गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर – 495009 (छ.ग.)

Guru Ghasidas Vishwavidyalaya
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)
Koni, Bilaspur – 495009 (C.G.)

Department of Industrial and Production Engineering

School of Studies of Engineering & Technology

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

Minutes of Meeting of BoS

The scheduled meeting of member of Board of Studies (BoS) of Department of Industrial and Production Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Final year (VII and VIII semesters) scheme and syllabi on Feb 25, 2018 at E-Class Room for the Academic Year 2018-19.

The following members were present in the meeting:
1. Prof. B.S. Chawla (External Expert Member BoS, Principal GEC Bilaspur)
2. Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.)
3. Prof. Mukesh Kumar Singh (Member BoS, Professor, Dept. of Industrial and Production Engineering)
4. Mrs. Arpita Roy Choudhary (HOD, Assistant Prof., Dept. of Industrial and Production Engineering-cum Chairman, BOS)
5. Mr. C.P. Dewangan (Member BoS, Associate Professor, Dept. of Industrial and Production Engineering)
6. Mr. G.P. Shukla (Member BoS, Assistant Professor, Dept. of Industrial and Production Engineering)
7. Dr. Rajesh Kumar Bhushan (Invited Member, HOD, Dept. of Mechanical Engineering)

Following points were discussed during the meeting
1. In the meeting syllabus and scheme of B.Tech (IPE) from VII Sem,ester to VIII Semester have been discussed in detail as per Choice Based Credit System(CBCS).
The B.Tech. (Industrial and Production Engineering) VIIth and VIIIth Semester have been approved by the B.O.S. member.

The following new courses were introduced in the of B. Tech. Final year (VII and VIII Semesters):

- ❖ PRINCIPLES OF MANAGEMENT (IP7TPC51)
- ❖ PRODUCTION PLANNING AND CONTROL (IP7TPC52)
- ❖ CAD/CAM (IP7TPC53)
- ❖ PRODUCT DESIGN & DEVELOPMENT (IP7TOE31)
- ❖ ENTREPRENEURSHIP DEVELOPMENT (IP7TOE32)
- ❖ STRATEGIC MANAGEMENT (IP7TOE33)
- ❖ MACHINE TOOL DESIGN (IP7TPE61)
- ❖ REFRIGERATION AND AIR CONDITIONING (IP7TPE62)
- ❖ COMPOSITES MATERIALS & TECHNOLOGY (IP7TPE63)
- ❖ CAD/CAM LAB (IP7LPC53)
- ❖ SEMINAR ON SUMMER TRAINING (ABOUT 30 DAYS) (IP7LPC54)
- ❖ MINOR PROJECT (IP7LPC54)

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- ❖ OPERATION RESEARCH (IP8TPC61)
- ❖ MARKETING MANAGEMENT (IP8TPC62)
- ❖ SUPPLY CHAIN MANAGEMENT (IP8TOE41)
- ❖ SAFETY MANAGEMENT AND LABOUR LAW (IP8TOE42)
- ❖ FINITE ELEMENT METHOD (IP8 TOE 43)
- ❖ FLUID POWER AND CONTROL (IP8TPE71)
- ❖ ROBOTICS AND ROBOT APPLICATION (IP8TPE72)
- ❖ POWDER METALLURGY & CERAMICS (IP8TPE73)
- ❖ MAJOR PROJECT (IP8LPS02)
- ❖ COMPREHENSIVE VIVA (IP8LPC01)

विभागाध्यक्ष/Head
औद्योगिक एवं उत्पादन अभियांत्रिकी
Industrial & Production Engineering
प्रौद्योगिकी संस्थान/Engineering & Technology
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD

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Department of Industrial and Production Engineering

School of Studies of Engineering & Technology

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Minutes of Meeting of BoS

The scheduled meeting of member of Board of Studies (BoS) of Department of Industrial and Production Engineering, School of Studies of Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur was held to design and discuss the B. Tech. Final year (VII and VIII semesters) scheme and syllabi on Sept 25, 2018 at CAD lab (G11) Room for the Academic Year 2018-19

