Jabalpur Engineering College, Jabalpur

Semester VIII Credit Based Grading System (CBGS) w.e.f. July 2018
Scheme of Examination
Bachelor of Engineering B.E. (Industrial & Production Engineering)
Subject Wise Distribution of Marks and Corresponding Credits
Scheme of Examination w.e.f. July 2018 Academic Session 2018-19

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
			Theory			Practical			L	T	P	
			End. Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work					
1	IP8001	Computer Integrated Manufacturing	70	20	10	30	20	150	3	1	2	6
2	IP8002	Computer Aided Design	70	20	10	30	20	150	3	1	2	6
3	IP8003	Elective-V	70	20	10	-	-	100	3	1	-	4
4	IP8004	Elective-VI	70	20	10	-	-	100	3	1	-	4
5	IP8005	Project-II	-	-	-	120	80	200	-	-	8	8
6	IP8006	Departmental Choice (Internal Assessment)	-	-	-	-	50	50	-	-	2	2
7	IP8007	Group Discussion/Seminar (Internal Assesment)	-	-	-	-	50	50	-	-	2	2
		Total	**280**	**80**	**40**	**180**	**220**	**800**	**12**	**4**	**16**	**32**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

Department Elective-V (Four Subjects)			Department Elective-VI (Four Subjects)	
S.No.	Subject Code	Subject Name	Subject Code	Subject Name
1	IP8003A	Entrepreneurship & Management Concept	IP8004A	Management Information System
2	IP8003B	Industrial Psychology & Human Behavior	IP8004B	Work Design and Ergonomics
3	IP8003C	Finite Element Methods	IP8004C	Computer Aided Manufacturing
4	IP8003D	Research Methodology and Optimization Techniques	IP8004D	Concurrent Product Design

Principal
Jabalpur Engineering College

(w.e.f. July 2018)

Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IP8001	Computer Integrated Manufacturing	70	20	10	30	20	150	3	1	2	6

Unit 1 Introduction to CIM: Objectives of CIM, Enterprise wide Integration of CIM Information requirements of manufacturing organizations, Scope of Computer Integrated Manufacturing Business forecasting and aggregate production plan, Production Activity Control (PAC), Manufacturing as a system, Production processes on volume-variety axes, Importance of batch and job shop production, CIM definition and CIM wheel, Evolution and benefits of CIM, Automation, Types of Automation, Advantages of Automation.

Unit II Computer Aided Process Planning (CAPP): Introduction to CAPP, Objectives to CAPP, Introduction to Process Planning, Approaches to Process Planning, Manual Experience-based Process Planning, Computer Aided Process Planning, Approaches to Computer Aided Process Planning, Variant Process Planning, Advantages and Disadvantages, Generative Process Planning, Advantages and Disadvantages, Knowledge-based Process Planning, Feature Recognition in Computer Aided Process Planning, Approaches to Part Feature Recognition, Recent Trends in Computer Aided Process Planning.

Unit III Computer Aided Manufacturing: Introduction to CAM, Numerical Control system, Suitability of NC technology, Need of NC system, Features and classification of NC system, Computer Numerical Control, Features of CNC , Direct Numerical Control, NC words used in part program, Manual and Computer Aided Part Program, APT Programming.

Unit IV Automated Material Handling and Storage: Introduction and Objectives of Automated Material Handling, Principles of Automated Material Handling, Factors considered in selection of automated material handling equipments, Material handling Equipment, Conveyor systems, Cranes and Hoists, Industrial Trucks, Monorail, Automated Guided Vehicle, Automated storage and Retrival System.

Unit V Group Technology: Importance of batch and job shop production, Merits of converting zigzag process layout flow to smooth flow in cellular layout, Production flow Analysis and clustering methods, Concept of part families and coding, Optiz, MIClass and Dclass coding, FMS.

Text Books

1. Roa. P.N. CAD/CAM, Tata McGraw Hill Publishing Co.
2. S.Kant Vajpay, Principles of CIM, PHI Publishing Co.
3. Radhakrishan P.CAD/CAM/CIM, New age Publishing Co.

