PRODUCTION ENGINEERING/ MANUFACTURING ENGINEERING

MANUFACTURING TECHNOLOGY-I

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I (10 classes)

Manufacturing process: Definition, Manufacturing process vs. manufacturing system, Classification of manufacturing process, selection of materials and processes.

Sand Casting : Pattern – materials, allowances, types, molding types, molding procedure, molding and properties, testing of molding sand, cores, core materials, properties of core making. Melting and founding of cast iron, degasification, design of casting and risering, pouring and feeding of casting, casting defects and inspection.

Special casting: Melting of steels and non-ferrous metals and alloys, solidification, shell mould casting, investment casting, Die casting, and centrifugal casting.

Module-II (10 classes)

Fusion welding processes: Introduction, oxy-fuel gas welding, arc welding processes-I (consumable electrode): principle, equipment, power sources, principle of metal transfer, Electrodes, Submerged arc welding, Gas Metal Arc Welding, arc welding processes-II (non-consumable electrode): Gas Tungsten Arc Welding, Plasma Arc Welding, Defects in welding, Gas and arc cutting.

Brazing, Soldering, Adhesive Bonding, Mechanical fastening and joining plastics

Module-III (08classes)

Solid state welding process: Introduction, Ultrasonic welding, Friction welding, Resistance welding, Explosion welding.

Other welding processes: Thermit welding, Electron beam welding, Laser beam welding

Metallurgy of welding: Welding design and process selection: Introduction, welded joint, weld quality, weldabilty, testing of welded joint.

Module – IV (08 classes)

Hot and cold working of metals, Classification, Advantages, Limitations and applications of Extrusion, Forging and Rolling , Wire Drawing, Classification, Advantages, Limitations and applications, Sheet Metal Working: Deep drawing process.

Text Books:

1. Manufacturing Technology: Foundry, Forming and Welding by P.N. Rao, TMH.
2. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern

References

1. Principles of manufacturing Materials and processes, by James S. Campbell, TMH.
2. Welding Metallurgy by G.E. Linnert, AWS.
3. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
4. Manufacturing Engineering and Technology, 4th Edition- S.Kalpakjian and S.R. Scsimid, Pearson Education.
5. Manufacturing Process, J.P.Kaishish, PHI

MANUFACTURING TECHNOLOGY-I

Practical L/T/P (Hours per week): 2, Credit: 1

Laboratory Experiments (Minimum 8 experiments)

1. Determination of grain size, clay content, permeability and green compressive strength of Molding sand. (2 to 3 experiments)
2. Practice and preparation of job in Gas welding
3. Practice and preparation of job in Arc welding
4. Practice and preparation of job in TIG/MIG welding (2experiments)
5. Practice and preparation of job in sheet metal using processes like forming and deep drawing.
6. Demonstration of different rolling mills
7. Demonstration of Extrusion processes

INTRODUCTION TO PHYSICAL METALLURGYAND ENGINEERING MATERIALS

Theory L/T (Hours per week): 3/0, Credit: 3

MODULE-I (08 Lectures)

Classification of Engineering Materials, Engineering properties of materials. Characteristic property of metals, bonding in solids, primary bonds like ionic, covalent and metallic bond, crystal systems, common crystal structure of metals, representations of planes and directions in crystals, atomic packing in crystals, calculation of packing density, voids in common crystal structures and imperfections crystals.

MODULE-II (08 Lectures)

Concept of plastic deformation of metals, critical resolve shear stress, dislocation theory, deformation by slip and twin, plastic deformation in polycrystalline metals, yield point phenomenon and related effects, concept of cold working preferred orientation. Annealing ; recovery; recrystalization and grain growth; hot working.

Concept of alloy formation, types of alloys, solid solutions, factors governing solids solubility viz. size factor, valency factor, crystal structure factor and chemical affinity factor; order-disorder transformation.

MODULE-III (10 Lectures)

Binary phase diagrams (a) Isomorphism system, (b) Eutectic system, (c) Peritectic system, (d)Eutectoid system and (e) Peritectoid system. Allotropic transformation. Lever rule and its application, Interpretation of solidification behaviors and microstructure of different alloys belonging to those systems, Effect of non-equilibrium cooling, coring and homogenization.

