



**Department of Industrial & Production Engineering**  
**School of Studies (Engineering & Technology)**

Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.) 495009

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**Minutes of Meeting of Online Board of Studies**

An online meeting of board of studies (BOS) of the department of Industrial & Production Engineering was held on 23.07.2021 at 11:00AM. The following members were present-

1. Prof. G.K. Agrawal (External Member),  
Professor, Govt. Engineering College, Bilaspur (C.G.)
2. Mr. Dalbir Singh Rekhi (External Member),  
Associate Vice President, Jindal Steel & Power Ltd., Angul (OD)
3. Prof. M.K. Singh (Member of B.O.S.),  
Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
4. Prof. S.C. Shrivastava  
Professor, & H.O.D. Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
5. Mrs. Disha Dewanagn (Member of B.O.S.)  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
6. Mr. C.P. Dewangan (Member of B.O.S.)  
Associate Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
7. Mrs. Arpita Roy Choudhary  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
8. Dr. Atul Kumar Sahu  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
9. Mr. Ganesh Prasad Shukla  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
10. Mr. Leeladhar Rajput  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
11. Mr. Nitin Kumar Sahu  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
12. Mr. Kailash Borkar  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
13. Mr. Anurag Singh  
Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)
14. Mr. Kawal Lal Kurrey



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Assistant Professor, Deptt. of I.P.E., G.G.V., Bilaspur (C.G.)

In the meeting, new Choice Based Credit System (CBCS) scheme, syllabus of B.Tech.VII, VIII Semester (Industrial & Production Engineering) was discussed in detail. All the suggestions of the members were incorporated and recommended for approval.

The new CBCS scheme and syllabus of B.Tech (Industrial & Production Engineering) VII, VIII Semester have been accepted by the B.O.S. (I.P.E.) were attached herewith and recommended for approval from the competent authority.

The B.O.S. Online meeting was concluded with vote of thanks by Head of the Department.

Prof. G.K.Agrawal

Mr. Dalbir Singh Rekhi

Prof. M.K.Singh

Prof. S.C. Shrivastava

Mrs. Disha Dewanagn

Mr. Dewangan

Mrs. Arpita Roy Choudhary

Dr. Atul Kumar Sahu

Mr. Ganes Prasad Shukla

Mr. Leeladhar Rajput

Mr. Nitin Kumar Sahu

Mr. Kailash Borkar

Mr. Anurag Singh

Mr. Kawal Lal Kurrey

**GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG**  
**SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY**

Department of Industrial & Production Engineering

CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2021-22

**B. TECH FOURTH YEAR, VII SEMESTER**

S. No	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP07TPC14	Computer Aided Design & Manufacturing	3	1	-	30	70	100	4
2.	IP07TPC15	Production Planning and Control	3	-	-	30	70	100	3
3.	IP07TPE05	Professional Elective-05	3	-	-	30	70	100	3
4.	IP07TOE02	Open Elective-02	3	-	-	30	70	100	3
5.	IP07TMC02	Indian Constitution	3	-	-	-	-	-	-
<b>Total</b>			<b>15</b>	<b>1</b>	<b>-</b>	<b>120</b>	<b>280</b>	<b>400</b>	<b>13</b>
<b>PRACTICALS</b>									
1.	IP07PPC08	CAD/CAM Lab	-	-	2	30	20	50	1
2.	IP07PSC02	Seminar on Summer Training	-	-	4	50	-	50	2
3.	IP07PPR01	Minor Project	-	-	8	100	-	100	4
<b>Total</b>			<b>-</b>	<b>-</b>	<b>14</b>	<b>180</b>	<b>20</b>	<b>200</b>	<b>7</b>

Total Credits: 20

Total Contact Hour: 30

Total Marks: 600

INTERNAL ASSESSMENT: two class tests of 15 marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

IP07TPE05 Professional Electives-05
IP07TPE51 Fundamentals of Green Manufacturing
IP07TPE52 Product Design & Development
IP07TPE53 Engineering Economics
IP07TOE02 Open Elective-02
IP07TOE21 Advanced Manufacturing Processes
IP07TOE22 Principles of Management
IP07TOE23 Maintenance Management

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TPC14	Computer Aided Design & Manufacturing	3	1	-	15	15	70	100	4

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to:

- To introduce the student to be familiar with CAD/CAM terminology and its capabilities.
- To recognize geometric and graphical elements of engineering design problems.
- To study Basic features of CAM so as to be capable of accepting professional responsibilities and to understand the associativity between design and manufacturing.
- Integrate the CAD system and the CAM system by using the CAD system for modelling design information and converting the CAD model into a CAM model for modelling the manufacturing information.

**COURSE OUTCOMES:**

At the end of the course the students will be able to:

- Understand the various CAD/CAM and CNC processes.
- Recognize various types of Curves, surface and Solid and their application as used in geometric modelling.
- Analyse the NC programs to generate and verify the tool path for milling and drilling manufacturing processes.
- Appreciate the concept of parametric modelling which is the mainstay of most of the 3D modelling system.

**COURSE CONTENT:****MODULE-I**

**Basics of CAD:** Basics fundamental of computer graphics, principle of computer graphics, product life cycle, concept of computer aided design (CAD) and architecture, hardware and software, color management, raster graphics, graphic primitives, lines, and circle drawing algorithms, software documentations, CAD standards GKS, open GL, data exchange standards: IGES, STEP, CALS etc., communication standards, standards for exchange images.

**MODULE - II**

**Geometric modeling of curves, surface and solid:** Basics representation of curves, parametric and non-parametric curves, mathematical representation of curves, Hermite curves, Bezier curves, B-spline curves and rational curves, basic of surface, techniques of surface modeling, plane surface,

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rule surface, surface of revolution and sweep, coons and bi-cubic patches, concept of Bezier and B-spline surfaces, basic concept of solid modeling technique, CSG and B-rep method for solid generation.

#### MODULE – III

**Geometric transformation:** Computer Aided Design (CAD) methodology, coordinate systems, theory and applications, 2D and 3D geometric transformation, homogeneous transformation, concatenation, assembly modeling, interferences of positions and orientation, tolerance analysis, mass property calculations, visual realism- hidden line-surface-solid removal algorithms, shading, coloring, computer animation, concurrent engineering.

#### MODULE – IV

**Basics of CAM:** Basic concept of numerical control (NC) System, NC coordinate system, NC motion control, application of NC, concepts of computer numeric control (CNC) system, problems with conventional, NC, CNC.

**Part Programming:** Introduction to NC part programming, manual part programming, computer assisted part programming, automatically programming tool (APT) language, statements and code of APT, programming methods, advantages of CAD/CAM programming.

#### MODULE - V

**Advance manufacturing system:** Concept of distributed numeric control (DNC) system, and its advantages and disadvantages of over NC and CNC, Concept of computer integrated method (CIM), Flexible manufacturing system (FMS), benefits and applications of CIM and FMS, group technology (GT), parts classification and coding systems, benefits and applications of GT, automated storage and retrieval system (AS/RS), automated guided vehicle (AGV).

