

University of Pune

Structure of

TE (Production) (2003 Course)

Semester- I

Subject Code No	Subject	Teaching Scheme(Hrs)			Examination Scheme			Total
		Lecture	Pr./Dw	Theory	TW	Oral	Pr.	
302081	Material Science & Composite Material	4	2	100	50		-	150
302082	Kinematics of Mfg. Machines	4	2	100	-	50	-	150
311083	Material Forming	4	2	100	-	50	-	150
311084	Production Planning & Control	4	-	100	-	-	-	100
311085	Metal Cutting & Tool Design	4	2	100	-	50	-	150
311086	Production Practice –I	-	2	-	50	-	-	50

Total 20 10 500

100 150 750

Total of Part I = 750 marks

Semester II

Subject Code No	Subject	Teaching Scheme(Hrs)			Examination Scheme			Total
		Lecture	Pr./Dw	Theory	TW	Oral	Pr.	
311087	Machine Tools & Advanced Manufacturing Systems	4	-	100	-	-	-	100
311088	Manufacturing Processes II	4	-	100	-	-	-	100
311089	Metrology & Quality Control	4	2	100	-	50	-	150
311090	Die & Mould Design	4	2	100		50	-	150
311091	Database & Information Tech. For Production Engg	4	2	100	50			150
311092	Production Practice –II	-	2	-	50	-	-	50
311093	Seminar	-	2	-	50	-	-	50

		Total		20	10	500
150	100	750				

Total of Part II = 750 marks

Total of Part I & Part II = 1500 marks

Detail T. E. Prod Syllabus

T.E. (Production)

302081 Material Science & Composite Materials

Teaching Scheme:

Lectures: 4Hrs / Week

Practicals : 2Hrs / Week

Examination Scheme:

Theory: 100 Marks

Term work: 50 Marks

UNIT I

8Hrs. Steels:

Introduction to Metallography, micro and macro examination, metallurgical microscope, etching.

Steels: iron-iron carbide equilibrium diagram, Critical temperatures, Allotropy, cooling curve and volume changes of pure iron. Microstructure, non-equilibrium cooling of steel, widmanstatten structure, structure property relationship. Classification and applications of steels, specifications of some commonly used steels like BIS, EN, AISI, SAE.

UNIT II

8Hrs. Heat

treatment of Steels: Introduction to heat treatment furnaces and Furnace atmospheres, Transformation products of austenite, Time-temperature- transformation diagrams, Critical cooling rate, Continuous cooling transformation diagrams. Heat treatment of steels Quenching media, Annealing" Normalizing" Hardening" Retention of austenite" Effects of retained austenite" Elimination of retained austenite, Tempering" Secondary hardening, Temper embrittlement, Quench cracks, Hardenability testing" Defects due to heat treatment and remedial measure.

UNIT III

8Hrs. Surface

Hardening & Isothermal Treatments: Carburising, heat treatment after carburising, Nitriding, Carbonitriding, Tuffride and Sursulf process. Flame hardening and Induction hardening. Commercial heat treatment practice of gears of different sizes, tools, springs. Isothermal heat treatments such as austempering, patenting, isoforming, martempering, ausforming.

UNIT IV

8Hrs Alloy Steels

& Cast Iron: Alloy Steels - Effects of alloying elements, classification of alloying elements. Stainless Steels, Sensitization of stainless steel, weld decay of stainless steel. Tool steels and tool materials, Heat treatment of high-speed steel. Special purpose steels with applications.

Cast irons- Classification, Gray cast iron, White cast iron, Malleable cast iron" Ductile Iron, Chilled and alloy cast irons. Effects of various parameters on structures and properties of cast irons, Heat treatments of cast iron. Applications of cast irons for different components of

machine tool, automobiles, pumps etc.

UNIT V

8Hrs Non-

Ferrous Alloys: Copper alloys - Brasses, Bronzes-: Tin, Aluminium, Beryllium, Silicon Copper nickel alloys, Nickel - Silver, Aluminium and aluminium alloys. Solders, Bearing materials and their applications, Precipitation hardening alloys. High Temperature materials such as Nimonics, Super alloys, Ti-alloys etc.

UNIT VI

10Hrs Modern

Engineering Materials: Composites- Types, Characterization, Production techniques & applications. Metal - Matrix composites, Particulate & Fiber composites. Biomaterials, Nano materials, Sports materials.

List of Experiments

1. Testing of Composite materials (Like Hardness, Impact, Tension etc.)
2. Study and drawing of microstructures of mild steel, medium carbon steel, eutectoid steel and hypereutectoid steel.
3. Study and drawing of microstructures of white, malleable, grey and nodular cast iron.
4. Study and drawing of microstructures of alpha brass, alpha-beta brass, aluminum bronze, tin bronze and bearing metal.
5. Study and drawing of microstructures of hardened steel, tempered steel.
6. Hardening of steel- study of effect of carbon on hardness of hardened steel.