References

1. Zeid A. CAD/CAM, Tata McGraw Hill Publishing Co.
2. Roa. CAD/CAM, Tata McGraw Hill Publishing Co.

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COMPUTER INTEGRATED MANUFACTURING LAB
(IP-8001)

Laboratory Assignments:

1. To prepare planning sheet using CAPP from conventional process planning sheet.
2. To study and prepare sheet of G codes for various controllers.
3. To study and prepare sheet of M codes for various controllers.
4. To prepare part programs in APT for various machining operations.
5. To prepare cellular layout from the existing conventional layout,(Industry supported case study).

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CIM IP-8001

Course objectives-

1. To enable graduate to concept of concept of computer integrated manufacturing.
2. To provide the knowledge of CAPP.
3. To aware the students about the various information computer aided manufacturing.
4. To provide the knowledge automated material handling.
5. To provide the knowledge of Group technology.

Course outcomes

After completion the course the students should be able to –

CO 1. Understand the uses of computer integrated manufacturing.
CO 2. Understand functional concept of CAPP.
CO 3. Learn the function and issue of computer integrated manufacturing.
CO 4. Understand about emerging treads in Group technology.

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IP8002	Computer Aided Design	70	20	10	30	20	150	3	1	2	6

UNIT- I Fundamental of CAD, Automation and CAD, Product Cycle & CAD, Introduction to computer Hardware, Design of workstation, Graphics terminal. Operator input & output devices, CPU and Secondary storage. Introduction to computer software and their application.

UNIT- II Computer Aided Drafting - Creating Drawing: Various drawing commands: Line, Pline, Ellipse, Circle, Arc, Hatch, Text, Dimension, Limits, Scale, Grid, Layers, Fill, Snap, Trace, Units, Ortho. Editing Drawing: Various editing commands: Move, Erase, Copy, Zoom, Pan, View, Chamfer, Break, Explode, Extend, Trim, Help, Rotate, Mirror etc.
Other Utilities: Block, Array, Save, Quit, Plot Advanced Features of Auto- CAD: UCS, 3D-line, 3D-Objects, DXF & DXB files.

UNIT–III Geometric modeling- introduction, wire frame model, data structures for computer graphics, Review of vector algebra, lines, circle, ellipses, parabolas, hyperbolas, conics, parametric representation of synthetic curves: hermite cubic splines, bezier curve, b spline curves, rational curves. Curves: Algebraic and geometric forms, tangents and normal, blending functions

UNIT–IV 2D and 3D geometric transformations, homogenous coordinates, translation, rotation, scaling, reflection, shear, and transformations between coordinate systems, affine transformations.3-D geometric transformations, 3-D viewing operations and graphics projections, visual realism, hidden line removal, shading and color models.

UNIT –V Methods to solve engineering problems- analytical, numerical, experimental, their merits and comparison, discretization into smaller elements and effect of size/ shape on accuracy, importance of meshing, boundary conditions, Computer Aided Engineering (CAE) and design, chain-bumping-stages vs concurrent-collaborative design cycles, computer as enabler for concurrent design and Finite Element Method (FEM), degree of freedom (DOF), mechanical systems with mass, damper and spring, stiffness constant K for tensile, bending and torsion; Practical applications of FEA in new design, optimization/ cost-cutting and failure analysis.

Reference Books:

1. Inside Autocad By Ranker
2. CAD/CAM – principle and application By P N Rao, TMH
3. CAD/CAM – Zeid Ibrahim,TMH
4. Practical Finite Element Analysis By Gokhle Nitin
5. Finite Element Analysis, Theory and programming By Krishnamoorthy,TMH

COMPUTER AIDED DESIGN LAB
(IP-8002)

List of Experiment (Pl. Expand it):

1. Preparation of 2-D drawings using various 2-D commands.
2. Preparation of 3-D drawings for machine components.
3. 3-D modeling - solid, surface, wireframe using standard CAD packages - Assembly of standard parts created using 3-D model.
4. Parametric modeling, creating standard machine parts, connecting rod, flange coupling, bearings
5. Analysis of simple machine parts by meshing into finite elements

Computer aided Design IP-8002

Course Objectives

1 To provides the knowledge and concept of Computer aided design.
2 To enable graduates to conceptualize the importance Computer aided drafting .
3 To provide the knowledge of Geometric modeling.
4 To provides the knowledge of engineering optimization.