Iron-cementite and iron-graphite phase diagrams, microstructure and properties of different alloys (alloy steels; stainless steel, tool steel, HSS, high strength low alloy steel) types of cast iron, their microstructures and typical uses. Specification of steel.

T.T.T. diagram: concept of heat treatment of steels i.e. annealing, normalizing, hardening and tempering; microstructural effects brought about by these processes and their influences on mechanical properties; factor affecting hardenability.

MODULE-IV (10 Lectures)

Optical properties of Materials: Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres- Principle, structure, application of optical fibres.

Plastic-: Thermosetting and thermoplastics.

Ceramics: Types, structure, Mechanical properties, application

Composite Materials: Agglomerated Materials: Cermets .Reinforced Materials: Reinforced Concrete. Fibre reinforced plastics, Properties of composites, Metal matrix composites, manufacturing procedure for fiber reinforced composite.

Text Books:

1. Introduction to Physical Metallurgy by Avner, Tata McGraw Hill
2. Materials Science and Engineering by W.D.Callister, Wiley and Sons Inc.
3. Physical Metallurgy: Principles and Practice by Ragahvan, PHI

Reference Books

1. Engineering Physical Metallurgy and Heat Treatment by Y.Lakhtin, Mir Publisher, Moscow.
2. Elements of Material Science and Engineering, L.H.Van Vlack, Addison Wesley
3. Materials Science and Engineering by V.Raghavan, Prentice Hall of India Pvt.Ltd.
4. Elements of Materials Science & Engineering by Van Vlack, Pearson
5. Mechanical Metallurgy by Dieter, Tata MacGraw Hill
6. Composite Material science and Engineering by K. K. Chawla, Springer
7. Material Science and Metallurgy, by U. C. Jindal, Pearson

APPLIED THERMODYNAMICS

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I (6Lectures)

Review of First and Second laws:

First law analysis of unsteady flow control volumes, Entropy generation ,Entropy balance for closed systems and steady flow systems, Available energy, Quality of energy, Availability for non flow and flow process, Irreversibility, Energy balance, Second law efficiency.

Module – II (8 Lectures)

Air Standard Cycle & Introduction to I.C. Engine: Otto, diesel and dual cycles, description and operation of four and two stroke cycle engine, comparison of SI and CI engines, valve timing diagram, power output and efficiency calculation.

Reciprocating Air Compressors: Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Performance and design calculations of reciprocating compressors, Air motors

Module – III (10 Lectures)

Steam And Steam Generator :- Properties of steam, measurement of dryness fraction, use of steam table. T-S and H-S diagrams for representing thermodynamic processes.Boiler, Classification of boiler, comparison between water tube boiler and fire tube boiler.Boiler mountings and accessories. Description of Cochran & Babcock -Wilcox boiler.

Steam Nozzles :- Types of nozzles, isentropic flow through nozzles, effect of friction on nozzle efficiency. Critical pressure ratio and maximum discharge, throat and exit area.

Module – IV (12 Lectures)

Steam Turbines &Condensers:- Turbine type and applications. Impulse turbine, pressure and velocity compounding, velocity diagram, work output, losses and efficiency. Impulse reaction turbine, velocity diagram, degree of reaction, work output, losses and efficiency.Jet and surface condensers.Condenser vacuum and vacuum efficiency.

Heat Transfer : Basic modes of heat transfer, one dimensional steady state, conduction through slab, cylinder and sphere ; basic theory of radiant heat transfer, black body & mono chromatic radiation, total emissive power.

Refrigeration system: Reversed Carnot cycle, Reversed Brayton cycle (Gas refrigeration system), The vapor compression cycle, The vapor absorption cycle.