7. Tempering of steels - study of effect of temperature on hardness of tempered steel.
 8. Study of change in microstructure on annealing and normalizing of tempered steel.
 9. Sulphur print test on a steel specimen & flow lines examination of a forged component.
 10. Jominy Hardenability test on a steel sample.
10. Jominy Hardenability test on steel sample.

Text-books:

1. Kodgire V. D., "Material science and metallurgy for Engineers", Everest Publishing
House, Pune.
2. K. G. Bundinski , M. K. Bundinski , Engineering Materials Practice - Hall of
India
Pvt. Ltd. , New- Delhi.
3. Higgins "Engineering Metallurgy", Part I Applied Physical Metallurgy, English
Language book Society / Edward Arnold.
4. Smith W. F., " Principles of Material Science and Engineering", McGraw- Hill Inc.

Reference books:

1. Rollason E. C., "Metallurgy for Engineers", ELBS Publishing.
2. Clark and Varney W. R. "Physical Metallurgy for Engineers", East-West Press
Pvt. Ltd., New Delhi.
Avner, "An introduction to physical metallurgy", TMH publication.
3. Donald R. Askeland & Pradeep Phule. , The science of engineering materials,
Thomson series.

T.E. (Production & Production S/w)

302082 - Kinematics and Design of Manufacturing Machines

Teaching Scheme:

Examination Scheme:

Lectures: 4Hrs / Week
Week

Theory: 100 Marks Practical: 2Hrs /
Term work: 50 Marks

UNIT I

10 Hrs Computer

Aided Analysis and Synthesis of mechanisms and kinematics structure of machine tools: Computer Aided Analysis and coupler curves for four bar mechanism and slider crank mechanism, dimensional synthesis of mechanisms, three position synthesis of slider crank mechanism, Over lay method, Bloch Synthesis, Least square technique

Machine tool motion and their transmissions, Kinematic balancing equation for motion transmitting elements, Kinematic analysis of machine tool structure: gear hobbling, gear shaping, bevel gear generator.

UNIT II

6 Hrs

Design for fluctuating loads: Stress Concentration and remedies, S.N.Diagram, Endurance limit, Factors affecting Endurance Strength, Design for Finite and Infinite life under reverse stresses, Cumulative damage, Sodberg's and Goodman's Diagram, Design of components like shaft, bolted joints, springs etc. subjected to variable loading.

UNIT III

8 Hrs

Spur Gears: various design considerations, Beam Strength, tangential loading, module Calculations, width calculations, types of gear tooth failures, Estimation of dynamic load by velocity factor and Spott's equation.

Helical Gears: Normal Module, Virtual no. of teeth, force analysis, Beam and wear . strength, Design of Helical Gears.

UNIT IV

8 Hrs Rolling

Contact Bearings: Types, Static and Dynamic load Capacity, Stribeck's Equation, Concept of equivalent load, Load life Relationship, Selection of bearing from

Manufacturer's Catalogue, Design for variable loads and Speeds, Bearings with Probability of Survival other than 90%, Lubrication and Mounting of bearing.

Sliding Contact Bearings: Introduction, Classification of bearings, Hydrodynamic Lubricated Bearings, Wedge film Journal Bearings, Squeeze film Journal Bearings, Materials used for Sliding Contact Bearings, Lubricants.

UNIT V

10 Hrs Flywheel:

Introduction, Coefficient of fluctuation of speed, Fluctuation of energy, Maximum fluctuation of energy, Energy stored in flywheel, Stresses in flywheel rim & Arms, Detail Design and construction of flywheel.

Design for Manufacture: General Principles for Design for Manufacture, Principles of design for casting, Forging, Machining, Welded Joints, etc., Design for Manufacturing & Assembly, Aesthetic and Ergonomics aspects in design.

UNIT VI

10 Hrs Statistical

considerations in design and Optimum Design:

Statistical Considerations in Design: Analysis of Tolerances, Design and Natural Tolerances, Factor of safety and reliability.

Optimum Design: Objectives of Johnson's Method of optimum design, design for normal specification and redundant and incompatible specification, Lagrange multipliers.

Term Work:

1. Assignments, one each on Units I, II, IV, V & VI.
2. **Design Project:** - One design project on gear box design, consisting detail design report & Two Full Imperial size sheets one showing the manufacturing drawing (Preferably on C.A.D.) of assembly of Gear box and second showing details for the same.

Oral is based on above Term work

Text Book:

1. Design of Machine Elements, Bhandari V.B., Tata McGraw Hill Publication.
2. Mechanical Engineering Design, Shigly, McGraw Hill Publication.
3. Design of Machine Elements, M.F. Spott, Prentice Hall.

References:

1. Theory of Machine, R.S.Khurmi & J.K.Gupta, S.Chand and Company.
2. Theory of Machine, Ratan, Tata McGraw Hill Publication.
3. Principles of Machine Tools, G.C. Sen & A. Bhattacharya.
4. Design Data Book, PSG College Technology.
5. William C.Ortwein, Machine Component Design, West Pub. Co. and Jaico Publication House.
6. R.K.Jain, Machine Design, Khanna Publication Delhi.
7. R.S.Khurmi & Gupta J.K., A Text book of Machine Design, S.Chand and Company.