#### TEXT & REFERENCE BOOKS:

1. Principles of Computer Graphics, W. M. Neumann and R.F. Sproul, McGraw Hill.
2. Computer Graphics, D. Hearn and M.P. Baker, Prentice Hall Inc.
3. CAD/CAD Theory & Practice, I. Zeid & R. Sivasubramaniam, TMH.
4. CAD/CAM, Groover & Zimmer, Prentice Hall, India.
5. Computer Graphics & CAD, Ramamurthy, T.M.H.
6. Industrial Robotics & CIM, Surendra Kumar I.B.H.
7. CAD/CAM, P.N. Rao, Prentice Hall, India,
8. Mastering CAD CAM, Ibrahim Zeid, Tata McGraw Hill Publishing Co.
9. CAD/CAM Principles, C. McMohan & J. Browne, Pearson Education.

*Handwritten signatures and initials:* Khosla, Singh, Dhole, ASR, and others.

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TPC15	Production Planning and Control	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objectives of this course are:

- To originate engineering skills to identify, formulate, and solve industrial process problems.
- To demonstrate the concept of organization, production systems and cost analysis.
- To understand the problems and opportunities faced by the operations manager in manufacturing and service organizations.
- To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
- To integrate operations concepts with other functional areas of business and to compile several important contemporary topics relevant to business managers under functional disciplines, including quality management, production concepts, and sustainability issues.
- To evaluate the PPC function in both manufacturing and service organizations and to examine several dilemmas related to operations management, production planning and inventory control.

**COURSE OUTCOMES:**

After successful completion of the course, the students will be able to:

- Recognize the objectives, functions and applications of Production management and allied techniques.
- Categorize and solve different inventory control techniques, forecasting dilemmas, routing problems and scheduling troubles.
- Summarize various aggregate production planning techniques and integrating them to different departments to execute effective PPC functions.
- Inspect organizational performance, production systems, demand trends, location feasibility and cost analysis.
- Elaborate and estimate methods of line balancing, process sheets, production strategies, sales forecasting and maintenance.

**COURSE CONTENT:**

**MODULE - I**

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**Introduction:** Introduction to various types of production system viz. mass production, job shop, batch production system, continuous production system, concept of production and operation management, objective & functions of PPC.

**Forecasting:** Time series method, moving average, weighted average, trend, seasonality, regression technique, delphi method.

#### MODULE – II

**Aggregate planning:** Definition, strategies, pure and mixed strategies, methods.

**Master production schedule:** Objective and functions, design of MPS, bill of materials.

**Material requirement planning:** Objectives, functions, MRP, MRP-II, limitations.

**Capacity requirement planning:** Definition, objectives, process of CRP, process sheet, rough cut capacity planning, loading, and preparation of CRP chart.

#### MODULE – III

**Scheduling:** Types, single machine scheduling, job shop scheduling, flow scheduling;

**Sequencing:** Various priority rules, line of balancing, rank and positional weight method, Kilbridge westner method.

**Facility location and facility location problems:** Factors affecting plant locations, single facility locations problems and its methods.

#### MODULE – IV

**Types of layouts:** layouts design procedure such as CORELAP, CRAFT etc., material handling system & their classification, principles, JIT & KANBAN, depreciation & methods of depreciation.

#### MODULE -V

**Maintenance management:** Types of maintenance strategies, breakdown and preventive maintenance, predictive and total productive maintenance, condition monitoring, individual and group replacement policies, make or buy decision, concept of original equipment effectiveness.

#### TEXT & REFERENCE BOOKS:

1. Production and operation management, O. Paneerselvem, TMH.
2. Production and operation management, Adem Ebert.
3. Production and operation management, Charry S.N. TMH.
4. Production and operations management Theory and practice Mahadevan. B.
5. Production and operation management, Joseph G. Monks, TMH.
6. Handbook of Material Handling, Ellis Horwood limited.
7. Operations Management: Design Planning and control for the manufacturing and services.
8. Lawrence P. Atkin, James B. Dilworth Tata Mc Graw Hill.
9. Production and Operations management, R.B Khanna, PHI.
10. Production operations management, S.N. Buffa, PHI.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TPE51	Fundamentals of Green Manufacturing	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objectives of this course are:

- To originate engineering skills to identify, formulate, and solve industrial process problems.
- To demonstrate the concept of organization, production systems and cost analysis.
- To understand the problems and opportunities faced by the operations manager in manufacturing and service organizations.
- To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
- To integrate operations concepts with other functional areas of business and to compile several important contemporary topics relevant to business managers under functional disciplines, including quality management, production concepts, and sustainability issues.
- To evaluate the PPC function in both manufacturing and service organizations and to examine several dilemmas related to operations management, production planning and inventory control.

**COURSE OUTCOMES:**

After successful completion of the course, the students will be able to:

- Recognize the objectives, functions and applications of Production management and allied techniques.
- Categorize and solve different inventory control techniques, forecasting dilemmas, routing problems and scheduling troubles.
- Summarize various aggregate production planning techniques and integrating them to different departments to execute effective PPC functions.
- Inspect organizational performance, production systems, demand trends, location feasibility and cost analysis.
- Elaborate and estimate methods of line balancing, process sheets, production strategies, sales forecasting and maintenance.

**COURSE CONTENT:****MODULE-I**

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8. Manufacturing the future, Steve Brown, Prentice Hall, 2000
9. Manufacturing strategy, Terry Hill, Homewood, IL- 1989
10. Becoming Lean - Inside Stories of U.S. Manufacturers, Jeffrey K. Liker, Productivity Press, Portland, Oregon
11. Handbook of Sustainable Manufacturing, G. Atkinson, S. Dietz, E. Neumayer, Edward Elgar Publishing Limited, 2007.
12. Industrial Development for the 21st Century: Sustainable Development Perspectives, D. Rodick, UN New York, 2007.
13. An Introduction to Sustainable Development, P.P. Rogers, , K.F. Jalal & J.A. Boyd, J.A, Earth scan, London, 2007.
14. Sustainable Development Indicators in Ecological Economics, P. Lawn, Edward Elgar Publishing Limited.
15. The Economics of Sustainable Development, S. Asefa, W.E. Upjohn Institute for Employment Research, 2005.

Pisla

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Shri

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech, VII Sem.	IP07TPE52	Product Design & Development	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objectives of this course are:

- To introduce design concepts and techniques to develop design ability in a product design.
- To provide knowledge about estimating and evaluating the feasible manufacturing design.
- To make aware of legal issues pertaining to product design.
- To provide knowledge of management of product development projects.

**COURSE OUTCOMES:**

After successful completion of the course, the students will be able to:

- Describe an engineering design and development process.
- Identify, formulate, and solve engineering problems.
- Design a system, component, or process to meet desired needs.
- Understand the professional and ethical responsibility.
- Recognize the legal issue pertaining to patents of product design.

**COURSE CONTENT:**

**MODULE – I**

**Product design:** Definition, design by evolution, innovation, essential factors of product design, production-consumption cycle, flow and value addition in the production-consumption cycle, the morphology of design, primary design phases and flow charting, role of allowance, concurrent engineering.

**MODULE – II**

**Product design practice and industry:** Introduction, product strategies, time to market, analysis of the product, three S's, standardization, Renard series, simplification.

**Designer:** Role, myth and reality, industrial design organization, basic design considerations.

**MODULE – III**

**New products idea generation:** Modification, product variants: adding, dropping, formal testing: new products, concept, product testing, market tests, evaluation, adoption, expansion and forecasting.

