B.E. (PTDC) Mechanical Engineering
SEMESTER – V

BRANCH	SUBJECT TITLE	SUBJECT CODE	Period per week			
			L	T	P	C
B.E. PART TIME MECHANICAL	Manufacturing Process	PTME-501	3	1	--	4

UNIT I

Patterns and Pattern making (5) Introduction to Foundry - Steps involved in casting, advantages, limitations and applications of casting process. Pattern types, allowances for pattern, pattern materials, color coding and storing of patterns

Moulding: Moulding methods and processes-materials, equipment, Moulding sand ingredients, essential requirements, sand preparation and control, testing, cores and core making. Design considerations in casting, gating and Riser - directional solidification in castings, Metallurgical aspects of Casting

UNIT II

Casting Processes: Sand castings, pressure die casting, permanent mould casting, centrifugal casting, precision investment casting, shell Moulding, Co2 Moulding, continuous casting-squeeze casting, electro slag casting, Fettling and finishing, defects in Castings, Casting of non-ferrous materials

Melting, Pouring and Testing

Melting furnaces- -crucibles oil fired furnaces-electric furnaces-cupola, selection of furnace, calculation of cupola charges-Degasification, inoculation, pouring techniques casting defects and Inspection of castings.

UNIT III

Basic Joining Processes Types of welding-gas welding, -arc welding,-shielded metal arc welding, GTAW, GMAW, SAW, ESW-Resistance welding (spot, seam, projection, percussion, flash types)-atomic hydrogen arc welding-thermit welding, Flame cutting - Use of Oxyacetylene, modern cutting processes, arc cutting,

UNIT IV

Special Welding Processes Soldering, brazing and braze welding and their application., welding of special materials – Stainless steel, Aluminum etc. weld ability of cast iron, steel, stainless steel, aluminum alloys. Introduction to Electron beam and Laser welding. UNIT V Design of Weldments

Welding symbols-Positions of welding-joint and groove design-weld stress-calculations design of weld size, estimation of weld dilution, heat input, effect of welding parameters preheating, and post heating temperature: Selection of electrodes, flux etc. Weldments Testing and Metallurgy

Inspection of welds – destructive and non-destructive testing methods, Defects in welding causes and remedies, -effect of gases in welding-fatigue failure in Weldments.

Suggested Reading

1.Lindberg,"Processes and Materials of Manufacture", Prentice hall India (p) Ltd.

2.P.N.Rao, "Manufacturing Technology", TMH Ltd 1998(Revised edition)

3.Richard L.Little, "Welding& Welding Technology", Tata Mc Graw Hill, 1992.

References

1.Heine, Loper and Rosenthal, “Principles of Metal Casting”, Tata Mc Graw Hill Publishing Co, Ltd; New Delhi, 1995.

2.Doehler.E.H, “Die Casting”, McGraw Hill Book Co. New York.1991.

3.Banga T.R; and Agrawal R.L, “Foundry Engineering”, Khanna Publishers, 1992.

4.Serope Kalpakjian, Steven R.Schmid, “Manufacturing Engineering and Technology”. (4th Edition), Prentice Hall 2000-06-15 ISBN:0201361310

5.E.PaulDeGarmo, J.T.Black, Ronald A.Khoser, “Materials and Processes in Manufacturing” Wiley; 9 edition (December6, 2002) ISBN:0471033065

6.Taylor H.F Flemings M.C&Wulff J, “Foundry Engineering”, Wiley Eastern Limited, 1993.

7.Gupta R.B, “Foundry Engineering”Satyaprakashan, 1989.

8.Lal, Mand Khanna O.P A, “Text Book of Foundry Technology”, Dhanpat Rai and Sons, 1986.

9.Jain P.L, “Principles of Foundry Technology”, Tata Mc Graw Hill Publishing Company, Ltd; 1995”.

10. “ASM Metals Hand Book on Casting”, 1992.

11.Parmer R.S; “Welding Processes& Technology”, Khanna Publishers, 1994.