Course outcome

CO 1. To understand the concept of importance of Computer aided design.
CO 2. To understand Geometric modeling.
CO 3. To understand Computer aided drafting.
CO 4. To solve engineering optimization problems.

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-V IP8003A	Entrepreneurship & Management Concept	70	20	10	-	-	100	3	1	-	4

Unit I : Management: Importance, definition and functions; schools of theories, BCG matrix, SWOT analysis, steps in decision making, structured and unstructured decision; dimensions of organizations, departmentalization, spam and line of control, technology and Minzberg organization typology, line and staff organization, business process reengineering and process of change management, leader & manager, leadership grid, Maslow's need hierarchy and Herzberg two factor theory, team work and stress management, , HR planning placement and training

Unit II :Marketing: Importance, definition, core concepts of need want and demand, exchange & relationships, product value, cost and satisfaction (goods and services) marketing environment; selling, marketing and societal marketing concepts; four P's, product, price, placement, promotion; consumer, business and industrial market, market targeting, advertising, publicity, CRM and market research.

Unit III : Finance: Nature and scope, forms of business ownerships, balance sheet, profit and loss account, fund flow and cash flow statements, breakeven point (BEP) and financial ratio analysis, pay-back period, NPV and capital budgeting.

Unit IV : Intellectual Property System: Introduction, Definition of Intellectual property, Concept of Intellectual Property, Different Types of IP, Intellectual Property Rights (IPR), Benefits of securing IPRs;, Rationale behind Intellectual Property, Enforcement of IPRs, Patent Law in India, Interpretations and Implementations, Copyrights and related rights, Trademarks, Geographical indications, Industrial designs, Trade secrets and layout of Integrated circuits , Indian Legislations for the protection of various types of Intellectual Properties; TRIPs and various provisions in TRIPs Agreement.

Unit V : Entrepreneurship : Definition and concepts, characteristics, comparison with manager, Becoming an Entrepreneur, Need for Entrepreneurship, Benefits of Self-Employment, Who is an Entrepreneur?, Sensing Opportunities- Sources of Idea, Creating Efforts, SWOT Analysis, Entrepreneur and Economy, classification and function of entrepreneurs, sociological and economic theories of entrepreneurship, entrepreneur traits and behavior, roles in economic growth.

References:

1- Daft R; The new era of management; Cengage.
2- Bhat Anil, Arya kumar; Management: Principles ,Processes and Practices; Oxford higher edu.
3- Davis & Olson; Management Information System; TMH.
4- Steven Alter; Information systems, Pearson, www.stevenalter.com
5- Kotler P; Marketing management;
6- Khan, Jain; Financial Management;
7- ILO; Work study; ILO.
8- Mohanty SK; Fundamental of Entrepreneurship; PHI.

Entrepreneurship and management concept IP-8003A

Course Objectives

1. To provides the knowledge and concept of management and Entrepreneurship.
2. To enable graduates to conceptualize the importance of marketing and its need.
3. To provide the knowledge of finance system and concept of intellectual property system.

Course outcome

CO1. To understand the concept of importance of management and Entrepreneurship.
CO2. To understand market research.
CO3. To understand intellectual property system and their types.
CO4. To make balance sheet and find break even point.

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-V IP8003B	Industrial Psychology & Human Behavior	70	20	10	-	-	100	3	1	-	4

Unit-I

Industrial Psychology: Basic concepts, Role and Application, Discipline, Fatigue, Accidents, Labour welfare, Supervision.

Unit –II

Maintenance of Human Resource : Health, Safety, Labour welfare, Welfare measures, Human Relations, Personnel audit, Industrial Safety, Safety efforts by government, Safety programs.

Unit – III

Industrial Relations: Objective, Industrial unrest, Industrial peace, Parties in industrial relations, Organizational conflicts, Industrial disputes and their settlement, Impact of Conflicts, Sources of conflicts, Labour policy, Worker's grievances, Suggestion system

Unit- IV

Human Behaviour: Attitudes and Job satisfaction, Emotions and Moods, Personality and values, Perception and Decision making.