Text Books

1. Engineering Thermodynamics by P. K. Nag, Publisher:TMH
2. Engineering Thermodynamics by P. Chattopadhyay, OXFORD
3. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen, John Wiley & Sons
4. Fundamentals of Engineering Thermodynamics by E. Rathakrishnan, PHI

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Reference

1. Engineering Thermodynamics by M.Achyuthan, PHI
2. Engineering Thermodynamics by Y.V.C. Rao, University Press
3. Thermodynamics and Thermal Engineering by Kothandaraman & Domkundwar, Dhanpat Rai
4. Applied Thermodynamics by P.L.Ballaney, Khanna Publishers
5. Steam Tables in SI Units by Ramalingam, Scitech
6. Steam Tables by C.P.Kothandaraman, New Age International

Practical (Hours per week): 2, Credit: 1

Laboratory Experiments: (Minimum 8 experiments)

1. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.
2. Study of Cut-Sections of 2 stroke and 4 stroke Petrol Engine.
3. Study of steam power plant.
4. Study of refrigeration system.
5. Study of gas turbine power plant.
6. Performance analysis of reciprocating air-compressor.
7. Performance analysis of Centrifugal / Axial Flow compressor.
8. Determination of performance characteristics of gear pump.
9. Measurement of steam quality using calorimeter
10. Verification of Joule-Thomson coefficient.

THEORY OF MACHINE

Theory L/T (Hours per week): 3/0, Credit: 3

Module-I(10 classes)

Mechanism: Basic Kinematic concepts and definitions, mechanism, link, kinematic pair, classification of kinematic pairs, degree of freedom, kinematic chain, binary ternary and quaternary joints and links, degrees of freedom for plane mechanism, grubler's equation, inversion of mechanism, four bar chains and their inversions, single slider crank chain, double slider crank chain and their inversion.

Module-II(10 classes)

Friction of a screw and nut, square threaded crew, V-threaded screw, pivot and collar, friction circle, friction axis, friction clutches, transmission of power by single plate, multiplate and cone clutches.

Gear trains: simple train, compound train, reverted train, epicyclic train and their application.

Module-III(08 classes)

Toothed gears: Theory of shape and action of tooth properties methods of generation of standard Tooth profiles, Standard proportions, Interference and Under-cutting, methods of Eliminating Interference, Minimum numbers of teeth to avoid interference.

Module-IV(08 classes)

Governors: Centrifugal Governors-watt and Porter Governors, Spring loaded Governor-Hartnell Governor ,sensitiveness, stability, Isochronisms ,Hunting, Governor effort and power, curves of controlling force.

Text Book(S):

1. Theory of machines – S.S Ratan, Tata McGraw Hill.
2. A Textbook of theory of machines (in S.I units) – R.K.Bansal, Laxmi Publication.

Reference(S):

1. Mechanism and machine Theory- Rao and Dukkipati, Wiley Eastern Ltd.
2. Theory of Machines –Thomas Beven.

Practical (Hours per week): 2, Credit: 1

Laboratory Experiments: (Minimum 8 experiments)

1. Determination of gyroscopic couple.
2. Performance characteristics of spring loaded governor.
3. Determination of critical speed of rotating shaft.
4. Experiment on static and dynamic balancing apparatus. (2 experiments)

5. Determination of natural frequency under damped and un-damped vibration.(2 experiments)
6. Study of interference and undercutting for gear.
7. Radius of gyration of compound pendulum
8. Radius of gyration of connecting rodExperiment on Screw Jack
9. Experiment on Journal Bearing Apparatus
10. Experiment on Epicyclic Gear Train
11. Experiments on Simple/Compound/Reverted Gear trains
12. Experiment on Dynamometer

STRENGTH OF MATERIAL

Theory L/T (Hours per week): 3/1, Credit: 3

Module-I(10 classes)

Analysis of axially loaded members: Composite bars in tension and compression-temperature stresses in composite rods-statically indeterminate problem. 2D Stress system, Principal Planes, Principal stress, Mohr's stress circle, Members in biaxial state of stress: Stresses in thin cylinders, thin spherical shells under internal pressure-wire winding of thin cylinders. Strain & deformation: Two dimensional state of strain, Principal Strains, Calculation of principal stresses from principal strains, Strain measurement.