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**Economic factors influencing design:** Product value, economic analysis, profit and competitiveness.

**Product design for environment:** Introduction, importance of DfE, environmental factors, scope of environmental impact, design guidelines for DfE.

#### MODULE – IV

**Developing product strategy:** Benefits of strategy, elements of a product strategy, setting objectives, selection of strategic alternatives, increasing sales/market share, increasing profitability, design for manufacturing and design for assembly, ergonomics in design, modular versus integral design.

**Human engineering considerations in product design:** Introduction, anthropometry, design of controls, the design of displays, man/machine information exchange.

#### MODULE -V

**Intellectual property systems:** Definition, concept of intellectual property, kinds of intellectual property, economic importance of intellectual property, importance of IPR, TRIPS and its implications.

**Trademark:** Introduction, historical development of the concept, need for protection, kinds of trademarks, and well-known trademarks, patents: historical development, concepts, novelty, utility, inventiveness/non-obviousness, copyrights, industrial design.

#### TEXT & REFERENCE BOOKS:

1. Product Design and Manufacturing, A. K. Chitale & R. C. Gupta, PHI.
2. Fundamentals of Design and manufacturing, V. Gupta, G.K. Lal & Reddy, Narosa Publishing.
3. Design and technology (1996), James Garratt, Cambridge University Press.
4. Product Management, Donald R. Lehman, S. Russell Wines, 3rd Edition, TMH.
5. Product Life Cycle Engineering and Management, CEP Lecture notes, Prof B. Ravi, IIT Bombay.
6. Product Design & Development, Karl. T. Ulrich & Steven D. Eppinger, 3rd addition, TMH.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TPE53	Engineering Economics	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objectives of this course are:

- Prepare students to analyse cost/revenue data and carry out economic analyses in the decision-making process to justify or reject alternatives/projects on an economic basis.

**COURSE OUTCOMES:**

At the end of the course, the students will be able to:

- Describe the role of economics in the decision-making process and perform calculations in regard to interest formulas.
- Trained towards estimating the present, annual and future worth comparisons for cash flows.
- Calculate the rate of return, depreciation charges and income taxes.
- Enumerate different cost entities in estimation and costing the elements of budgeting.
- Explain the importance of finance functions, financial ratios and solve related problems.

**COURSE CONTENT:****MODULE - I**

**Basic concepts and definitions:** Methodology of economics, demand and supply-elasticity, theory of the firm and market structure, price and output determinations in different types of market.

**MODULE - II**

**Public sector economics:** Welfare economics, central and commercial banks and their functions, industrial policies, theory of localization, weber & surgent florence theory, investment analysis - NPV, ROI, IRR, payback period, SWOT analysis.

**MODULE - III**

**Monetary and fiscal policy:** Tools, impact on the economy, inflation, business cycle, cash flow-2, 3, 4 model.

**MODULE - IV**

**Business forecasting:** Elementary techniques, cost and revenue analysis, capital budget, break even analysis.

**MODULE - V**

**Indian economy:** Urbanization, unemployment-poverty, regional disparities, unorganized sectors  
roll of plans, reforms-post independent period.

**TEXT & REFERENCE BOOKS:**

1. Principles of Economics, N. Mankiw Gregory (2002), Thompson Asia.
2. Managerial Economics, V. Mote, S. Paul, G. Gupta (2004), Tata McGraw Hill.
3. Indian Economy, Its Development Experience Misra, S. K. and Puri V. K., Himalaya Publishing House, Mumbai.
4. Textbook of Business Economics, Pareek Saroj (2003), Sunrise Publishers.
5. Indian economy since Independence, U. Kapila, Academic Foundation, New Delhi.
6. Indian Economy, R. Dutt & K.P.M. Sundharam, S. Chand & Company Ltd., New Delhi.
7. Indian Economic Policy and Reform, R. Mathur, RBSA Publisher, Jaipur.
8. Indian Economic Policy, B. Jalan, Penguin Books Ltd.
9. Economic Survey (Annual), Government of India, Economic Division, Ministry of Finance, New Delhi.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech, VII Sem.	IP07TOE21	Advanced Manufacturing Processes	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to:

- To understand the principle of various advanced machining processes kinematics drive of machine tool.
- To impart knowledge about cutting different material removal, joining processes.
- To understand about various advanced metal forming processes.
- Explain how to identify suitable hybrid welding processes for joining dissimilar materials.
- To understand about various advanced casting processes.

**COURSE OUTCOMES:**

At the end of the course the students will be able to:

- Analyze real-life application in various organizations.
- Categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.
- Choose material processing technique with the aim of cost reduction, reducing material wastage & machining time.
- Estimate process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.

**COURSE CONTENT:**

**MODULE – I**

**Advanced machining processes:** Introduction, micro machining process, principle, material removal mechanism, parametric analysis and applications of processes such as ultrasonic machining (USM), abrasive jet machining (AJM), water jet machining (WJM), abrasive water jet machining (AWJM), electrochemical machining (ECM), electro discharge machining (EDM), electron beam machining (EBM), laser beam machining (LBM) processes, working principle of plasma arc machining.

**MODULE – II**

**Advanced machining theory & practices:** Mechanisms of chip formation, shear angle relations, and theoretical determination of cutting forces in orthogonal cutting, analysis of turning, drilling and

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milling operations, mechanics of grinding, dynamometry, thermal aspects of machining, tool wear, economics of machining, processing of polymers, ceramics, and composites.

### MODULE – III

**Advanced metal forming processes:** Details of high energy rate forming (HERF) process, electro-magnetic forming, explosive forming electro-hydraulic forming, stretch forming, contour roll forming.

### MODULE – IV

**Advanced welding processes:** Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW), cold welding, diffusion welding, forge welding, friction welding, explosive welding, hard vacuum welding, soft vacuum welding, underwater welding processes, concept of robotized welding and welding automation.

### MODULE -V

**Advanced casting processes:** Metal mould casting, continuous casting, squeeze casting, vacuum mould casting, evaporative pattern casting, ceramic shell casting.

### TEXT & REFERENCE BOOKS:

1. Manufacturing processes for Engineering Materials, Serope Kalpakjian, Steven R. Schmid, Fourth edition, Pearson Education.
2. Manufacturing Engineering and Technology, Serope Kalpakjian, Third Edition, Addison-Wesley Publication Co.,
3. Materials and Processes in Manufacturing, E.P. DeGarmo, J. T Black, R.A. Kohser, 8th Edition, Prentice Hall of India, New Delhi (ISBN 0-02-978760).
4. Manufacturing Science, A. Ghosh & A.K. Mallik, East-West Press Pvt. Ltd. New Delhi.
5. Non-traditional Manufacturing Processes, G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7)
6. Advanced Machining Processes, V.K. Jain, Allied Publishers Pvt. Ltd.
7. Modern Machining Processes, P.C Pandey & H.S. Shan, McGraw Hill Education.
8. Manufacturing Technology, P. N Rao, Tata McGraw Hill Publishing Company.
9. Non-Conventional Machining, P. K Mishra, Narosa Publishers.
10. Unconventional Manufacturing Processes, K. K Singh, Dhanpat Rai & Company, New Delhi.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDIT S	
			L	T	P	INTERNAL ASSESSMENT		ESE		SUB-TOTAL
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TOE22	Principles of Management	3	-	-	15	15	70	100	3

**The objectives of this course are:**

- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyse and understand the environment of the organization.
- To help the students to develop cognizance of the importance of management principles.