12.Lancaster J.F., George Allen and Unwin, 1991, “Metallurgy of Welding”.

13.Metals Hand Book, Vol 6,8th edition, ASM, 1971. 14.AWS Welding Hand Book,Vol 1 to 4 AWS.

BRANCH	SUBJECT TITLE	SUBJECT CODE	Period per week			
			L	T	P	C
B.E. PART TIME MECHANICAL	Machine Design-I	PTME-502	3	1	2	6

UNIT-1

Mechanical Engineering design - Design considerations, Design Procedure Material selection Modes of failure - Theories of failure , causes of stress concentration; stress concentration in tension, bending and torsion; reduction of stress concentration, theoretical stress concentration factor, notch sensitivity, fatigue stress concentration factor, cyclic loading, endurance limit, S-N Curve, loading factor, size factor, surface factor. Design consideration for fatigue, Goodman and modified Goodman's diagram, Soderberg equation, Gerber parabola, design for finite life, cumulative fatigue damage

UNIT-2

Design of Fasteners: Design of cotter and knuckle joints. Fasteners and keys, Design of welded joints, Fillet and butt welds, Design of riveted joints. Design of bolted joints. Power screws.

UNIT-3

Selection & Design of bearings : Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-element Bearings: Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

UNIT-4

Design of Springs : Design of helical compression & tension spring , design of leaf spring & torsion springs , fatigue loading of springs ,surge in springs ,spiral springs .

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment.

References :

1.Robert C Juvinal, Kurt M Marshek Machine Component design Wiley Student edition

2. C S Sharma & Kamlesh Purohit , Design of machine elements PHI

3. Sharma & Agarwal Machine design .

4. Pandya & Shah , Charottar .

5. J E Shingley Machine design Mc Graw Hills

6. Gope P C , Machine Design , PHI Learning . 2015

7. P Kannaiah , Machine Design , SCITECH .

8. Nortan RL , Machine Design , Pearson , Fifth Edition .

BRANCH	SUBJECT TITLE	SUBJECT CODE	Period per week			
			L	T	P	C
B.E. PART TIME MECHANICAL	Production Management	PTME-503	3	1	-	4

Introduction to Production and Operations management, difference between production, operations and manufacturing, production systems, production system model, types of production systems, Job, Batch, Mass and Continuous production systems, Flexible production systems, Lean production systems. Push and Pull production control systems. Facility design, facility location planning, factors affecting facility location decision, facility layout planning, principles and methods of facility layout design, shop floor management techniques. Forecasting, scheduling, routing, dispatching and follow up.

Management functions, Evolution of Management Theory, Management approach to Planning, Analysis and Control functions involved in a Production System; Production cycles, planning functions;

Types of industry: Job, Batch, Continuous, Mass and Flow Productions; Organization and policies in respect of production planning and control; Product design and development;

Forecasting techniques; Scheduling, Sequencing and plant loading for optimal utilization; Queuing models and line balancing;

Materials planning and Control, Inventory Management; Value Analysis; Productivity Analysis, Mechanics of production control.

References:

1. Production and Operations Management by S.N. Chary, TMH.

2. Essentials of Management by Koontz & Weihrich, TMH.

3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons.

BRANCH	SUBJECT TITLE	SUBJECT CODE	Period per week			
			L	T	P	C
B.E. PART TIME MECHANICAL	Production Process – II (Machine tools)	PTME-504	3	1	2	6

Unit – I

Introduction to tool design: Tooling, tool design, duties of a tool designer, general tool design procedure. Design of Single point Cutting Tools: Design of single point lathe tool: Solid type tool, brazed tip tool, long index able insert, throwaway index able insert types and chip breakers.

Unit – II

Design of Multi Point Cutting Tool: The twist drill, elements of a twist drill, Drill specification, Cutting speed, feed, depth of cut of drill tool, forces on a drill, Machining time, forces acting on drill, power of drilling, selection of tool geometry. Design of milling cutter: Milling operations, Elements of milling cutter, Design of elements like number of teeth, Cutting speed, feed, depth of cut of milling cutter, machining time, power required at the cutter, problems.