T.E. (Production)

311083 Material forming

Teaching scheme:
4 Hrs/Week

Examination scheme: I Lectures:
Theory: 100 Marks Practical: 2 Hrs/Week
Oral: 50 Marks

UNIT I

10Hrs Fundamentals

of Material Forming: Introduction of forming processes. Strain hardening Concept of flow stress determination, Theory of plasticity, Yield criteria for ductile materials- Von mises criteria, Tresca criteria. Effect of temperature, strain rate, metallurgical

microstructure, chemical composition and mechanical properties, for Classification of material forming process. Concept of Formability, formability limits s. and formability diagram.

UNIT II

10Hrs FORGING:

Introduction, classification of forging processes. Forging equipment- Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. wing Forgability tests, design of forging as a product, friction in forging. Forging defects and r the remedies. New technologies: Liquid metal forging, isothermal forging, No draft forging, P/M forging, Rotary swaging, roll forging, Lubrications in forging.

UNU III

6 Hrs WIRE AND

TUBE DRA WING: Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Patenting heat treatment. Variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, work hardening, lubrication in wire drawing.

Tube drawing: Methods, force calculation, stock penetration. lubrication in tube drawing

UNIT IV

8 Hrs ROLLING OF

METALS: Scope and importance of rolling. Types of Rolling Mills- Construction and working. Roll bite, reduction, elongation and spread. Deformation in rolling and determination forces required. Process variables, redundant deformation. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling

UNIT V

8 Hrs EXTRUSION:

Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio Force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.

UNIT VI

10Hrs ADVANCED

METAL FORMING PROCESSES: High velocity forming- principles, comparison of high velocity and conventional Forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic Forming. Microforming, Microcoinig, microextrusion, Microbending

Stretch forming, coining, embossing, curling, spinning, flow forming advantages, limitations and application of the process

Term work;

Term work shall consist of

1. Assignment based on each topic of syllabus
2. Study of roll pass design for two structural shapes -Round & Square.
3. A report on factory visit, comprising of product range, processes, plant layout. Auxillary equipment, process parameters etc.

Text Books:

1. Dieter, Mechanical Metallurgy
2. P.N. Rao, Manufacturing Technology, TataMcGrawHill
3. G.W. Rowe, Principles of industrial metal working process, Edward Arnold

References:

1. Dr. R. Narayanswamy, Metal Forming Technology, Ahuja Book Co.
2. Surender Kumar, Principles of Metal Working.
3. ASM Metal hand book Vol: 4 forming.

T .E. (Production Engineering)

311084 PRODUCTION PLANNING AND CONTROL

Teaching Scheme:

**Lectures: 4Hrs / Week
2Hrs / Week**

Examination Scheme:

**Theory: 1 00 Marks Practical:
Term work: 50**

UNIT-I

6 Hrs

Introduction to PPC: Role and stages of PPC, PPC as an integrated function, Product Life Cycle Analysis, Types of Production systems.

UNIT-II

8Hrs

Forecasting Techniques: Use and types of forecasting, Methods of forecasting and comparison, Verification and control.

UNIT-III

10Hrs Scheduling

Techniques And Production Control: Process sheet, Routing, Scheduling- Gantt Chart, Machine Loading Chart, Line of Balance, Line Balancing, Dispatching rules, Sequencing - Johnson's rule, Loading, Follow- up, Evaluation.

UNIT-IV

10 Hrs

Materials Planning And Purchasing: Scope and requirement of MRP, MRP I and MRP II, Master Production Schedule, Bill of Materials, Capacity Requirement Planning, Introduction to ERP, Purchasing - Documentation, Make or Buy decisions, Vendor Development.

UNIT-V

8 Hrs

Inventory Control: Types of Inventory Cost of Inventory, EOQ, Selective Inventory Control, Replenishment Systems.

UNIT-VI

6 Hrs

Stores Management: Types of stores, Storage layout and storage systems, Stores Documentations, Stores Control and Control of Wastage and surplus, JIT, Value Stream Mapping.

Text Book:

1. J.L. Riggs, "Production Systems - Planning Analysis and Control ", JhonWiley & Sons.
2. J.B. Dilworth, "Operations Management - Design, Planning & Control *for* Manufacturing and Services ", McGraw Hill.
3. S N Charry, "Production and Operation Management" Tata McGraw- Hill

Reference Books:

1. Samuel Elion, Elements of PPC ", Universal Book Company.
2. Martand Telsang, "Industrial Engineering and Production Management" S. Chand and Co. Ltd.
3. Moore, "Production Control ".
4. Mager and Boodman," Production Planning And Inventory Control"
5. Martin Star, " Production Management ".
6. Erry Johnson, " Process Engineering ".
7. E. EL. Buffa, " Production Management ".
8. A. K. Bewoor, "Production Planning and Control" Satya Publication.