**COURSE OUTCOMES:**

**At the end of the course, the students will be able to:**

- Discuss and communicate the management evolution and how it will affect future managers.
- Analyse and evaluate the influence of historical forces on the current practice of management.
- Identify and evaluate social responsibility and ethical issues involved in business situations and logically articulate own position on such issues.
- Explain how organizations adapt to an uncertain environment and identify techniques managers use to influence and control the internal environment. Practice the process of management's four functions: planning, organizing, leading, and controlling.
- Identify and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences.
- Evaluate leadership styles to anticipate the consequences of each leadership style.
- Analyse and apply both qualitative and quantitative information to isolate issues and formulate best control methods.

**COURSE CONTENT:**

**MODULE - I**

**Introduction:** Definition of management, science or art, manager v/s entrepreneur, types of managers managerial roles and skills, evolution of management- scientific, human relations, system and contingency approaches, types of business organizations, sole proprietorship, partnership, company, public and private enterprises, organization culture and environment, current trends and issues in management.

**MODULE - II**

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**Planning:** Nature and purpose of planning, types of planning, objectives, setting objectives, policies, strategic management, planning tools and techniques, decision making steps & processes.

**MODULE - III**

**Organization:** Nature and purpose of organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, recruitment selection, training & development, performance management, career planning and management.

**MODULE - IV**

**Direction and leadership:** Directing, individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

**MODULE - V**

**Controlling:** System and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

**TEXT & REFERENCE BOOKS:**

1. Management, S.P. Robins & M. Couiter, 10th Edition, 2009, Prentice Hall India.
2. Management, Jaf Stoner, R.E Freeman and D.R Gilbert, 6th Edition, 2004, Pearson Education.
3. Principles of Management, P.C Tripathy & P.N. Reddy, 1999, Tata McGraw Hill.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP07TOE23	Maintenance Management	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to:

- To develop the skill of maintenance functions in industry.
- To provide the concept of various types of maintenance system used in industries.
- To impart knowledge on reasons for failure and the corrective and preventive measure adopted to reduce them.
- To create the ability of data, analyze failure cause and reliability engineering.
- To develop the new techniques of maintenance for minimizing the cost of maintenance and improving of life of equipment's.

**COURSE OUTCOMES:**

At the end of the course the students will be able to:

- Understand and be able to explain the aim and basics of maintenance activity.
- Use various methods of maintenance and procedures applied to equipment's.
- Be aware of methods of detection for faults and errors in operations.
- Apply the tools and techniques of repairing, faults analysis.

**COURSE CONTENT:**

**MODULE - I**

**Introduction:** Fundamentals of maintenance engineering, maintenance engineering its importance in material & energy conservation, inventory control, productivity, safety, pollution control etc. safety regulations, pollution problems, human reliability, total quality management (TQM), total productivity maintenance (TPM), environmental issues in maintenance, ISO 9000.

**MODULE - II**

**Maintenance management:** Types of maintenance strategies, Planned and unplanned maintenance, breakdown, preventive & predictive maintenance and their comparison, advantages & disadvantages, limitations of computer aided maintenance, maintenance scheduling, spare part management, inventory control, organization of maintenance department.

**MODULE - III**

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**Tribology in maintenance:** Friction wear and lubrication, friction & wear mechanisms, prevention of wear, types of lubrication mechanisms, lubrication processes.

**Lubricants:** Types, general and special purpose, additives, testing of lubricants, degradation of lubricants, seal & packing.

#### MODULE - IV

**Machine health monitoring:** Condition based maintenance, signature analysis, oil analysis, vibration, noise and thermal signatures, on line & off line techniques, instrumentation & equipment used in machine health monitoring, instrumentation in maintenance, signal processing, data acquisition and analysis, application of intelligent systems, data base design.

**TPM:** Introduction, history, components, pillars of TPM, calculation of OEE, Terri technology.

#### MODULE - V

**Reliability, availability & maintainability (RAM) analysis:** Introduction to RAM failure mechanism, failure data analysis, failure distribution, reliability of repairable and non-repairable systems, improvement in reliability, reliability testing, reliability prediction, utilization factor, system reliability by Monte Carlo simulation technique, FMECA.

#### TEXT & REFERENCE BOOKS:

1. Maintenance Engineering Hand Book, Higgins.
2. Maintenance & Spare parts Management, Gopal Krishnan.
3. Industrial Maintenance Management, S.K. Shrivastava.
4. Industrial Engineering, Hand book of Condition Monitoring, C.N.R. Rao.

















Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B. Tech, VII Sem.	IP07TMC02	Indian Constitution	3	-	-	-	-	-	-

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to:

- To help the students to understand and explain the fundamental rights.
- To describe the uses of directive principle.
- Importance of union executives.
- Describe the composition of legislative assembly, its powers and functions.

**COURSE OUTCOMES:**

At the end of the course the students will be able to:

- Understand the meaning and importance of constitution.
- Identify and explore the basic features and modalities about Indian constitution.
- Realize the state and central policies (union and state executive), fundamental rights & their duties.
- Analyze the salient (outstanding) features of Indian constitution.
- Recognize the importance and significance of preamble with respect to Indian constitution.

**MODULE – I**

**Introduction:** Constitution-meaning of the term, sources and constitutional theory, features, citizenship preamble.

**MODULE – II**

**Fundamental rights and duties:** Fundamental rights, fundamental duties, directive principles of state policy.

**MODULE – III**

**Union government:** Structure of Indian union: federalism, Centre-state relationship President: role, power and position, Prime minister and council of ministers, cabinet and central secretariat, Lok Sabha, Rajya Sabha.

**MODULE – IV**

**State Government:** Governor: role and position, chief minister and council of ministers, state secretariat.

**MODULE -V**

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**Relationship between Centre and States:** Distribution of legislative powers, administrative relations, coordination between states.

**TEXT BOOKS:**

1. Constitution of India, V.N. Shukla
2. The Constitutional Law of India, J.N. Pandey
3. Indian Constitutional Law. M.P. Jain

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B. Tech. VII Sem.	IP07PPC08	CAD/CAM Lab	-	-	2	30	20	50	1

**COURSE LEARNING OBJECTIVES:**

- To provide students with the writing and reading principles of "Engineering Drawing", which is a graphical universal language used in technical world for describing the shape and size of an object via supplying orthographic views and/or solid models associated with all the necessary dimensions, associated tolerances and annotations created in a CADD environment.
- To understand 3D drafting and analysis software used for modelling and analysis.