The following members were present in the meeting:
1. Mrs. Arpita Roy Choudhary (HOD, Assistant Prof., Dept. of Industrial and Production Engineering-cum Chairman, BOS)
2. Prof. Mukesh Kumar Singh (Member BoS, Professor, Dept. of Industrial and Production Engineering)
3. Mr. C.P. Dewangan (Member BoS, Associate Professor, Dept. of Industrial and Production Engineering)
4. Dr. Rajesh Kumar Bhushan (Invited Member, HOD, Dept. of Mechanical Engineering)

In the meeting, the members of BOS, Department of IP, discussed at length and the decision obtained via mail from external members Mr. Dalbir Singh Rekhi (Member BoS Industry Expert, J.S.P.L. Raigarh CG.) *"The course contains for the semester seems Ok and recommended it as proposed by the team"* and from Prof. B.S. Chawla (External Expert Member BoS, Principal GEC Bilaspur) *"It's OK approved"* are taken into account.

Following points were discussed during the meeting
    In the meeting syllabus and scheme of B.Tech. (Industrial and Production Engineering) Ist and IInd Semester have been approved by the B.O.S. member.

The following new courses were introduced in the of B. Tech. First year (I and II Semesters):

- ❖ MATHEMATICS-II (IP01TBS01)
- ❖ CHEMISTRY (IP01TBS02)
- ❖ PROGRAMMING FOR PROBLEM SOLVING (IP01TES01)
- ❖ ENGINEERING MECHANICS (IP01TES02)
- ❖ CHEMISTRY LAB (IP01PBS01)
- ❖ PROGRAMMING FOR PROBLEM SOLVING LAB (IP01PES01)
- ❖ WORKSHOP AND MANUFACTURING PRACTICES (IP01PES02)
- ❖ ENGINEERING MECHANICS LAB (IP01PES02)
- ❖ INDUCTION TRAINING PROGRAMME (IP01PMC01)
- ❖ PHYSICS(IP02TBS03)
- ❖ BASIC ELECTRICAL ENGINEERING(IP02TES03)
- ❖ MATHEMATICS-I(IP02TBS04)

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❖ ENGLISH(IP02THS01)
❖ ENVIRONMENTAL SCIENCES(IP02THS02)
❖ PHYSICS LAB(IP02PBS02)
❖ BASIC ELECTRICAL ENGINEERING LAB(IP02PES04)
❖ ENGINEERING GRAPHICS AND DESIGN(IP02PES05)

विभागाध्यक्ष/Head
औद्योगिक एवं उत्पादन अभियांत्रिकी
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Signature & Seal of HoD

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Scheme and Syllabus

INSTITUTE OF TECHNOLOGY (SCHOOL OF ENGINEERIRNG & TECHNOLOGY)
GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)
DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING
C.B.C.S. STUDY & EVALUATION SCHEME
W.E.F. SESSION 2018-2019
Year: B. Tech. IV year

SEMESTER-VII

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP7TPC51	Principles of Management	4	0	0	40	60	100	4
2	IP7TPC52	Production Planning and Control	3	1	0	40	60	100	4
3	IP7TPC53	CAD /CAM	3	1	0	40	60	100	4
4	IP7TOE3..	Elective-OE3	3	0	0	40	60	100	3
5	IP7TPE6..	Elective-PE6	3	0	0	40	60	100	3
	Total		16	2	0	200	300	500	18
PRACTICALS									
6.	IP7LPC53	CAD/CAM lab	-	-	3	30	20	50	2
7.	IP7LPC54	Seminar on Summer Training (About 30 Days)**	-	-	3	50	-	50	2
8.	IP7LPC55	Minor Project	-	-	4	50	-	50	2
	Total		-		10	130	20	150	6
	Grand Total		16	2	10	330	320	650	24

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Head of Department
Industrial & Production Engg.
Institute of Technology
G.G.V.V. Koni, Bilaspur (C. G.)