TE Production Engineering

311085 Metal Cutting and Tool Design

Teaching scheme:

Hrs/Week

Examination scheme: Theory : 4

Paper: 100 Marks Practical: 2 Hrs/Week

Oral : 50 Marks

UNIT I

10 Hrs

Theory of metal cutting: Cutting tools, tool geometry, concept of speed, feed, depth of cut & cutting action & effect of these on cutting forces, types of chips, Merchant circle of forces. Estimation of cutting forces. Empirical relations. Tool force dynamometers. Measurement of cutting forces and power required.

UNIT II

8 Hrs

Cutting tool standards and materials: Tool signature ORS & ASA methods, tool standards: Single point cutting tool, drills, broach, reamer, milling cutters. Cutting tool materials, heat treatment of tools. Non-conventional tool geometry: Koleshov, Gaussian tools, Anti chatter tools, Advance tool materials, coating on tool, throwaway inserts.

UNIT III

8 Hrs

Heat generation, tool life & Economic of cutting tools: Heat generation in cutting, cutting fluid, tool wear, Tool life-modified Taylor's equation. Factors affecting tool life, Machinability and its rating, criteria for Machinability. Economics of tooling. Criteria for minimum cost & maximum production.

UNIT IV

8 Hrs

Design of cutting tools: Single point cutting tool, Form tool, drills, reamers, milling cutters, and Broaches. Manufacturing of Cutting tools.

UNIT V

8 Hrs

Fundamentals of Jigs and fixtures: Significance and purpose of jigs and fixtures and their functions in manufacturing processes. Classifications of jigs and fixtures. Design features of main elements of Jigs and fixtures such as locating, clamping and guiding elements and their integrations. Indexing, locking and auxiliary elements. Bodies and bases or frames of Jigs and fixtures. Economics of Jigs and fixtures, Pneumatics & Hydraulics for jig & fixtures.

UNIT VI

10 Hrs

Design of jigs & fixtures: General guidelines & procedures for design of Jigs and fixtures. Design & selection of standard elements, Analysis of number of clamping forces required & their magnitude, concept of modular fixtures & tool presetting fixtures.

Text Book:

1. Wilson, fundamentals of tool design, A.S.T.M.E.
2. M.H.A. Kempster, Introduction to Jigs and fixtures design.
3. Dolye, Manufacturing processes and material for engineers.

Reference:

1. P C Sharma, Production Engg. , Khanna publishers.
2. P.C. Sharma, Machine tools & Tool Design
3. Richard Kibbe, John E.Neely, Meyer, White, Machine tool practices

4. Dolalson, Lecain and Goold, Tool design, Tata McGrawhill.
5. Hoffman, Introduction to Jigs and fixtures.
6. Tool Engineering Handbook, A.S.T.M.E.
7. Basu, Mukherjee and Mishra, Fundamentals of tool engineering and design, Oxford and ffiH publishing.
8. R. K. Jain, production technology, Khanna Publishers
9. Milton Shaw, Metal cutting principle
10. P .H. Joshi, Jigs & Fixtures.
11. Dr. Surender Kumar, Production Engineering Design

List of Experiments:

1. Experiments on chip formation.
2. Verification of Metal cutting Theories.
3. Measurement of cutting forces (anyone)
4. In Turning / Milling / Drilling.
5. Effect of tool geometry, cutting speed, feed, depth of cut on cutting parameters.
6. Design and working drawing of any three of following cutting tools:
7. Single point tools, Form tool, Reamer, Milling cutter, Broaches, Drills.
8. Design and Working drawing of one jig. (Drilling, Reaming, Tapping)
9. Design and Working drawing of one fixture. (Turning, Milling, Broaching)

T.E Production

311086 Production Practice-1

Teaching Scheme:
Hrs/W eek

Examination Scheme: Practical: 2
Practical: 50 Marks

Each candidate shall be required to complete and submit the following term work.

Composite job involving different machining operations.

Part A:-

1) **Lathe:** external and internal threading (Vee, Square or Acme threads), taper turning,

grooving, knurling, drilling operations on lathe.

2) **Milling:** helical or bevel gear cutting on a milling machine.

Part B:- Journal consistin2 of :

1) Preparation of journal *consisting* of calculation and procedure for above gear *cutting* on

milling machine.

2) Safety aspects used in the machine shop:- Precautions and care to be taken while working on various machine tools

e.g. lathe, milling, drilling, grinding etc.

Note: - A practical examination of 12 hours duration shall be conducted at the end of semester based on the part A.

311087 Machine Tools And Advance Manufacturing Systems

Teaching Scheme: -

Examination Scheme: -

Theory: 4 hrs /week

Paper: 100 Marks

UNIT I

6Hrs

Machine Tool Automation: Automation Concepts, Automatic and Semiautomatic Machine Tools and their Classification, Turret and Capstan Lathes. Single Spindle and Multi-spindle Automats, setup of automatics and semiautomatics. Tooling Layout and Operation Sheet, Cam Tool Layout for Single spindle automat. Concepts of Transfer Machines/Lines.