**COURSE OUTCOMES:**

- Ability to perform both 2D and 3D drafting of component using CAD software.
- Create solid models of objects, objects in basic shapes, composite bodies, custom built machine parts, building modules etc.
- Draw the orthographic views of an object in CAD environment (particularly in Autodesk AutoCAD environment).
- Create the orthographic views of an object from the solid model (particularly in Autodesk Inventor environment).
- Dimension the views, show some annotations, provide the size tolerance of functional features, and general tolerances.
- Explain and interpret the dimensions and the associated tolerances, some annotations.
- Read the given orthographic views; i.e., visualize the 3- Dimensional model of the object shown to its orthographic views and create its CAD model.
- Create auxiliary views, revolved views, sectional views.
- Ability to construct assemblies from the concepts learnt using drafting software.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B. Tech. VII Sem.	IP07PSC02	Seminar on Summer Training	-	-	4	50	-	50	2

**COURSE LEARNING OBJECTIVES:**

- To provide comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.
- To enhance students' knowledge in one particular technology.
- To increase self-confidence of students and helps in finding their own proficiency.
- To cultivate student's leadership ability and responsibility to perform or execute the given task.
- To provide learners hands on practice within a real job situation.
- Enhance and supplement the knowledge and skills of the students.
- Develop the students in terms of ability, competence and interpersonal relationship.

**COURSE OUTCOMES:**

- Capability to acquire and apply fundamental principles of engineering.
- Become master in one's specialized technology.
- Become updated with all the latest changes in technological world.
- Develop a skill of a multi-skilled engineer with sound technical knowledge, management, leadership and entrepreneurship skills.
- Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
- Capability and enthusiasm for self-improvement through continuous professional development and life-long learning.
- Awareness of the social, cultural, global and environmental responsibility as an engineer.











**GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG  
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY**

Department of Industrial & Production Engineering

CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2021-22

**B. TECH FOURTH YEAR, VIII SEMESTER**

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP08TPC16	Robotics and Robot Applications	3	1	-	30	70	100	4
2.	IP08THS04	Electives from Humanity Science-04	3	-	-	30	70	100	3
3.	IP08TOE03	Open Elective-03	3	-	-	30	70	100	3
4.	IP08TOE04	Open Elective-04	3	-	-	30	70	100	3
5.	IP08TMC03	Essence of Indian Traditional Knowledge	3	-	-	-	-	-	-
<b>Total</b>			<b>15</b>	<b>1</b>	<b>-</b>	<b>120</b>	<b>280</b>	<b>400</b>	<b>13</b>
<b>PRACTICALS</b>									
1.	IP08PPR02	Major Project	-	-	12	120	80	200	6
2.	IP08PPC01	Comprehensive Viva	-	-	-	-	50	50	2
<b>Total</b>			<b>-</b>	<b>-</b>	<b>12</b>	<b>120</b>	<b>130</b>	<b>250</b>	<b>8</b>

Total Credits: 21

Total Contact Hour: 28

Total Marks: 650

INTERNAL ASSESSMENT: -two class tests of 15 marks each will be conducted.

L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE -END SEMESTER EXAMINATION

IP08THS04 Electives from Humanity Science-04
IP08THS41 Intellectual Property Rights
IP08THS42 Safety Management and Labour Law
IP08TOE03 Open Elective-03
IP08TOE31 Computer Aided Process Planning
IP08TOE32 Microprocessors in Automation
IP08TOE04 Open Elective-04
IP08TOE41 Supply Chain Management
IP08TOE42 Composite Materials Technology
IP08TOE43 Finite Element Method

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TPC16	Robotics and Robot Applications	3	1	-	15	15	70	100	4

#### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To define basic concept about robots, robotics and programming.
- To learn about coordinate frames, mapping and transforms/plots.
- To understand kinematic modelling of the manipulators and their working.

#### COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Apply knowledge of robotics for understanding, formulating and solving engineering problems.
- Demonstrate creativeness in designing and development of robotics.
- Analyse the kinematic of industrial robot.
- Design control laws for a simple robot.
- Identify, analyse and design of robots useful to the society.

#### COURSE CONTENT:

##### MODULE - I

**Introduction to robotics:** Evolution of robots and robotics, progressive advancement in robots, definitions and classifications, laws of robotics, robot anatomy and related attributes, repeatability, accuracy and precision, human arm characteristics, robot specification and notations, concept of robots programming, the future prospects.

##### MODULE - II

**Coordinate frames, mapping and transforms:** Coordinate frames, spatial descriptions and transformations, fundamental of translation, rotations and transformations, inverting a homogeneous transform, fundamental rotation matrices, yaw pitch and roll, yaw pitch and roll transformation, equivalent angle.

##### MODULE - III

**Symbolic modeling of robots, direct kinematic model:** Mechanical structure and notations, description of links and joints, kinematic modeling of the manipulator, Denavit-Hartenberg (D- H) representation, kinematic relationship between adjacent links, manipulator, transformation matrix, arm equations.

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#### MODULE – IV

**Robotic sensors and vision:** The meaning of sensing, sensors in robotics, kinds of sensors used in robotics, robotic vision, industrial applications of vision-controlled robotic systems, process of imaging, architecture of robotic vision systems, image acquisition, description of other components of vision system, image representation, image processing, artificial intelligence (AI) in robotics.

#### MODULE – V

**Robot controller & applications:** Linear control of robot manipulation, feedback and close loop control, second-order linear systems, trajectory following control, modelling and control of single joint, architecture of industrial robotic controllers, artificial intelligence, industrial and non-industrial applications, robotic application for sustainable development & social issues.

#### TEXT & REFERENCE BOOKS:

1. Robotics & Control, R.K. Mittal & I.J. Nagrath, TMH Publications
2. Robotics for engineers, Yoram Korean, McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications, M.P. Groover, M. Weiss.
4. Robotics Control Sensing, Vision and Intelligence - K.S. Fu, R.C. Gonzalez, C.S.G. Lee, McGrew Hill Book Co.
5. Kinematics and Synthesis of linkages, Hartenberg & Denavit, McGrew Hill Book Co.
6. Kinematics and Linkage Design, A.S. Hall, Prentice Hall.
7. Kinematics and Dynamics of Machinery, J. Hirschhorn, McGrew Hill Book Company.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08THS41	Intellectual Property Rights	3	-	-	15	15	70	100	3

### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Understand, define and differentiate various types of intellectual properties (IPs) and their roles in contributing to organizational competitiveness.
- Understand the framework of strategic management of Intellectual Property (IP).
- Appreciate and appraise different IP management (IPM) approaches and describing how pioneering firms initiate, implement and manage IPM programs.
- Explain how to derive value from IP and leverage its value in new product and service development.

### COURSE OUTCOMES:

At the end of the course the students will be able to:

- Identify the different types of Intellectual properties (IPs), the right of ownership and scope of protection.
- Recognize the crucial role of IP in organizations of different industrial sectors for the purposes of product and technology development.
- Identify activities and constitute IP infringements and the remedies available to the IP owner and describe the precautionary steps to be taken to prevent infringement of proprietary rights in products and technology development.
- Analyze ethical and professional issues which arise in the intellectual property right context.
- Apply intellectual property right principles (including copyright, patents, designs and trademarks) to real problems and analyze the social impact of intellectual property rights.
- Demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing.

## COURSE CONTENT:

### MODULE - I

**Introduction to intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

### MODULE - II

**Trademarks:** Purpose and function of trademarks, acquisition of trademarks rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

### MODULE - III

**Law of copyrights and law of patents:** Fundamentals of copyrights law, originality of material, rights to reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, international copyright law, foundation of patent law, patent searching process, ownership rights and transfer.

### MODULE - IV

**Trade secrets and unfair competition:** Trade secrets law, determination of trade secrets status, liability for misappropriations of trade secrets, protection for submission, trade secrets litigation, misappropriation of right of publicity and false advertising.