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Elective- Open Elective (OE)-3		Elective- Professional Elective (PE)-6	
S.N.	IP7-TOE3..	S.N.	IP7-TPE6..
31	Product Design & Development	61	Machine Tool Design
32	Entrepreneurship Development	62	Refrigeration And Air Conditioning
33	Strategic Management	63	Composites Materials & Technology

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TPC51	Principal of Management	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

PRINCIPLES OF MANAGEMENT

UNIT-I

Definition of management, science or art, manager vs 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.

UNIT-II

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes.

UNIT-III

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.

UNIT-IV

Directing, individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT-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.

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Text Books

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed., 2009.

2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education, 2004.

3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill, 1999.

4. Essential of management, Koontz & O'Donnel, McGraw-Hill.

5. Organizational Behavior, Stephen P. Robbins, PHI.

6. Organization and Management, Agrawal R.D, TMH.Principles of Management, Terry & Francklin, Richard – Frwin

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TPC52	Production Planning And Control	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

PRODUCTION PLANNING AND CONTROL

UNIT - I

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.

UNIT - 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.

UNIT - 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.

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UNIT - IV

Types of layout- layouts design procedure such as CORELAP, CRAFT etc., Material handling system & their classification, principles. JIT & KANBAN. Depreciation & methods of depreciation.

UNIT-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 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 Lawrence.P.Atkin, James B. Dilworth Tata Mc Graw Hill

8. Production and Operations management, R.B Khanna, PHI.

9. Production operations management S.N.Buffa, PHI.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TPC53	Computer Aided Design And Manufacturing (CAD/CAM)	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

COMPUTER AIDED DESIGN AND MANUFACTURING (CAD/CAM)

UNIT-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, OpenGL, Data exchange standards- IGES, STEP, CALS etc, Communication standards. Standards for vexchange images.

UNIT- 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 modelling, Plane surface, Rule surface, Surface of revolution and sweep, Coons and bi-cubic patches, concept of Bezier and B-spline surfaces, Basic concept of solid modelling technique, CSG and B-rep method for solid generation.

UNIT – III

Geometric Transformation: Computer Aided Design (CAD) methodology, Coordinate systems, Theory and applications, 2D and 3D geometric transformation, Homogeneous transformation, Concatenation, Assembly modelling, interferences of positions and orientation, tolerance analysis, mass property calculations, Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, computer animation, Concurrent Engineering,

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गुरु घासीदास विश्वविद्यालय
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UNIT – 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.

UNIT- 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 Books

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

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TOE..31	Product Design & Development	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

PRODUCT DESIGN & DEVELOPMENT

UNIT-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.

UNIT-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.

Industrial Designer: Problems, procedure for adoption, types of models. Role of aesthetics in product design, functional design practice.

UNIT-III

New products Idea generation: modification. Product variants: adding, dropping. Formal testing: new products, concept, product testing, market tests, evaluation, adoption, expansion and forecasting.

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.

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UNIT - 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.

UNIT –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 Books

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

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7TOE...32	Entrepreneurship Development	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ENTREPRENEURSHIP DEVELOPMENT

UNIT- I

Entrepreneurship Concepts: Concepts of entrepreneurship, Characteristics of successful entrepreneurs, Functions of entrepreneurs, Types of entrepreneurs, Distinction between entrepreneur and manager, Growth of entrepreneurship in India and role of entrepreneurship in economic development

Types of entrepreneurship: Women entrepreneurship, Rural entrepreneurship, Tourism entrepreneurship, Agripreneurship, social entrepreneurship & family business – Factors affecting entrepreneurship growth.

UNIT- II

Entrepreneurship Development: Entrepreneurship development programmes Objectives, contents and evaluation. Small Enterprises: Micro and macro units, scope of micro and small enterprises and their role in economic development – problems of micro and small enterprises – promotional packages.

Types of Business Organization: Sole proprietorship, partnership joint stock company, cooperative organization, public sector organization.

UNIT- III

Opportunity / Product Identification: Business opportunities in various sectors, identification of business. Opportunity- idea generation and opportunity selection. Steps in setting up of small business enterprises. Formulation of business plans and project appraisal. Contents of business plans, significance and formulation.

Guide lines for formulating project reports: Methods of project appraisal –economic, financial, market analysis, technical feasibility and managerial competency environmental clearance.