Unit –V

Group Behaviour: Foundation of group behavior, Understanding work teams, Communication, power and Politics, Conflicts and Negotiations

Reference Books:

1. Industrial Organisation and Engineering Economics – T.R. Banga and S.C. Sharma
2. Organisationl Behaviour – Stephen P. Robbins, Timathy A. Judge and Neharika Vohra
3. Organisationl Behaviour part-1 and Part-2 –John B. Miner

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ELECTIVE-V IP8003C	Finite Element Methods	70	20	10	-	-	100	3	1	-	4

UNIT-I

GENERAL PROCEDURE OF FINITE ELEMENT METHOD

Basic concept of FEM, Engineering applications, Comparison of FEM with other methods of analysis,

Discretization of the domain-Basic element shapes, discretization process, Interpolation polynomials, Selection of the order of the interpolation polynomial, Convergence requirements, Linear interpolation

UNIT-II

polynomials in terms of global and local coordinates, Formulation of element characteristic matrices and vectors-Direct approach, variational approach, weighted residual approach, Assembly of element matrices and vectors and derivation of system equations together with their solution.

UNIT-III

HIGH-- ORDER AND ISO-PARAMETRIC ELEMENT FORMULATIONS

Introduction, Higher order one-dimensional element, Higher order elements in terms of natural coordinates and in terms of classical interpolation polynomials, Continuity conditions, Iso-parametric elements, Numerical integration in one, two and three-dimensions.

UNIT-IV

SOLID AND STRUCTURAL MECHANICS

Introduction, Basic equations of solid mechanics, Static analysis-Formulation of equilibrium equations, analysis of trusses and frames, analysis of plates, analysis of three-dimensional problems, analysis of solids of revolution, Dynamic analysis-Dynamic equations of motion, consistent and lumped mass matrices, consistent mass matrices in global coordinate system, Dynamic response calculation using FEM

UNIT-V

APPLICATIONS AND GENERALISATON OF THE FINITE ELEMENT METHOD

Energy balance and rate equations of heat transfer, Governing differential equation for the heat conduction in three-dimensional bodies, Derivation of finite element equations for one-dimensional, two-dimensional, unsteady state and radiation heat transfer problems and their solutions, Solution of Helmholtz equation and Reynolds equation, Least squares finite element approach.

RECOMMENDED BOOKS :

1. The Finite Element Method in Engineering – S.S. Rao, Pub.- Pergamon Press.
2. Numerical Methods in Finite Element Analysis—Klaus-Jurgen Bathe and Edwar L. Wilson, Pub.-PHI.
3. The Finite Element Method – O.C. Zienkiewicz – McGraw-Hill
4. The Finite Element Methods for Engineers – K.H. Huebner – Wiley, New York

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
IP8003D	Research Methodology and Optimization Techniques	70	20	10	-	-	100	3	1	-	4

Unit I

Introduction to Research Methodology , Various Types of Techniques, Alternative approaches to the study of the research problem and problem formulation. Formulation of hypotheses, Feasibility, Preparation and presentation of research proposal.

Introduction to Experimental Design, Taguchi Method, Concept of Orthogonal Array, Primary and Secondary data collection, S/N ratio, Validation, Regression and correlation analysis. Tests of significance based on normal. t and chi square distributions, Analysis of variance.

Unit II

Edition, tabulation & testing of hypotheses, interpolation of results, presentation, styles for figures, tables, text, quoting of reference and bibliography. Use of software for statistical analysis like SPSS, Mini Tab or MAT Lab, Report writing, preparation of thesis, use of software like MS Office. The course will include extensive use of software, reporting writing and seminars in tutorial class.

Unit III

Integer linear programming methods and applications, Introduction to integer non-linear Programming, Basics of geometric programming.

Unit IV

Multi-objective optimization methods and applications, Formulation of problems – Separable programming and stochastic programming.

Unit V

Introduction to Genetic algorithms, neural network based optimization and optimization of fuzzy systems, Evolutionary Algorithm and Ant Colony Optimisation techniques.
Note: - Some of the algorithm is used to be exercised using MAT LAB

RECOMMENDED BOOKS :

1. C.R Kothari, Research Methodology, Wishwa Prakashan
2. P.G Triphati, Research Methodology, Sultan Chand & Sons, N.Delhi
3. Fisher, Design of Experiments, Hafner
4. Sadhu Singh, Research Methodology in Social Sciences, Himalya Publishers
5. Kalyanmoy Deb, Optimization for Engineering design – algorithms and examples. PHI, NewDelhi 1995
6. Singiresu S.Rao, "Engineering optimization – Theory and practices", John Wiley and Sons, 1998.
7. Garfinkel, R.S. and Nemhauser, G.L., Integer programming, John Wiley & Sons, 1972.