### MODULE - V

**New developments of intellectual property:** New developments in trade law, copyright law, patent law, intellectual property audits international overview of intellectual property, international-trademark law, copyright law, international patent law, international development in trade secrets law.

### TEXT & REFERENCE BOOKS:

1. Intellectual Property Right, Deborah. E. Bouchoux, 4th Edition, 2013, Cengage Learning.
2. Intellectual Property Right: Unleashing the Knowledge Economy, Prabuddha Ganguli, 3rd Edition, 2005, Tata McGraw Hill Publishing Company Ltd.,

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08THS42	Safety Management & Labour Law	3	-	-	15	15	70	100	3

#### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To understand roles, responsibilities importance of health safety, and welfare in workplaces.
- To impart knowledge about material handling, air pollution control system, fire prevention and protection.
- To learn about safety audit, disaster control, safety principles.
- To understand the labour laws and various acts applicable to industries.

#### COURSE OUTCOMES:

At the end of the course the students will be able to:

- To acquire the knowledge of substantive as well as procedural contents of safety management and labour laws.
- To develop an insight into the wages law, factory act etc.
- To gather an understanding of natures of accidents and its effects.
- To gather an understanding of natures of various types of hazards in industry.

#### COURSE CONTENT:

##### MODULE -I

**Safety management:** Concept's evolution of modern safety concept, safety policy, safety in organization, line and staff functions for safety, safety committee, budgeting for safety, techniques incident recall technique (IRT), disaster control, job safety analysis (JSA), safety survey, safety inspection, safety sampling, safety audit.

**Safety in material handling:** Ergonomic consideration in material handling, design, installation, operation and maintenance of conveying equipment, hoisting, traveling and slewing mechanisms.

##### MODULE -II

**Design of air pollution control system:** Industrial sources of air pollution, emission factors, regulations control strategies, policies, gaseous pollutant control: gas absorption in tray and packed towers, absorption with/without chemical reaction, removal of SO<sub>2</sub>, absorption in fixed blades-breakthrough, removal of HCs/VOCs, NO<sub>x</sub> removal, wet scrubbers.

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**Integrated air pollution control systems:** Pollution control in process industries, pollution control in process industries like cement, paper, petroleum, petroleum products, textile, tanneries, thermal power plants dying and pigment industries, eco-friendly energy.

### MODULE -III

**Safety in metal working machinery and wood working machines:** General safety rules, principles, maintenance, inspections of turning machines, boring machines, milling machine, planing machine and grinding machines, CNC machines, wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes, saws, types, hazards.

### MODULE -IV

**Fire prevention and protection:** Sources of ignition, fire triangle, principles of fire extinguishing, active and passive fire protection systems, various classes of fires, A, B, C, D, E, types of fire extinguishers, fire stoppers, hydrant pipes, hoses, monitors, fire watcher's layout of stand pipes, fire station, fire alarms and sirens, maintenance of fire trucks, foam generators, escape from fire rescue operations, fire drills, notice first aid for burns.

### MODULE -V

**Explosion protecting systems:** Principles of explosion, detonation and blast waves, explosion, parameters, explosion protection, containment, flame arrestors, isolation, suppression, venting, explosion relief of large enclosure, explosion venting, inert gases, plant for generation of inert gas rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO<sub>2</sub>) and halons-hazards in LPG, ammonia (NH<sub>3</sub>), sulphur dioxide (SO<sub>2</sub>), chlorine (Cl<sub>2</sub>) etc.

### TEXT & REFERENCE BOOKS:

1. Accident Prevention Manual for Industrial Operations, N.S.C. Chicago, 1982.
2. Industrial Accident Prevention, H.W Heinrich, 1980, McGraw-Hill Company, New York.
3. Hand Book of Fire Technology, R.S. Gupta, Orient Longman, 1977, Bombay.
4. Accident Prevention manual for industrial operations, N.S.C. Chicago, 1982.
5. Fire and explosion protection, Dinko Tuhtar.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TOE31	Computer Aided Process Planning (CAPP)	3	-	-	15	15	70	100	3

#### COURSE LEARNING OBJECTIVES:

The objective of this Course is to:

- Learn the fundamentals of computer aided process planning, group technology and applications.
- Study the simulation of machining processes, importance of design and manufacturing tolerances.
- Understand the role of optimal selection of machining parameters.

#### COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Generate the structure of automated process planning system and uses the principle of generative and retrieval CAPP systems for automation.
- Select the manufacturing sequence and explains the reduction of total set up cost for a particular sequence.
- Predict the effect of machining parameters on production rate, cost and surface quality and determines the manufacturing tolerances.
- Explain the generation of tool path and solve optimization models of machining processes.
- Create awareness about the implementation techniques for CAPP.

#### COURSE CONTENT:

##### MODULE -I

**Introduction to CAPP:** Information requirement for process planning system, role of process planning, advantages of conventional process planning over CAPP, structure of automated process planning system, feature recognition, methods.

##### MODULE- II

**Generative CAPP system:** Importance, principle of generative CAPP system, automation of logical decisions, knowledge-based systems, inference engine, implementation, benefits.

**Retrieval CAPP system:** Significance, group technology, structure, relative advantages, implementation, and applications.

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### MODULE- III

**Selection of manufacturing sequence:** Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

### MODULE- IV

**Determination of machining parameters:** Reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.

### MODULE- V

**Generation of tool path:** Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

### TEXT & REFERENCE BOOKS:

1. Automation, Production systems & Computer Integrated Manufacturing System, Mikell P. Groover, PHI Publication.
2. Computer Aided Engineering, David Bedworth, TMH Publishers
3. Computer Aided Design and Manufacturing, Sadhu Singh, Khanna Publisher.
4. Computer Aided Process Planning, H.P. Wang and J.K. Li, Elsevier Science and Technology Publishers, 1st edition, 1991.
5. Computer Aided Process Planning, Joseph Tulkoff, SME Publications.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TOE32	Microprocessors in Automation	3	-	-	15	15	70	100	3

#### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To understand the fundamentals of PIC microcontroller.
- Understand the working of microcontroller systems and able to determine its hardware and software.
- Interface with real time systems.
- Understand the design application based on microprocessor systems.

#### COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Learn embedded system and its applications in industry.
- Recognise working of microcontroller architecture and programming model.
- Identify the concept of timer, interrupt, I/O port interfacing with microcontroller.
- Study the concept of interfacing with real time system.

#### COURSE CONTENT:

##### MODULE - I

Number Systems: Codes, digital electronics, logic gates, combinational circuits design, flip-flops, sequential logic circuits design, counters, shift registers.

Introduction to 8085 functional block diagram, registers, ALU, bus systems, timing and control signals.

##### MODULE - II

Machine cycles: Instruction cycle and timing states, instruction timing diagrams, memory interfacing.

##### MODULE - III

Assembly language programming: Addressing modes, instruction set, simple programs in 8085, concept of interrupt, need for interrupts, interrupt structure, multiple interrupt requests and their handling,

programmable interrupt controller, interfacing peripherals, programmable peripheral interface (8255).

##### MODULE - IV

Interfacing analog to digital converter & digital to analog converter, multiplexed seven segments LED display systems, stepper motor control, data communication: serial data communication (8251), programmable timers (8253), 8086/8088 microprocessor and its advanced features.