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UNIT- IV

Financing of Enterprise Source of finance: internal and external sources, capitalization, term loans- short term finance, venture capital, export finance. Institutional finance- commercial banks, other financial institution, institutional support.

Support Institutions: National small industries, corporation ltd, small industries development organization, small scale industry board, state small industry development organization, small industries service institutes, direct industry centre, technical consultancy organizations

Government policy and taxation: Benefits to small scale industry, tax benefits, incentives and concession for small scale industries. Government policies for small scale enterprises and industrial policy resolutions.

UNIT- V

Start-up Business: Why start a business, key consideration, start-up a process, presentation to investors, company considerations, equity considerations, key factors for success.

Government strategies: Growth of enterprises, Objectives of growth, stages and types of growth-Expansion diversification, joint venture, mergers and acquisitions, sub-contracting and financing.

Sickness in small industries: Meaning of industrial sickness, signals and symptoms of industrial sickness, causes and consequences, corrective measures to curb sickness, government policies on revival of sick units.

E-commerce: Basic concepts, advantages and disadvantages.

Text Books

1. Entrepreneurship, Roy, Rajiv, Univ. Press.
2. Entrepreneurship,/ Hisrich, McGraw Hill
3. Entrepreneurship Development, Kumar, New- Age.
4. Entrepreneurship Development, Kaulgud, Thomson Learning.
5. Entrepreneurship: Theory & Practices, Saini, Wheeler.
6. Entrepreneurship Development, Dr. S.S. Khanka S. Chand.

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Dalbir Singh Relah
24/02/18

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TOE…33	Strategic Management	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

STRATEGIC MANAGEMENT

UNIT- I

Strategy and Process - Conceptual framework for strategic management, the Concept of Strategy and the Strategy Formation Process – Stakeholders in business –Vision, Mission and Purpose– Business definition, Objectives and Goals – Corporate Governance and Social responsibility-case study.

UNIT- II

Competitive Advantage - External Environment - Porter's Five Forces Model-Strategic Groups Competitive Changes during Industry Evolution- Globalization and Industry Structure - National Context and Competitive advantage Resources-Capabilities and competencies–core competencies-Low cost and differentiation Generic Building Blocks of Competitive Advantage- Distinctive Competencies-Resources and Capabilities durability of competitive Advantage- Avoiding failures and sustaining competitive advantage-Case study.

UNIT- III

Strategies - The generic strategic alternatives, Stability, Expansion, Retrenchment and Combination Business level strategy, Strategy in the Global Environment, Corporate Strategy, Vertical Integration-Diversification and Strategic Alliances, Building and Restructuring the corporation- Strategic analysis and choice - Environmental Threat and Opportunity Profile (ETOP), Organizational Capability Profile Strategic Advantage Profile, Corporate Portfolio Analysis, SWOT Analysis, GAP Analysis, Mc Kinsey's 7s Framework, GE 9 Cell Model, Distinctive competitiveness, Selection of matrix, Alance Score Card-case study.

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UNIT- IV

Strategy Implementation & Evaluation - The implementation process, Resource allocation, designing organizational structure-Designing Strategic Control Systems, Matching structure and control to strategy-Implementing Strategic change-Politics-Power and Conflict, Techniques of strategic evaluation & control-case study.

UNIT- V

Other Strategic Issues - Managing Technology and Innovation, Strategic issues for Non Profit organizations. New Business Models and strategies for Internet Economy-case study

Text Books

1. Thomas L. Wheelen, J.David Hunger and Krish Rangarajan, Strategic Management andBusiness policy, Pearson Education., 11th edition, 2007.

2. Charles W.L.Hill & Gareth R.Jones, Strategic Management Theory, An Integrated approach, Biztantra, Wiley India,6th edition, 2007.

3. Azhar Kazmi, Strategic Management & Business Policy, Tata McGraw Hill, Third Edition,

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TPE...61	Machine Tool Design	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

MACHINE TOOL DESIGN

UNIT - I

Introduction to machine tool design and mechanism: definitions, classification and general; requirement of machine tool, working and auxiliary motions in machine tools, parameters defining working motion of a machine tools, layout of machine tools.