Module-II(10 classes)

Shear force and bending moment diagrams for simple beams: Support reactions for statically determinate beams, relationship between bending moment and shear force, shear force and bending moment diagrams.

Simple bending of beams: Theory of simple bending of initially straight beams, distribution of normal and shear stress, composite beams.

Module-III(12 classes)

Torsion in solid and hollow circular shafts, Twisting moment, strength of solid and hollow circular shafts, Strength of shafts in combined bending and twisting, Close-coiled helical springs.

Deflection of Beams: Slope and deflection of beams by integration method and area-moment method.

Module-IV(10 classes)

Buckling of columns: Euler's theory for initially straight columns with various end conditions.

Theories of failure: maximum principal stress theory, maximum shear stress theory, maximum principal strain theory, Maximum strain energy theory and maximum distortion energy theory.

Text book(s):

1. Strength of Materials- G.H.Ryder, Macmillan India.
2. Mechanics of Materials- J.M.Gere and S.Timoshenko.
3. Strength of Materials by R.Subramaniam, Oxford University Press

Reference(s):

1. Mechanics of Materials-I- E.J. Hern; Paragaman.
2. Introduction to Mechanics of Solids- Crandell, Dahl and Lardner, McGraw Hill.
3. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill
4. Mechanics of Materials by R.C.Hibbeler, Pearson Education

Practical (Hours per week): 2, Credit: 1

Laboratory Experiments (Minimum 8 experiments)

1. Determination of tensile strength of materials by Universal Testing Machine
2. Determination of compressive strength of materials by Universal Testing Machine
3. Determination of bending strength of materials by Universal Testing Machine
4. Double shear test in Universal Testing Machine
5. Determination of Impact strength of material (Charpy and Izod)
6. Determination of Hardness strength of materials (Brinnel, Rockwell and Vickers)
7. Determination of Rigidity modulus of material
8. Determination of Fatigue strength of material
9. Estimation of Spring Constant under Tension and Compression.
10. Load measurement using Load indicator, Load Cells.
11. Strain measurement using Strain Gauge.
12. Stress measurement using strain rosette.

ENGINEERING ECONOMICS

L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, " Engineering Economics", PHI
5. Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd
6. Jhingan,M.L., "Macro Economic Theory"
7. Macro Economics by S.P.Gupta, TMH

ORGANIZATIONAL BEHAVIOUR

Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership, Success stories of today's Global and Indian leaders.	9
04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	8
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process,	7

Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS ELECTIVE

COMPOSITE MATERIALS

Theory L/T (Hours per week): 4/0, Credit: 4

Module – I (10 hours)

Introduction and characteristics of composite materials, mechanical behaviour of composites, constituents, Reinforcements, Matrices, Fillers, Additives, Applications and advantages of composites.

Classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites(MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

Module – II (12 hours)

Characteristics of Polymer matrix composites – Characteristics of resins, Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

Characteristics of Metal Matrix Composites , Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures.Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

Module – III (10 hours)

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

Module – IV(10 hours)
Advances in composites:
Carbon / carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique.Composites for aerospace applications.

Text Book

1. Chawla K.K., Composite materials, Springer – Verlag, 1987
2. Mathews F.L. and Rawlings R.D., Composite materials: Engineering and Science, Chapman and Hall, London, England, 1st edition, 1994.
3. Mechanics of Composite Materials, R.M. Jones, Mc. Graw Hill Book Co.

Reference Book :

1. Fibre - Reinforced composites :- Materials, manufacturing and Design by P.K. Mallick, CRC Press.
2. Composite materials, Broutman & Crock,
4. Principles of Composite Material Mechanics, R.F.Gibson, CRC Press

(or) HONOR ELECTIVE

SURFACE ENGINEERING PRINCIPLE AND PRACTICE

Theory L/T (Hours per week): 4/0, Credit: 4

Module-I (10 classes)

Mechanisms of Wear and Metal Cleaning: Basic Mechanisms of wear-abrasive, adhesive wear, contact fatigue, Fretting corrosion, Testing of wear resistance, practical diagnosis of wear, general cleaning process for ferrous and non ferrous metals and alloys selection of cleaning processes, alkaline cleaning, emulsion cleaning, ultrasonic cleaning, pickling salt bath descaling, abrasive bath cleaning, polishing and buffing shot peening.