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## MODULE -V

**Introduction to digital control:** Sampling theorem, signal conversion and processing, Z-transform, digital filters, implementation of digital algorithm.

### TEXT & REFERENCE BOOKS:

1. Digital Electronics: An Introduction to Theory and Practice, William H. Gothmann, PHI Learning Private Limited.
2. Digital Computer Electronics: An Introduction to Microcomputers, Albert Paul Malvino, Tata McGraw-Hill Publishing Company Ltd.
3. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.
4. Digital Control Systems, Benjamin C. Kuo, Oxford University Press (2/e, Indian Edition).
5. Microcomputer Experimentation with the Intel SDK-85, Lance A. Leventhal, Prentice Hall.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TOE41	Supply Chain Management	3	-	-	15	15	70	100	3

### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To understand supply chain activities, process planning, decision phases, importance and management of supply chains.
- To examine various drivers of supply chain for acquiring effectual performance, ease distribution and acquisition of production resources & Inventories.
- To understand about uncertainty, risk management, distribution network, role of location, capacity and forecasting in SC.
- To adapt drivers of supply chain, related framework and to appraise supply chain performance, pricing and sourcing decisions.

### COURSE OUTCOMES

At the end of the course, the student will be able to:

- Demonstrate basic understanding about competition, logistics network, capable factors for supply chain designs and supply chain strategies.
- Acquire knowledge about distribution network, e-business, forecasting, network design and time-series analysis.
- Decide technical understanding about demand, inventory, safety, pricing and information technology
- Manage and measure sourcing decisions in supply chain, product availability under capacity constraints, optimal levels of product, services and resources.

### COURSE CONTENT:

#### MODULE -I

**Building a strategic framework to analyze supply chains:** Supply chain, its objective and the importance of supply chain decisions, decision phases in a supply chain, process view of a supply chain, examples of supply chains, supply chain performance, achieving strategic fit and scope, competitive and supply chain strategies, achieving strategic fit, expanding strategic scope, supply chain drivers and metrics, drivers of supply chain performance, framework for structuring drivers.

facilities, inventory, transportation, information, sourcing, pricing.

## MODULE- II

**Designing the supply chain network:** Designing distribution networks and applications to e-business the role of distribution in the supply chain, factors influencing distribution network design, design options for a distribution network, e-business and the distribution network, distribution networks in practice.

**Network design in the supply chain:** The role of network design in the supply chain, factors influencing network design decisions framework for network design decisions, models for facility location and capacity allocation, role of IT in network design, making network design decisions in practice.

**Network design in an uncertain environment:** The impact of uncertainty on network design, discounted cash flow analysis, representations of uncertainty, evaluating network design decisions using decision trees, AMTires:evaluationofsupply.chainedesign decisions under uncertainty, risk management and networkdesign175, making supply chain decisions under uncertainty in practice.

## MODULE- III

**Planning demand and supply in a supply chain:** Demand forecasting in a supply chain, the role of forecasting in a supply chain, characteristics of forecasts, components of a forecast and forecasting methods, basic approach to demand forecasting, time-series forecasting methods, measures of forecast error, forecasting demand at Tahoe salt, role of IT in forecasting, risk management in forecasting, forecasting in practice.

**Aggregate planning in a supply chain:** Role of aggregate planning in a supply chain, the aggregate planning problem, aggregate planning strategies, aggregate planning using linear programming, aggregate planning in excel, role of IT in aggregate planning, implementing aggregate planning in practice.

**Planning supply and demand in a supply chain:** Managing predictable variability, responding to predictable variability in a supply chain, managing supply, managing demand, implementing solutions to predictable variability in practice.

## MODULE- IV

**Planning and managing inventories in a supply chain:** Managing economies of scale in a supply chain, cycle inventory, the role of cycle inventory in a supply chain, economies of scale to exploit fixed costs, economies of scale to exploit quantity discounts, short-term discounting, trade promotions, managing multiechelon cycle inventory, estimating cycle inventory-related costs in practice.

**Managing uncertainty in a supply chain:** Safety inventory, the role of safety inventory in a supply

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chain, determining appropriate level of safety inventory, impact of supply uncertainty on safety inventory, impact of aggregation on safety inventory, impact of replenishment policies on safety inventory, managing safety inventory in a multi-echelon supply chain, role of IT in inventory management, estimating and managing safety inventory in practice.

**Determining the optimal level of product availability:** The importance of the level of product availability, factors affecting optimal level of product availability, managerial levers to improve supply chain profitability, setting product availability for multiple products under capacity constraints, setting optimal level of product availability in practice.

#### MODULE- V

**Designing and planning transportation networks:** Transportation in a supply chain, the role of transportation in a supply chain, modes of transportation and their performance characteristics, transportation infrastructure and policies, design options for a transportation network, trade-off in transportation design, tailored transportation, role of IT in transportation risk management in transportation, making transportation decisions in practice.

**Managing cross-functional drivers in a supply chain:** Sourcing decisions in a supply chain, the role of sourcing in a supply chain, in-house or outsource, third-party and fourth-party logistics providers, supplier scoring and assessment, supplier selection-auctions and negotiations contracts and supply chain performance, design collaboration, the procurement process, sourcing planning and analysis, role of IT in sourcing, risk management in sourcing, making sourcing decisions in practice.

#### TEXT & REFERENCE BOOKS:

1. Supply Chain Management, Jaijit Shuk, 2010, Pearson Publications.
2. Supply Chain Management, Sunil Chopra & Meindl, Fourth Edition, 2010, PHI.
3. Supply Chain Management, A.S. Aravamudan, Second Edition, 2006, PHI.
4. Logistics Management, James Stock & Douglas Lambert, Edition, 2006, McGraw Hill International.
5. Supply Chain Management for Global Competitiveness, B.S. Sahay, 2000, McMillan Publication.
6. Emerging Trends in Supply Chain Management, B.S. Sahay 2000, McMillan Publication.
7. Logistics Management, Bowersox, 2004, TMH.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS	
			L	T	P	INTERNAL ASSESSMENT		ESE		SUB-TOTAL
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TOE42	Composite Materials Technology	3	-	-	15	15	70	100	3

### COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Analyze the basic concepts of composite materials and application of composite material in various engineering fields.
- Apply the requirements for production and application of composite materials.
- Explain students to various techniques used for composite manufacturing.
- Describe concepts of nano-materials, nano technology and use of nano materials.
- Analyze micro mechanical properties of laminas using various approaches.

### COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Identify and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
- Apply competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.
- Analyse the elastic properties and simulate the mechanical performance of composite laminates and understand and predict the failure behaviour of fibre-reinforced composites.
- Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project.
- Critique and select literature and apply the knowledge gained from the course in the design and application of fibre-reinforced composites.

### COURSE CONTENT:

#### MODULE - 1

**Introduction to composites:** Definitions, typical reinforcements and matrices, properties of fiber composites: mechanical, weight, chemical resistance, etc., compared with standard materials, particular composites, quality assurance, outline of manufacturing methods, economic aspects, dependence of properties on manufacturing route, typical manufacturing defects, applications: fiber strengthening, fiber flaws, critical length, critical volume fraction, natural composites (wood,

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bone, etc.)