Regulation of speed and feed rates: objective of speed and feed rate regulation, design of speed box, general recommendation for developing the gearing diagram, determining the number of teeth of gear boxes, mechanical step less regulation of speed and feed rates.

UNIT- II

Design of machine tool structures: function of machine tool structures and their requirement, design criteria for machine tool structures, material of machine tool structures, static and dynamic stiffness, profile of machine tool structures, basic design procedure of machine tool structures, design of bed.

UNIT - III

Design of guide ways and power screws: function and types of guide ways, design of slide ways, design criteria and calculation for slide ways, guide ways operating under liquid friction conditions. Design of aerostatic slide ways, design of anti-friction guide ways, design of power screws.

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UNIT - IV

Design of spindles and spindle supports: function of spindle unit and requirements, material of spindles, effects of machine tool compliance on machining accuracy, design calculation of spindles, design of jigs and fixtures: principle of jigs and fixtures design, locating and clamping, jig bushes, drilling jigs.

UNIT - V

Press work die design: Classification of presses and dies, cutting action in dies, clearances and cutting forces, shear, center of pressure, method of mounting punches,   design of blanking **dies**, drawing die design.

Text Books

1. Machine Tool Design by NK Mehta Tata Mcgraw Publication.

2. Basu, S.K., Design of Machine tool, Allied Publishers, New Delhi.

3. Koenigsberger, F., Design Principles of Metal cutting machine Tools, pergamon Press, Oxford, 1964.

4. Push, V.E., Design of Machine Tools, Mashinostroenie Publishers, Moscow, 1977.

5. Machine Tool Design, vols. I-IV, Mir Publishers, Moscow, 1968.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP7-TPE…62	Refrigeration & Air Conditioning	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

REFRIGERATION & AIR CONDITIONING

UNIT – I

Carnot Refrigerator & Heat pump: air refrigeration systems, bell Coleman air refrigeration cycle. Air craft system & its performance.

Vapour compression refrigeration: simple cycle, t-s and p-h charts analysis of vapor compression cycle, factors effecting performance of vapor compression cycle, actual vapour compression cycle, multi stage compression system.

UNIT – II

Vapour absorption refrigeration systems: description of system components, aqua ammonia and water lithium bromide systems. Its analysis & advantages over vapour compression system.

Refrigeration equipment: constructional details, capacity, control and performance of compressors, condensers, evaporators, expansion devices, thermostatic expansion valve.

UNIT – III

Production of low temperature - cascade system, Joule Thomson effect & liquefaction of gases, liquefaction of hydrogen & helium, application of cryogenics.

Nonconventional refrigeration system-thermo-electric refrigeration, vortex tube, steam jet refrigeration system.

Refrigerants: classification, properties & selection of refrigerants.

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UNIT – IV

Psychometrics: Psychrometry and psychometric properties, psychometric relations, psychometric chart and its use, psychometrics processes, human comfort, factors affecting comfort, comfort chart.

Requirements of comfort air conditioning: thermodynamics of human body, comfort chart, factors **governing** optimum effective temperature.

Cooling load calculations & design of a.c. system- different heat sources, design of air conditioning system, bypass factors, effective sensible heat factor, cooling coils.

UNIT – V

Fluid flow, duct design & air distribution system- various losses in fluid flow, different methods of duct design & arrangement system, air distribution system & ventilation system.

Automotive air conditioning: system location and layout, components, system maintenance. Car, Railway air conditioning & marine air conditioning.

Text Books

1. Refrigeration and Air Conditioning C. P. Arora - TMH.

2. Refrigeration and Air Conditioning – Manohar Prasad – New-Age International Pub

3. Refrigeration and Air Conditioning – Arora & Domkundwar – Dhanpat Rai & Sons

4. Refrigeration and Air Conditioning – P.L. Ballaney – Khanna Pub.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VII Sem.	IP8PET…63	Composite Materials and Technology	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

COMPOSITE MATERIALS AND TECHNOLOGY

UNIT – I

Introduction to Composites Definitions. Typical reinforcements and matrices. Typical properties of fibre 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. Fibre strengthening; fibre flaws, critical length, critical volume fraction. Natural composites (wood, bone, etc.)