UNIT II

10 Hrs

NC/CNC/DNC Machining: NC/CNC Machining: Introduction to NC,CNC,DNC Machines, Comparison between NC and Conventional Machine Tools, Basic Principles of NC Machines, its Advantages, Tooling Requirements, Introduction to Turning and Machining Center.

UNIT III

8 Hrs

Surface Coating Processes: Electroplating, Electroless plating, Phosphating, Galvanizing, Metal spraying, Anodising. Plasma coating, physical and chemical vapour deposition, Ion implantation-influence of process parameters on coating.

Micro and Nano Machining: Concepts, introduction and applications of the process and machines.

UNIT IV

8 Hrs

High Volume Manufacturing System: Analysis of automated flow lines, Analysis of transfer line without storage buffer, partial automation, flow lines with storage buffer,

computer simulation, assembly line balancing, automated material handling and inspection methods.

Unit V

10 Hrs .

FMS and Robot Technology: Concept of manufacturing systems and automation, automation strategies, group technology, concept of machine cell and CMS, Building blocks of FMS Planning and implementations of FMS, Computer integrated manufacturing (CIM). Elements of robot, robot controller unit, manipulators, end effectors, robot joints, and degrees of freedom, Robot axes and configuration, robot sensors, robot cells layout and applications Simulation Of Manufacturing Systems - Introduction, Concept of System and their Nomenclature, Types of Models, Applications.

UNIT VI

6 Hrs

Controls/ Installation/Chip Disposal! Cutting Tool Machines:

Machine Tool Operator's Control Systems: Need of Standardization, Classification, Controls in Conventional and NC/CNC Machines, Adaptive Control.

Machine Tool Installation and Maintenance, Selection of Machine Specification, Chip Disposal Systems, Recovery of Material from Disposal.

Cutting Tool Manufacturing Machines, Cutting Oil/Coolant Type and Selection.

Text Book:

1. HMT Production Technology
2. Chapman; Workshop Technology
3. P.N.Rao-manufacturing technology Tata McGraw hill publication.

Reference Books: -

- 1 Degarmo, Black and Kohser; Material and Processes in Manufacturing
- 2 PC Sharma; Production Technology (Manufacturing Processes)
- 3 Roy Lindberg; Processes and Materials of Manufacture

- 4 Kalpakjian; -Manufacturing Engineering and Technology,- Manufacturing Processes for Engineering Materials
5. Pabla Adithan; CNC Machines
6. Kundra Rao Tiwari; Numerical Control and Computer Aided Manufacturing
7. Mikell P. Groover; Automation, Production Systems and Computer Integrated Manufacturing
- 8 G C Sen. and A.Bhattacharya; Principles Of Machine Tools
- 9 PH Joshi; - Cutting Tools, - Tooling Data
- 10 Pande Shan; Modern Machining Processes
11. Ghosh Malik; Manufacturing Science
12. Surenderkumar and Umeshchandra; Production Engineering Design
13. P.N.Rao- CAD/CAM/CIM Tata McGraw hill publication.
14. Khire and Kulkarni CAD/CAM/CIM

TE (Production)

311082 MANUFACTURING PROCESS-II

Teaching Scheme

Examination Scheme:

Lectures: 4 Hrs /Week

Theory: 100 Marks

UNIT I

8Hrs

Classification of welding processes, Surface and edge preparation, fundamentals of heat and fluid flow in fusion welding. Arc welding processes-Carbon arc, submerged arc, tungsten inert Gas (TIG), metal inert gas (MIG), Electro slag, plasma arc & stud welding process- theory, comparison on merits, limitations and applications. Classification of arc welding processes with reference to BIS, ASTM, IS standards. Fluxes used in arc welding.

UNIT II

8 Hrs

Gas welding - processes and equipment used, types of flame, adjustment of flame, oxy Acetylene welding, gas cutting - merits, limitations and applications of above processes. Electric resistance welding - processes and equipment used, spot, seam, projection, Butt, Percussion welding, resistance tube welding, merits, limitations and applications.

UNIT III

8 Hrs

Pressure welding, diffusion, ultrasonic, friction, explosive, forges, Thermit welding, laser,

electron beam welding - equipment used - merits, limitations and applications of above processes.

Brazing, braze welding and soldering processes types of flames, filler metals fluxes used merits, limitations and applications of above processes.

UNIT IV

8 Hrs

Solidification of casting, theory and its applications. Chvornov's Rule. Principles of gating, risering and their design methods. Progressive and directional solidification casting design considerations. Segregations, shrinkage, porosity, cellular structure, hot tear problems in casting. Computer applications in casting design & software's.

UNIT V

8 Hrs

Gear cutting processes -forming & generation, gear cutting on milling, gear hobbing, gear shaping, gear shaving, lapping & grinding, various machines use for gear manufacturing. Thread cutting, internal and external chasers, dies, thread rolling thread milling, lapping and grinding.

UNIT VI

10 Hrs

Non-conventional machining process: Detail study with respect to principle process parameter, theoretical analysis, experimental results and comparative assessment of abrasive jet machining, Ultrasonic machining, Chemical machining, Electrochemical machining, Electro discharge machining, Electron beam machining, laser beam machining, Plasma arc machining, Ion Beam machining, wire cut EDM.

