

Syllabus of Industrial engineering*

Probability and Statistics: Definitions of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Linear regression, Regression and Correlation Analysis Random variables, Poisson, normal, binomial and exponential distributions.

Engineering Materials: Structure, physical and mechanical properties, and applications of common engineering materials (metals and alloys, semiconductors, ceramics, polymers, and composites - metal, polymer and ceramic based); Iron-carbon equilibrium phase diagram; Heat treatment of metals and alloys and its influence on mechanical properties; Stress-strain behaviour of metals and alloys.

Applied Mechanics: Engineering mechanics - equivalent force systems, free body concepts, equations of equilibrium; Trusses; Strength of materials - stress, strain and their relationship; Failure theories; Mohr's circle (stress); Deflection of beams, bending and shear stresses; Euler's theory of columns; Thick and thin cylinders; Torsion.

Theory of Machines and Design: Analysis of planar mechanisms, cams and followers; Governors and fly wheels; Design of bolted, riveted and welded joints; Interference/shrink fit joints; Friction and lubrication; Design of shafts, keys, couplings, spur gears, belt drives, brakes and clutches; Pressure vessels.

Thermal and Fluids Engineering: Fluid mechanics - fluid statics, Bernoulli's equation, flow through pipes, laminar and turbulent flows, equations of continuity and momentum, capillary action; Dimensional analysis; Thermodynamics - zeroth, first and second laws of thermodynamics, thermodynamic systems and processes, calculation of work and heat for systems and control volumes; Air standard cycles; Heat transfer - basic applications of conduction, convection and radiation.

Metrology and Inspection: Accuracy and precision; Types of errors; Limits, fits and tolerances; Gauge design, Interchangeability, Selective assembly; Linear, angular, and form measurements (straightness, flatness, roundness, runout and cylindricity) by mechanical and optical methods; Inspection of screw threads and gears; Surface roughness measurement by contact and non-contact methods.

Quality Management: Quality - concept and costs; Statistical quality control - process capability analysis, control charts for variables and attributes and acceptance sampling; Six sigma; Total quality management; Quality assurance and certification - ISO 9000, ISO14000.

Reliability and Maintenance: Reliability, availability and maintainability; Distribution of failure and repair times; Determination of MTBF and MTTR, Reliability models; Determination of system reliability; Preventive and predictive maintenance and replacement, Total productive maintenance.

Product Design and Development: Principles of product design, tolerance design; Quality and cost considerations; Product life cycle; Standardization, simplification, diversification; Value engineering and analysis; Concurrent engineering; Design for "X"; comparison of production alternatives.

Work System Design: Taylor's scientific management, Gilbreths's contributions; Productivity - concepts and measurements; Method study, Micro-motion study, Principles of motion economy; Work measurement - time study, Work sampling, Standard data, PMTS; Ergonomics; Job evaluation and merit rating; Incentive Scheme and Wage Administration; Manpower Planning.

Facility Design: Facility location factors and evaluation of alternate locations; Types of plant layout and their evaluation; Computer aided layout design techniques; Assembly line balancing; Materials handling systems.

Operation Research: Linear programming - problem formulation, simplex method, duality and sensitivity analysis; Transportation and assignment models; Integer programming; Constrained and unconstrained nonlinear optimization; Markovian queuing models; Simulation - manufacturing applications.

Engineering Economy and Costing: Elementary cost accounting and methods of depreciation; Break-even analysis; Techniques for evaluation of capital investments; Financial statements; Activity based costing; Time-Cost Trade-Off, Resource Levelling.

Production Control: Forecasting techniques - causal and time series models, moving average, exponential smoothing, trend and seasonality; Aggregate production planning; Master production scheduling; MRP, MRP-II and ERP; Routing, scheduling and priority dispatching; Push and pull production systems, concepts of Lean and JIT manufacturing systems; Logistics, distribution, and supply chain management; Inventory - functions, costs, classifications, deterministic inventory models, quantity discount; Perpetual and periodic inventory control systems.

Project Management: Scheduling techniques - Gantt chart, CPM, PERT and GERT.

***Note- The above syllabus is indicative in nature not exhaustive.**