UNIT – II

Fibres Manufacturing methods: Physical and chemical characteristics. Mechanical and other properties of commonly used fibres - carbon, glass, aramid and other organics, ceramics. Fibre coating to achieve compatibility with matrix. Use of statistical methods to characterize fibre behaviour. Naturally-occurring (cellulose) fibres. Whisker, typical properties, Manufacturing methods.

UNIT – 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, RRIM, filament winding, pultrusion, centrifugal casting, autoclave, prepreg and other "starting" materials, etc. Machine methods for manufacture of composites .Cutting, drilling and other finishing operations

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UNIT – IV

Engineering properties Stiffness and Strength: Geometrical aspects, volume and weight fraction. Unidirectional continuous fibre systems; stiffness and strength. Discontinuous fibres. Short fibre systems; length and orientation distributions. Woven reinforcements. Hybrids. Failure theories for unidirectional lamina. Micro   mechanics theories.

UNIT – V

Mechanical Testing Determination of stiffness and strengths 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 Books

1. Introduction to Composite Materials Design: Ever J Barbero Taylor and Francis.
2. Mechanics of Composite Materials: Robert Jones Second Edition 1999 Taylor and Francis.
3. Composites and Processing Methods: Ed. Venkatesan Narosa Publications.

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Industrial & Production Engg.
Institute of Technology
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GURU GHASIDAS VISHWAVIDHALAYA
(A CENTRAL UNIVERSITY ESTABLISHED BY THE CENTRAL UNIVERSITY ORDINANCE 2009, NO: 3 OF 2009)
DEPARTMENT OF INDUSTRIAL &PRODUCTION ENGINEERING
STUDY & EVALUATION SCHEME
W.E.F. SESSION 2018-2019
Year: B.Tech. IV year

SEMESTER-VIII

S. No.	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP8TPC61	Operation Research	3	1	0	40	60	100	4
2	IP8TPC62	Marketing Management	4	0	0	40	60	100	4
3	IP8TPE7…	Elective-PE7	4	0	0	40	60	100	4
4	IP8TOE4…	Elective-OE4	4	0	0	40	60	100	4
		Total	15	1	0	160	240	400	16
PRACTICALS									
6.	IP8LPS02	Project	-	-	12	120	80	200	6
7.	IP8LPC01	Comprehensive Viva	-	-	-	-	50	50	2
		Total	-	-	12	120	130	250	8
		Grand Total	15	1	12	280	370	650	24

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Elective- Open Elective (OE)-4		Elective- Professional Elective (PE)-7	
S.N.	IP8-OET…	S.N.	IP8-PET…
41	Supply Chain Management	71	Fluid Power Control
42	Safety Management And Labour Law.	72	Robotics and Robot Applications
43	Finite Element Method	73	Powder Metallurgy & Ceramics.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-TPC61	Operation Research	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

OPERATION RESEARCH

UNIT -I

Introduction to linear programming, graphically solution to linear programming problem, solving linear problem by simplex method, optimization problem, maximization & minimization function with or without constraints, sack surplus & artificial, variable method, degeneracy problem

UNIT- II

Mathematical statement of the transportation problem, the transportation model, method for basic feasible solution, Degeneracy & unbalance problem , Mathematical statement of the assignment problem, solution of assignment problem ,traveling sales-man problem.

UNIT-III

Game theory: rule of game, Method of solving game , graphically & Arithmetic , saddle point & without saddle point , dominance method, mixed strategies 2 X 2game , 2 X N game , M X 2 game , 3 X 3game (Method of matrix's, method of linear programming etc).

Inventory: Introduction, classification, function, level, control techniques, models, various costs associated, EOQ, optimum lot sizing.

UNIT- IV

Introduction of queuing theory ,elements of queuing system ,operating characteristics of a queuing system ,Poisson arrivals & exponential service time , waiting time & idle time cost, single channel queuing theory.

