production Planning, Capacity Planning and Management, Material Requirements Planning (MRP), Production Activity Control, Estimation and Costing, Costing Methods, Lean Manufacturing, Just-In-Time (JIT) Production Systems, Agile Manufacturing, Flexible Manufacturing Systems (FMS), Sustainable Manufacturing and Green Production.

Quality, Reliability and Maintenance Engineering: Quality Concepts and Dimensions, Total Quality Management (TQM), Six Sigma Concepts and DMAIC Methodology, Statistical Process Control (SPC), Process Capability Analysis, Acceptance Sampling, Reliability Concepts, Failure Data Analysis, Reliability Prediction and Modeling, Maintenance Concepts, Total Productive Maintenance (TPM), Lean Six Sigma, Design for Six Sigma (DFSS), Quality Function Deployment (QFD), AI-based Quality Inspection

Supply Chain and Logistics: Supply Chain Management, Logistics and Distribution Systems, Warehouse Management, Reverse Logistics, Green Supply Chains, Circular Supply Chains

Data Analytics in Industrial Engineering: Industrial Data Analytics, Big Data in Manufacturing, Decision Support Systems, Digital Twin Concepts