Text Book:

1. Little - welding and welding technology, Tata McGraw Hill.
2. Production Technology, HMT
3. Dgarmo Black & Kohser, Material & Processing in Manufacturing, Prentice Hall.

References:

1. O.P.Khanna- A text book of welding technology, Dhanpat Rai & sons.
2. Carry - modem welding technology, Prentice Hall.
3. S.V. Nadakarni - modem arc welding technology, Oxford mHo
4. O.P .Khanna- A textbook of foundry technology, Dhanpat Rai & sons.
5. P.L. Jain - A text book offoundry technology, Tata McGraw Hill.
6. R.S. Parmar - welding and welding processes, Khanna publisher.
7. P.C. Sharma, Production Engineering, - S. Chand & co.
- 8) Ghosh & Malik, Manufacturing Science,
- 9 P.N. Rao, Manufacturing Technology, TataMcGrawHill

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T .E. Production

311089 - Metrology and Quality Control

Teaching Scheme:

Lectures: 4Hrs/Week

Practical: 2 Hrs./W eek

Examination Scheme:

Theory: 100 Marks

Oral: 50 Marks

UNIT I

8Hrs

Introduction: Meaning of Metrology, Precision, Accuracy, Errors in Measurement, Calibration.

Linear Measurement: Standards, Line Standard, End Standard, Wavelength Standard, Classification of Standards, Precision and Non Precision Measuring instrument~, Slip Gauges.

Angular Measurement: Sine bar, Sine Center, Uses of sine bars, angle gauges, Auto Collimator Angle Dekkor, Constant deviation prism.

UNIT II

8 Hrs

Limits, Fits and Tolerances: Meaning of Limit, Fits and Tolerance, Cost - Tolerance relationship, concept of Interchangeability, Indian Standard System.

Design of limits Gauges: Types, Uses, Taylor's Principle, Design of Limit Gauges.

Inspection of Geometric parameters: Straightness, Parallelism, Concentricity, Squareness, and Circularity.

Comparators: Uses, Types, Advantages and Disadvantages of various types of Comparators.

UNIT III

10Hrs

Surface Finish Measurement: Surface Texture, Meaning of RMS and CLA values, Tomlinson's Surface Meter, Taylor- Hobson Surface Meter, Grades of Roughness, Specifications.

Screw Thread Metrology: External Screw Thread terminology, Floating Carriage Instruments, Pitch and flank Measurement of External Screw Thread, Application of Tool Maker's Microscope, Use of Profile Projector.

Gear Metrology: Spur Gear Parameters, Gear tooth thickness measurement: Gear tooth vernier caliper, Constant chord method, Span Micrometer.

Interferometry: Introduction, Flatness testing by interferometry, NPL Flatness Interferometer.

Study of Measuring Machines, Recent Trends in Engineering Metrology.

UNIT IV

8 Hrs

Introduction: Meaning of Quality, Approaches- Deming's Approach, Juran's Approach, Quality of Product, Quality of Service, Cost of Quality, Value of Quality, Difference between Inspection, Quality Control and Quality Assurance, Role of Quality in Present day environment.

Introduction to Quality Control: 1) Meaning of quality Control 2) 100% Inspection and Selective Inspection 3) Statistics in Selective inspection.

Introduction to statistical quality control: Control charts- Attribute (P, np, C, U) and Variable (\bar{X} bar, R chart and XMR chart), Sampling inspection, OC Curves and Sampling Plan, Process Capability Index (Cp, Cpk)Concept, Methods of determining Cp and Cpk.

UNIT V

8 Hrs

Quality assurance systems:

Total quality management (T.Q.M):- 7 tools of Problem Solving, Like Cause and Effect Diagram, Pareto Analysis etc., Q.F .D., Quality Circles, Kaizen, six sigma, 5S System.

Technical Specification (T.S) TS 16949 Standards.

Reliability Engineering: - Concept, Definitions of MTTF, MTBF, FEMA.

Design of experiment: meaning, objective, and types of research, approaches, two factorial experiments, Taguchi Method.

UNIT VI

8 Hrs

ISO 9001-2000 Series of Standards- History and Evolution of ISO 9000 Series, importance and overview of ISO 9000- 1998 Series standards, structure of ISO 9000-

2000 Series standards, clauses of ISO 9000 series standards and their interpretation and implementation, quality system documentation and audit.

ISO 14000: - environmental management concepts, and requirement of ISO 14001, benefits of environmental management Systems

Malcom Baldrige national quality Award and other quality awards

Term Work:

The Term work should be in the form of Journal consisting of following three sections:

A) Experiments: (Any eight of the following)

1. Measurement of straightness, flatness, roundness.
2. Measurement of the Surface roughness.
3. Measurement of angle by sine bar / Sine center.
4. Measurement of Optical surface using Interferometer.
5. Measurement of Screw thread parameters using Floating Carriage Micrometer.
6. Measurement of Gear tooth thickness using Gear tooth Vernier caliper and Span Micrometer.