Replacement problems, requirement policy, replacement of items, machinery various themes, group replacement policy, MAPI methods

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UNIT- V

Network analysis, Introduction of PERT & CPM, computation of PERT, Time estimation , measure of deviation & variation , probability of completing project , Arrow diagram & critical path method , Scheduling , cost analysis & crushing of network.

Text Books

1. Sharma & S D Kedarnath - Operation Reasearch, Ramnath & Co Meerut

2. Operation Research, Sasien Yaspan

3. Operation Research – N. D. Vohra – TMH Publication

4. Operation Research– Hira & Gupta – S. Chand & Co.

5. Operation Research – H. Gillette – TMH, New Delhi

6. Operations Research – M. Taha – TMH, New Delhi

7. Operations Research – Phillip Ravindran- Wiley Publications

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-TPC62	Marketing Management	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

MARKETING MANAGEMENT

UNIT- I

Introduction to marketing management: what is marketing? The core concept, need, wants, demands, product, value cost its functions.

Marketing management: Production concept, product concept, and selling, marketing concept, role of marketing in modern organization, marketing philosophies.

UNIT- II

The nature of high performance business: corporate and division strategic planning, business strategic planning, marketing process. Analyzing consumer markets & buying behavior.

UNIT- III

The product life cycle: conditions and strategies in different phases. Marketing strategies through PLC.

New Product Decisions: Definitions and factors contributing to new production development, new product development process.

UNIT-IV

Deciding on the marketing Program: Product, promotion, pricing, place (Distribution Channel), Managing Advertising, Sales promotion, & public relation, developing & managing development program, sales promotion, public relation.

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UNIT- V

Managing retailing whole selling and logistic- types of retailers and levels of services, trends in retailing, types of whole selling, market logistics.

The role of marketing communication: communication process model and developing effective e communication, characteristics of marketing communication mix, factors in setting the communication mix.

Text Books

1. Product Design and Manufacturing, Chitale & Gupta, PHI.
2. Marketing Management, Philip Kotler PHI Publication

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-OET…41	Supply Chain Management	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

SUPPLY CHAIN MANAGEMENT

UNIT- I

Building a Strategic Framework to Analyze Supply Chains: What Is a Supply Chain? The Objective of a Supply Chain ,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.

UNIT- 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, The 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 ,AM Tires: Evaluation of Supply, Chain Design Decisions Under Uncertainty ,Risk Management and Network Design 175,Making Supply Chain Decisions Under Uncertainty in Practice

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(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
कोनी, बिलासपुर – 495009 (छ.ग.)

Guru Ghasidas Vishwavidyalaya
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Koni, Bilaspur – 495009 (C.G.)

UNIT- 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 Forecast1ng ,Time-Series Forecasting Methods, Measures of Forecast Error ,Forecasting Demand at Tahoe Salt ,The Role of IT in Forecasting, Risk Management in Forecasting ,Forecasting in Practice.

Aggregate Planning in a Supply Chain: The Role of Aggregate Planning in a Supply Chain, the Aggregate Planning Problem, Aggregate Planning Strategies, Aggregate Planning Using Linear Programming, Aggregate Planning in Excel. The 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.

UNIT- 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 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 Multiechelon Supply Chain ,The 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 Levels of Product Availability in Practice

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UNIT- 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-Offs in Transportation Design, Tailored Transportation, The 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- 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, The Role of IT in Sourcing, Risk Management   in Sourcing, Making Sourcing Decisions in Practice.

Text Book

1. Supply Chain Management: Janat Shah, Pearson Publications 2010.
2. Supply Chain Management: Sunil Chopra and Mein del, Fourth Edition, PHI 2010.
3. Supply Chain Management: A.S.Altekar PHI Second Ed.2006.
4. Logistics Management: James Stock and Douglas Lambert. McGraw Hill International Ed.2006.
5. Supply Chain Management for Global Competitiveness :Ed.B.S.Sahay McMillan Publication 2000
6. Emerging Trends in Supply Chain Management: Ed.B.S.Sahay McMillan Publication 2000.
7. Logistics Management: Bowersox TMH 2004.