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ELECTIVE-VI IP8004A	Management Information System	70	20	10	-	-	100	3	1	-	4

UNIT-I : Management Information System (MIS): Concept of MIS, Definition, role of Management Information System , Objectives and benefits, MIS as strategic tool, obstacles and challenges for MIS, functional and cross functional systems, hierarchical view of CBIS, structured and unstructured decision, Decision process and MIS, information system components and activities, Value chain and MIS support. Database and data structures.

UNIT-II : System Engineering : System concepts, System control , Types of System, handling System, complexity system, efficiency and effectiveness, classes of system ,data processing system, business function processing system transaction processing system, Integrated information processing system, application processing system ,system analysis, need for system analysis, procedure for analyzing the existing system, work system model and comparison with input-process-output model, five views of work system, knowledge based systems.

UNIT-III : Information and e business technology : Information concepts, classification of information method of data and information collection ,Value of information, information storage and retrieval system ,general model of a human as an information processor, MIS and the Information and knowledge, introduction to e business, models of e business ,MIS in web environment, MIS and e business, Information technology and computer NW support to MIS

UNIT-IV : Planning and control Concepts: concept of corporate planning, dimensions of planning, Essentiality of strategic planning, Development of business strategic, types of strategies, tools of planning,MIS strategic business planning ,(SDLC) system development life cycle ,system investigation, analysis of needs, design and implementation phases, Control and Maintenance of Information Systems.

UNIT-V : Enterprise management System: EMS system concept, Enterprise resource planning(ERP)system ERP models and modules ,benefits of ERP,ERP product Evolution, ERP implementation(ERP) from MRP, information management in SCM, Customer relationship management (CRM),Integrated data model in ER, Business Process Re-Engineering (BPR), significance and functions,.

References

1. Davis and Olson, Management Information Systems, TMH
2. James O' Brian, Management Information Systems, TMH
3. Oz, Management Information Systems, Cengage
4. Alter Stevenson, Information Systems: Foundation of E-Business; (Prentice-Hall,USA)
5. Jayaraman, Business Process Re-Engineering, TMH.
6. Garg. V.K.; ERP, PHI
7. Kelkar SA; Management Information Systems A Concise Study; PHI Learning.
8. Radhakrishnan R and Balasuramanian S; Business Process Reengineering; PHI Learning.
9. Alex Leon ; ERP, TMH
10. Jawadekar WS; MIS- text and cases; TMH

MIS IP-8004 A

Course objectives-

1. To enable graduate to concept of conceptualize and manage the specification design and implementation of MIS system.
2. To provide the knowledge of various types of system.
3. To aware the students about the various information system solution like- ERP,CRM, SCM & BPR.

Course outcomes

After completion the course the students should be able to –

CO 1. Understand the uses of MIS in organization and constituent of MIS.
CO 2. Understand functional MIS and clarification of MIS.
CO 3. Learn the function and issue of each stage of system development.
CO 4. Understand about emerging MIS technologies like ERP, CRM, SCM ,and treads in enterprise application

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-V IP8004B	Work Design and Ergonomics	70	20	10	-	-	100	3	1	-	4

Unit I

Introduction to work study - Productivity – scope of motion and time study - Work methods design.

Unit II

Motion study-process analysis – process chart – flow diagram – assembly process chart – man and machine chart – two handed process chart - Micro motion and memo motion study.
Work measurement and its methods.

Unit III

Work sampling – Determining time standards from standard data and formulas - Predetermined motion time standards – work factor system – methods time measurement, Analytical Estimation.

Unit IV

Measuring work by physiological methods – heart rate measurement – measuring oxygen consumption– establishing time standards by physiology methods.

Unit V

Motion economy- Ergonomics practices – human body measurement – layout of equipment – seat design - design of controls and compatibility – environmental control – vision and design of displays. Design of work space, chair table.