## MODULE - II

**Fiber manufacturing methods:** Physical and chemical characteristics, mechanical and other properties of commonly used fibers: carbon, glass, aramid and other organics, ceramics, Fiber coating to achieve compatibility with matrix, use of statistical methods to characterize fiber behavior, naturally-occurring (cellulose) fibers, whisker, typical properties, manufacturing methods.

## MODULE - III

**Manufacture of polymer matrix composites** Principles of manufacturing processes (open and closed mould), including: hand and spray lay-up, press moulding, injection moulding, resin injection, RRM, filament winding, pultrusion, centrifugal casting, autoclave, prepreg and other starting materials, etc., machine methods for manufacture of composites, cutting, drilling and other finishing operations.

## MODULE - IV

**Engineering properties stiffness and strength:** Geometrical aspects, volume and weight fraction, unidirectional continuous fiber systems, stiffness and strength, discontinuous fiber, short fiber systems, length and orientation distributions, woven reinforcements hybrids, failure theories for unidirectional lamina, micro mechanics theories.

## MODULE - V

**Mechanical testing:** Determination of stiffness and strength of unidirectional composites, tension, compression, flexure and shear, typical standard methods, use of photo elastic, holographic and other methods of strain measurement.

**Metal matrix systems:** Metals and alloys, solidification processes, diffusion bonding, mechanical properties, boron fibre reinforced aluminium and titanium alloys, alumina fibre reinforced aluminium alloys, silicon carbide fibre reinforced aluminium alloy, particulate systems.

## TEXT & REFERENCE BOOKS

1. Introduction to Composite Materials Design, E.T. Cifuentes, Taylor & Francis.
2. Mechanics of Composite Materials, Robert Jones, Second Edition 1999, Taylor & Francis.
3. Composites and Processing Methods, Venkatesh, Narosa Publications.
4. Composite Material Science and Engineering, Krishan K. Chawla, Springer Third Edition First Indian Reprint 2015.
5. Fibre-Reinforced Composites, Materials, Manufacturing, and Design P.K. Mallick, CRC Press, Taylor & Francis Group Third Edition.
6. Mechanics of Composite Materials & Structures, Madhujit Mukhopadhyay Universities Press 2004.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TOE43	Finite Element Method	3	-	-	15	15	70	100	3

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to:

- Analyze the basic concept about principle of finite element method.
- Determine the coordinate system and shape function for various element.
- Learn plotting governing equations of linear and higher order.
- Define basic concept of matrix formulation.

**COURSE OUTCOMES:**

At the end of the course, the student will be able to:

- Apply concept of shape functions for optimizing decision problem.
- Understand the concepts behind formulation methods in FEM.
- Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
- Develop element characteristic equation and generation of global equation.
- Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.
- Identify boundary conditions to solve dynamic problems under thermal aspects and related to torsion of non-circular shafts.

**COURSE CONTENT:**

**MODULE -I**

**Basic concept of FEM:** Historical background, basic concept and steps in fem, mathematical modeling of field problems in engineering, governing equations, discrete and continuous models, boundary and initial value problems, one dimensional second order equation, discretization, linear and higher order elements, introduction of FEM software and steps.

**Matrix displacement formulation:** Matrix displacement equations, solution of matrix displacement

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equations, techniques of saving computer memory requirements, finite element formulation.

#### MODULE -II

**Natural coordinate systems and shape function:** Basic concept of natural coordinate, 1-D & 2- D natural coordinate, concept of shape functions, convergence requirements, pascal triangle, shape function for linear and plain elements, shape functions using Lagrange polynomials, shape functions for serendipity family elements, degrading technique for nodes.

#### MODULE - III

**Strain displacement matrix:** Strain displacement matrix for linear and plain element, strain displacement matrix for beam, linear and plain elements.

**Stiffness matrix:** Concept of element stiffness matrix for linear and plain elements. stiffness matrix for bar & trusses, stiffness matrix for linear and plain elements, force vectors, body forces and thermal loads, plate and shell elements, finite representation of infinite bodies, element aspect ratio, quadrilateral and higher order element vs mesh refinement.

#### MODULE - IV

**Assembling of stiffness matrix:** Assembly of elemental matrices, boundary conditions and solution, direct approach, strain energy, Castigliano's first theorem, minimum potential energy, Galerkin's method, Galerkin's method applied to elasticity problems, weighted residual methods, variational formulation of boundary value problems, Ritz technique, isoparametric formulations.

#### MODULE - V

**Finite element solutions:** Numerical integration and application to plane stress problems, solid mechanics and heat transfer, longitudinal vibration and mode shapes, fourth order beam equation, transverse deflections and natural frequencies, bar, trusses & beams, plane-stress and plane strain problems, use of higher order elements, solution of dynamic problems application to thermal problems, torsion of non-circular shafts.

#### TEXT & REFERENCE BOOKS:

1. The Finite Element Methods for Engineers, K.H. Huebner & E.A., Thorton, John Wiley & Sons.
2. Concepts and Applications of Finite Element Analysis, R.D. Cook, D.S. Malkus & M.E. Plesha, Third Edition, John Wiley & Sons.
3. Finite Element Method in Engineering, S.S. Rao, Butterworth Heinemann.
4. Finite Element Procedures, K.J. Bathe, Prentice Hall of India, New Delhi.
5. The Finite Element Methods, O.C. Zienewicz & R.L Taylor, Vol.1 & Vol.2, McGraw Hill.
6. Finite element analysis, S.S. Bhavikatti, New Age Pub.
7. An Introduction to Finite Element Method, J.N., Reddy, Tata McGraw Hill.
8. Text Book of Finite Element Analysis, P. Seshu, Prentice Hall, New Delhi.

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Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP08TMC03	Essence of Traditional Knowledge	3	-	-	-	-	-	-	-

**COURSE LEARNING OBJECTIVES:**

- The course aims at imparting basic principles of thought process, reasoning and inferencing. sustainability is at the core of Indian traditional knowledge systems connecting society and nature.
- Holistic life style of yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian knowledge system, Indian perspective of modern scientific world-view and basic principles of yoga and holistic health care system.

**COURSE OUTCOMES:**

- Ability to understand, connect up and explain basics of Indian traditional knowledge modern scientific perspective.

**COURSE CONTENT:**

- Basic structure of Indian knowledge system: अष्टादशविद्या -४वेद, ४उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थापत्य आदि) द्वेदांग (शिक्षा, कल्प, निरुक्त, ज्योतिष, छंद) ४उपाङ्ग (धर्मशास्त्र, मीमांसा, पुराण, तर्कशास्त्र).
- Modern science and Indian knowledge system.
- Yoga and holistic health care.
- Case studies.

**TEXT & REFERENCE BOOKS:**

1. Cultural Heritage of India-course material, V. Sivaramakrishnan (Ed.), Bharatiya Vidya Bhavan, Mumbai 5th Edition, 2014.
2. Modern Physics and Vedant, Swami Jitatmanand, Bharatiya Vidya Bhavan.
3. Tao of Physics, Fritz of Capra.
4. Tarkasangraha of Annam Bhatta, V.N. Jha (Eng. Trans.), International Chinmay Foundation, Velliarnad, Arnakulam.
5. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6. Yoga-darshanam with Vyasa Bhashya, G.N. Jha (Eng. Trans.), Ed. R.N. Jha, Vidyanidhi Prakashan, Delhi 2016.

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