7. Study and Experiment on Profile Projector.
8. Study and Experiment on any type Comparator.
9. Calibration of instrument using Calibration setup.
10. Alignment Test on Lathe/ Drilling/ Milling Machine
11. Experiment to measure Process Capability using Statistical Process Control.

B) Assignments:

Any Three Assignments Based on Quality Control Syllabus.

C) Industrial Visit: - A Report on Industrial visit to Metrology Department.

Text Book:

1. K.J.Hume, Engineering Metrology, Kalyani publication
2. K.W.B.Sharp, Practical Engineering Metrology, Pitman Publication
3. J.M. Juran & F.M.Gryna, Quality Planning and Analysis.

References:

1. R.K. Jain, Engineering Metrology, Khanna Publication.
2. Juran's Quality Control Handbook.
3. I.C.Gupta, A Text book of Engineering Metrology, Dhanpat Rai and Sons.
4. E.L.Grant & R.S. Kearenworth, Statistical Quality Control.
5. Kaoru Ishikawa, Guide to Quality Control, Asian Productivity Organisation, Series,
6. Tokyo. . 0-

7. ISO 9000 Quality System - S.Dalela.

8. ISO 9000 Quality Management System, International Trade Center, Geneva on and

9. Statistical Process Control Handbook by General Motor, Ford, and Chrysler.

T .E. Production

311090 Die & Mould Design

Teaching scheme:

Examination scheme:

Theory: 4 Hrs/Week

Paper: 100 Marks

Practical: 2 Hrs./ Week

Oral: 50 Marks

UNIT 1

10 Hrs

Design of Shearing Dies: Basic operations, fine blanking, types of presses- mechanical, hydraulic, pneumatic & their mechanisms, elements of die sets, types of die sets, types of dies simple, compound, progressive, combination & inverted dies, types of punches, Methods of reduction of shear force, types of strip layouts, types of strippers, types of pilots, types of stoppers, selection of dowel pins & allen screws Design of Blanking & Progressive dies - Shearing force, press capacity, clearances, die & punch size, center of pressure, strip layout, percent utilization.

UNIT II

8Hrs

Design of Drawing & Bending Dies: Design of shallow drawing die, design of deep drawing die (without flange) for cylindrical objects- calculation of blank size by area method & standard formula, percentage reduction number of draws, drawing force, blank holding force, press capacity, ironing force. Types of Bending dies, developed length calculation, bending force, spring back & methods used to overcome it, press brake.

UNIT III

8Hrs

Design of Forging Dies: Design of forging die for multi-impression die-: selection of parting line, drafts, fillet & comer radii, ribs & webs, stock size calculation, flash & gutter, design of fullering, edging, blocking, finishing impressions, trimming dies, Die block dimensions, die inserts. Rules for upset forging.

UNIT IV

10 Hrs

Design of Die castings dies: Die casting machines-Hot & cold chamber, metals for die casting, die locking methods, interlocks & safety devices, specific details of die constructions, casting ejection, cores, slides, loose die pieces, types of cores, directional solidification, types of feeders, die venting, water cooling, classification of dies- single, combination, multiimpression. General details of die design, inserted impressions, die casting defects, die lubrication & rules for die lubrication

UNIT V

6 Hrs

Plastics processing: Compression, transfer, injection, extrusion, blow, rotational moldings Thermoforming.

General construction of injection moulds, types of nozzles splits, side cores & side cavities, moulding internal undercuts, multidaylight moulds.

UNIT VI

8 Hrs

Design of Injection mould: Determination of number of cavities, types of cooling system, design of cooling channels, heat transfer considerations, types of ejectors, determination of mould opening force & ejection force, types of runners & gates, design of runners & gates, use of CAD for mould design.

Term Work

- 1) Design & drawing of Blanking die.
- 2) Design & drawing of Progressive die.
- 3) Design & drawing of Shallow drawing die. 4) Design & drawing of Deep drawing die.
- 5) Design & drawing of single cavity injection mould.

(All drawings on A2 size drawing sheet)

Text Books:

1. Donaldson, Lecain & Goold, Tool Design, Tata McGraw Hill
2. Paquin, Fundamentals of Die design,
3. Doebler H.H, .Die Casting, McGraw Hill

4. P.N. Rao, Manufacturing Technology, TataMcGrawHill

References:

1. P.H. Joshi, Press Tools, A.H. Wheeler

2. P.C.Sharma, Production Engineering, S. Chand

3 Dr. Surender Kumar, Production Engg.Design (Tool Design), Satya Prakashan

4. R.G. W. Pye,Injection Mould Design, EWP

5. A.S. Athalye, Plastic Processing handbook, Multitech

TE (Production Engineering)

311091 Database and Information Technology for Production Engineering

Teaching Scheme:

Examination Scheme:

Lectures: 04 Hrs/Wee

Paper: 100 Marks

Practical: 02 Hrs/Week

Term work: 50 Marks

Unit I

8

Hrs.