Unit – III

Design of Jigs: Functions and differences between jigs and fixtures, Design principles, Principles of location -3-2-1, choosing a locating surfaces, locating methods and devices. Clamping – Clamping devices, types of clamping devices. Drill jigs - Types, selection of a jig, Design of jigs for simple components.

Unit – IV

Design of Fixtures: Types of turning fixtures, types of milling fixture, types of grinding and broaching fixtures, indexing fixtures, Design of fixtures for simple components.

Unit – V

Die Casting Dies: Types of Dies: Single cavity, multicavity dies, combination dies, unit dies. Die casting alloys, defects in die casting, finishing trimming and inspection of die casting components, safety, problems. Injection Molding: Injection moulding machine and its elements, general configuration of a mould, problems. Introduction to compression, transfer moulding, blow moulding, extrusion moulding, Emerging Trends.

List of Experiment (Pl. expand it):

1. To make a job on lathe machine with all operations like turning, step turning, drilling, and tapper Turning, thread cutting and knurling.
2. Study of center less grinding machine/ tool and cutter type grinding machine.
3. Study of horizontal/ universal milling machine, diving head and indexing mechanism of it.
4. To cut a spur gear on milling machine using rapid indexing method.
5. Study of radial drilling machine and preparing a job on it.
6. To study a sapping machine to learn about working of quick return mechanism.

Text Books:

1. Machine Tool Technology by S.K.Gupta
2. Production Technology by P.C. Sharma –S.Chand & Co.
3. Industrial Maintenance by H.P.Garg –S.Chand & Co.
4. Production Technology by R.K.Jain - Khanna Publishers

BRANCH	SUBJECT TITLE	SUBJECT CODE	Period per week			
			L	T	P	C
B.E. PART TIME MECHANICAL	Simulation & Modeling	PTME-505	-	-	2	2

Unit – I

Advantages, Disadvantages, Areas of application, System environment, components of a system, Model of a system, types of models, steps in a simulation study. Simulation Examples: Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples.

Unit – II

General Principles: Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling. Random Numbers: Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Autocorrelation test.

Unit – III

Random Variate Generation: Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions, Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance Rejection Technique Optimization Via Simulation: Meaning, difficulty, Robust Heuristics, Random Search.

Unit – IV

Analysis of Simulation Data Input Modelling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis. Verification and Validation of Model – Model Building, Verification, Calibration and Validation of Models.

Unit – V

Output Analysis – Types of Simulations with Respect to Output Analysis, Stochastic Nature of output data, Measures of Performance and their estimation, Output analysis of terminating simulation, Output analysis of steady state simulations. Simulation Softwares: Selection of Simulation Software, Simulation packages, Trend in Simulation Software.

(Laboratory Work)

Part – I

1. Features of Promodel Package and Input Modeling

2. Simulation of Manufacturing System I

3. Simulation of Manufacturing System II

4. Simulation of Service Operations I

5. Simulation of Service Operations II

Part – II

6. Features of Arena Package and Input Modeling

7. Simulation of Manufacturing System I

8. Simulation of Manufacturing System II

9. Simulation of Service Operations I

10. Simulation of Service Operations II

11. Simulation of JIT Kanban Multi Product Assembly line System

12. Modelling a Live Problem Suggested Simulation Packages; Promodel, Arena, Quest, Witness, Extend.

Note: A minimum of 12 exercises to be executed covering the entire syllabus

Reference Books:

1. Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol, Discrete Event system Simulation, Pearson Education, Asia, 4th Edition, 2007, ISBN: 81-203-2832-9.

2. Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition, 1978, ISBN: 81-203-0140-4.

3. Averill M Law, W David Kelton, Simulation Modelling & Analysis, McGraw Hill International Editions – Industrial Engineering series, 4th Edition, ISBN: 0-07-100803-9.

4. Narsingh Deo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004, ISBN : 0-87692-028-8.