RECOMMENDED BOOKS :

1. Barnes, Raeph.m., "Motion and Time Study – Design and Measurement of Work ", John Wiley & sons, New York, 1990.
2. Mc.Cormick, E.J., "Human Factors in Engineering and Design", Mc.Graw Hill.
3. ILO, "Introduction to Work study ", Geneva, 1974.

MANAGEMENT INFORMATION SYSTEM LAB
(IP-8004)

List of Experiment (Pl. Expand it):

1. To prepare a report of survey/Study conducted in the industry/office where M.I.S. is implemented.
2. To prepare a report for implementing M.I.S. in the system (Industry/office) where M.I.S. is not Existing, stating clearly Advantages, that will be achieved by the organization by implementing M.I.S.

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ELECTIVE-VI IP8004C	Computer Aided Manufacturing	70	20	10	-	-	100	3	1	-	4

Unit I

1. Machine Centre : Principles of Numerical control, Types of CNC Machine Tools, Features of CNC Systems, Direct numerical control (DNC), Elements of CNC viz. Ball screws, rolling guide ways, structure, drives and controls, standard controllers, Manual part programming with APT, Virtual machining. Machining Centers and Interpolators

Unit II

CNC Programming: Types, Manual Part Programming, Canned Cycle, Offset, APT.

Unit III

Automated Material Handling: Types of Material Handling System, Configuration, Equipments, Elements AGVS, ASRS, Carousal System, Design & Analysis of Material Handling System, Conveyors, Stores& Storage Systems.

Unit IV

Automated Assembly &Inspection : Automated Assembly Systems, Automated Inspection Principles & Methods, Sectors Automated inspection principles and methods – sectors techniques for automated inspection - techniques for automated inspection – contact and non-contact inspection methods – in processes automated measuring methods – machine vision – optical inspection methods. Automatic identification.

Unit V

Techniques: Shop floor control – factory data collection system – Bar code techniques Computer forlocal area network – the future automated factory – Human workers in future automated factory – The impact on the society, Digital Manufacturing.

REFERENCES:

1. Mikell P. Grover, Automation, Production System and Computer Integrated Manufacturing, Prentice Hall of India Pvt Ltd, 1995.
2. C. Ray Astaihe, Robots of Manufacturing automation, John Wiley and Sons, New York.
3. Jon Stenerson and Kelly Curran "Computer Numerical Control", Prentice-Hall of India Pvt. Ltd. New Delhi, 2008
4. Ibrahim Zeid "CAD/CAM – Theory and Practice" Mc Hill, International edition, 1998
5. P. N. Rao "CAD/Cam principles and operations", Tata McGraw Hill
6. Reference Manuals of FANUC, Siemens, Mazak, etc.
7. Thomas M. Crandell "CNC Machining and Programming, Industrial Press ISBN- 0-8311-3118-7
8. Bedworth, Wolfe and Henderson – "Computer aided design and manufacturing" – McGraw Hill
9. A. Ghosh and Malik – "Manufacturing Science" Affiliated East West Press Pvt. Ltd.
10. Tilak Raj – "CNC Technology and Programming", DhanpatRai Publication Company.

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ELECTIVE-VI IP8004D	Concurrent Product Design	70	20	10	-	-	100	3	1	-	4

Unit I

Introduction: Types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customization. Concurrent design team its elements.

Unit II

Product Design Process: Steps in design, Functional requirement analysis, Axiomatic design, Product design specifications, concurrent design model.

Unit III

Material And Manufacturing Process Selection In Design: Factors influencing material and process selection, approaches, tools and software used in selection. Design For 'X': An introduction: Design for manufacturing, assembly and dissemble, an overview of DF'X'. Deign for maintainability and serviceability, design for environment, design for aesthetic, design for packaging, design for handling, design for safety, etc.

Unit IV

Design Cost Estimation: Need, cost indexes, categories; cost-capacity factors; design to cost and life cycle costing.

Unit V

Product Development Approaches: Concurrent engineering, partnership with supplier, collaborative and Internet based design, Design Project Management: PDM tools.

Reference Books

1. Dieter George E., Engineering Design, McGraw Hill Publication, 2000.
2. Ulrich Karl T and Eppinger Steven D., Product design and development, McGraw Hill Publication, 1995.
3. Chitale A.K. and Gupta R.C. Product Design and Manufacture, Prentice-Hall of India, New Delhi
4. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Publication

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