Module-II(10 classes)

Thermal Spraying Processes and Electrodeposited Coatings: Thermal spraying materials, characteristics of thermal spray processes, Design for thermally sprayed coatings coating production, spray fused coatings, Principles of electroplating, Technology and control-electroplating systems, Properties and applications of electrodeposits, Non aqueous and electroless deposition, plasma coating.

Module-III (12 classes)

Hot Dip Coating and Diffusion Coating: Principles, Surface preparation, Batchcoating and continuous coating process, Coating properties and application, Principles of cementation, Cladding-vacuum deposition, Sprayed metal coating, Structure of diffusion coatings, Chemical vapour deposition (CVD), Physical vapour deposition (PVD).

Non-Metallic Coating Oxide and Conversion Coatings: Plating coating, lacquers, rubbers and elastomers, viterous enamels, anodizing Chromating, application to aluminium, magnesium, tin, zinc, cadmium copper and silver, phosphating primers.

Module-IV (10 classes)

Quality Assurance, Testing and Selection af Coatings: The quality plan, design, testing and inspection, thickness and porosity measurement, selection of coatings, industrial applications of engineering coatings.

Text book(s):

1. Electroplating and other Surface Treatments; C.D.VARGHESE; TMH, 1993.

2. Engineering Coatings-design and application- S. Grainger, Jaico Publishing House.

Reference(s):

1. Electroplating Handbooks- N.V.Parathasarathy, Prentice Hall.
2. Advances in surface treatment- Niku-Lavi, Pergamon.
3. Metal Pretreatment; N.D.BANIK; TMH, 1992
4. Principles of Metals surface treatment and protection- D. R. Gabe, Pergamon.

MINOR SPECIALIZATION

MANUFACTURING PROCESS

Theory L/T (Hours per week): 4/0, Credit: 4

Module-I (10 classes)

Manufacturing Processes: Introduction to manufacturing processes, Classification and Selection of Manufacturing Processes.

Metal Casting Processes:

Patterns, Types of patterns, allowances and material used , moulding materials, , Metal casting: Types of casting processes, advantages, disadvantages and applications of casting processes; Green sand moulding and permanent moulding , casting defects.

MODULE 2 (12 classes)

Metal Joining Processes: Principle of welding,.Classification of welding. Capabilities and applications; Gas welding and gas cutting, Arc welding, Power sources and consumables, Resistance welding: Spot, Projection and seam welding process, Defects in welding, Introduction to Soldering and Brazing.

Metal Shaping and Forming: Hot and cold working of metals, Classification, Advantages, Limitations and applications of Extrusion, Forging and Rolling , Wire Drawing, Classification, Advantages, Limitations and applications, Sheet Metal Working: Deep drawing process.

MODULE 3 (10 classes)

Metal Cutting Principles: Machine tools classification, working and auxiliary motions in machine tools, Primary cutting motions in machines tools, Cutting tool geometry and tool signature, cutting forces and power requirement in machining

MODULE 4 (10 classes)

Advanced Manufacturing Processes

Introduction, equipment, process variables , advantages, disadvantages and applications of Abrasive Jet Machining, Ultrasonic Machining, Chemical Machining Electrochemical Machining, Laser Beam Machining

Text book(s):

1. Manufacturing Technology (Foundation Forming & Welding)- P.N. Rao, Tata McGraw Hill.
2. Manufacturing Science, Ghosh and Mallik, East West Press.
3. Principles of manufacturing materials and processes- J.S.Campbell, Tata McGraw Hill.

Reference(s):

1. Manufacturing Engineering and Technology, 4th Edition- S.Kalpakjian and S.R. Scsimid,Pearson Education.
2. Robotics Technology and Flexible Automation- S.R.Deb, TMH.
3. Principle of Metal Casting- Heine, Loper and Rosenthal, Tata McGraw Hill.