Introduction to Databases: Introduction, organization & component of database management system (DBMS), data models, entity relationship model, advantages and disadvantages in database processing, hierarchical & network databases.

Introduction to oracle, SQL, Database creation, database retrieval, use of compound conditions like AND, OR, Joining and updating tables.

Unit II

6 Hrs.

Database Management: Database design -dependencies and normalization (1st & 2nd order), database storage and querying, aggregate functions. - Group by, having order by, sub-queries and various SQL operators.

UNIT III

8 Hrs.

Introduction to Information Technology: Fundamentals of computer communications, transmission, types of communication lines, network topologies.

Mathematical modeling and engineering problem solving, software development process, algorithm design, pseudo code, flow charts, program composition, quality control, documentation and maintenance.

UNIT IV

8 Hrs.

Computational Techniques- I Revision of 'c' syntax

Numerical solution of algebraic and transcendental equations by bisection method,

Newton-Raphson Method

Numerical Solution of Linear Simultaneous Equations by Gauss Elimination Method,

Gauss-Siedel Method.

UNIT V

8 Hrs.

Computational Techniques- II

Curve Fitting: Least square criterion- 1st and 2nd order

Interpolation: Lagrange's formula, Newton forward difference method.

Errors and approximations: types of errors, error propagation.

UNIT VI

10 Hrs.

Information Technology for Competitive Advantage

Inter -organizational and global information systems, Electronic Data Interchange (EDI) and Electronic Fund Transfer (EFT).

Functional and Enterprise system- production and operation systems, human resource management systems, marketing and sales systems.

Intelligent systems in Business- Artificial intelligence and intelligent systems, expert systems, intelligent agents.

Electronic Commerce (E-Commerce)- foundations, business-to-consumer and business-to-business applications.

Text Book:

1. Database System Concepts: SiJberschaltz, Korth, Sudarshan - McGraw HilJ IntJ., 4th Edition, 2002
2. Database Management System: A. M. Muzumdar and P. Bhattacharya, Tata McGraw Hill Publication, New Delhi.
3. Introduction to Information Technology: Turban, Rainer & Potter -John Wiley & Sons, 2000.

Reference Books:

1. Oracle Programming - A Primer: Rajashekhar Sundarraman, Pearson Education, 2004.
2. Computer Aided Design and Manufacturing: Dr. Sadhu Singh, Khanna Publication, New Delhi.
3. Let Us C: Y. Kanetkar, BPB Publications, 4th revised edition 2002.
- 4 Programming with C: B. S. Gottfried, McGraw Hill Intl., Schaum's Outline Series.
5. Numerical Methods for Engineers with programming and software applications: S. C. Chappra, R. P. Canale - Tata McGraw Hill Co. Ltd, New Delhi.

Term Work:

1. A database related language such as VB or V FoxPro should be covered.
2. Creation of Database using SQL
3. Addition/Deletion/Modification of Existing Database using VB/ FoxPro
4. Creation of Database format for Purchase/Manufacturing/Logistics and its report generation
5. Solution of Algebraic/Transcendental Equation using C
6. Solution of Linear Simultaneous Equations using C
7. Solution of Curve Fitting using C
8. Solution of Numerical Interpolation using C
9. Study on any two of the following:
 - a) Inter-organizational and global information systems
 - b) Functional and Enterprise system
 - c) Intelligent systems in Business .
 - d) Electronic Commerce (E-Commerce).

TE (Production)

311092 Production Practice-II

Teaching Scheme

**Practicals: 2 Hn /Week
Marks**

Examination Scheme:-

Termwork: 50

ASSIGNMENTS (Minimum any 8 assignments)

1. Study of TIG welding process parameters for ferrous & Nonferrous metals & its effect on weld quality
2. Study of CO₂/MIG welding & its process parameters for steel.
3. Macro examination of Soldering joint & Brazing joint.
4. Application of gas welding on types of flames.
5. Permeability testing of green sand.
6. Casting Design calculations for green sand moulding. (One component for each batch)
7. Moulding & casting of above component.
8. Fluidity testing of any metal using fluidity spiral.
9. Study assignment on EDM, ECM, USM & AJM
10. Study assignment on LBM, EBM, PAM IBM
11. Study of Gear manufacturing Process.
12. Study of Thread Manufacturing Process.

T.E. (production Engineering)

311093 Seminar

**Teaching Scheme
Scheme**

Examination

**Practical: 02 Hrs/Week
Marks**

Oral: 50

a) The objective of Seminar is to test the student on his/her ability for self-study and his/her ability

to communicate - Written and oral.

b) Seminar will be in the form of a report submitted by the student:

It will be -

1. Done by a student individually, on topic of his/her choice based on literature survey/a case study wherever applicable/possible, and approved by the staff- in- charge,
2. A report with 15-20 pages of A-4 size paper, 1.5 spaced typed material, and appropriately bound.
3. Title font/figures/graphs shall be black and white.

c) The Oral examination will be based on the report submitted and (orally) presented.

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