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-OET…42	Safety Management And Labour Law	4	-	-	4	Max Marks-60 Min Marks- Duration-3Hrs

SAFETY MANAGEMENT AND LABOUR LAW

UNIT –I

Safety Management: Concepts Evolution of modern safety concept- Safety policy - Safety 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

UNIT -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_2 – Absorption in fixed blades- Breakthrough. Removal of HCs / VOCs – NOx removal – Wet scrubbers.

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

UNIT –III

Safety in Metal Working Machinery and Wood Working Machines: General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning 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.

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UNIT -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 watchers 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.

UNIT -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_2) and halons-hazards in LPG, ammonia (NH_3), Sulphur dioxide (SO_2), chlorine (CL_2) etc.

Text Book

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

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-OET…43	Finite Element Method	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

FINITE ELEMENT METHOD (FEM)

UNIT-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 equations, techniques of saving computer memory requirements, Finite element formulation.

UNIT-II

Natural Coordinate systems and Shape function: Basic concept of natural coordinate, 1-D and 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.

UNIT- 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.

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UNIT- 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.

UNIT- 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 Books:

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

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-PET…71	Fluid Power Control	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

FLUID POWER CONTROL

UNIT –I

Introduction –what is fluid power, application of fluid power, component of fluid power system. Force pressure and head .Specific weight, density specific gravity, bulk modules, viscosity, viscosity index.

Energy and Power in Hydraulic System: Pascal's law, continuity equation, conservation of energy, hydraulic power, Bernoulli's equation, Torricelli's theorem, the siphon. Energy power and flow rate in the SI units.

UNIT –II

Hydraulic pumps- introduction pumping theory, pumps classification, gear pump, vane pump, piston pump, pump Performance, pump Noise, pump selection , pump performance rating in SI unit.

Hydraulic Cylinders and cushioning-Introduction, Hydraulic Cylinders operating features, Cylinders mounting and mechanical linkage. Cylinder loads due to moving weights, special cylinder designs, cylinder loading thought mechanical linkage, hydraulic cylinder cushions, and hydraulic shock absorber.

UNIT –III

Hydraulic motors: Introduction, limited rotation Hydraulic motors, gear motors, vane motors, Hydraulic motors theoretical torque, power and flow rate, Hydraulic motors performance, Hydraulic transmission, Hydraulic motors performance in metric unit.

Hydraulic valve: Hydraulic components -pressure-flow-direction controls valves –proportional, servo, cartridge (logic) valves. Hydraulic fuses

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UNIT –IV

Hydraulic Conductor and Fittings: Introduction, conductor sizing for flow rate requirement, pressure rating of conductors, steel pipes, steel tubing, plastic tubing, flexible hoses, quick disconnect couplings, metric steel tubing .

Hydraulic Circuit Design and Analysis: Introduction, control of single and double acting hydraulic cylinder, pump hydraulic system, circuit, valve application, speed control of motor and cylinder, motor braking system, analysis of hydraulic system

UNIT –V

Pneumatics: Air preparation & components: Introduction, compressor, fluid conditioner, analysis of moisture removal from air, air control valves, Pneumatic actuators.

Pneumatic circuits and applications: design consideration, pressure losses in pipe lines, circuits, vacuum system, analysis

Text books

1. Fluid power with application by Anthony Esposito by PHI publication
2. Oil hydraulic system by Majumdar by TMC publication

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-PET…72	Robotics and Robot Applications	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

ROBOTICS AND ROBOT APPLICATIONS

UNIT – 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.

UNIT – 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.

UNIT – 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.

UNIT – 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.

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UNIT – 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 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.Gonzalex, C.S.G.Lee- McGrew Hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co
6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall
7. Kinematics and Dynamics of Machinary - J.Hirchhorn - McGrew HillBook Company

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Category of Course	Course Code	Course Title	Periods/Week				Theory Paper
			L	T	P	C	
Industrial & Production Engg. B. TECH- VIII Sem	IP8-PET…73	Powder Metallurgy and Ceramics	3	1	-	4	Max Marks-60 Min Marks- Duration-3Hrs

POWDER METALLURGY AND CERAMICS

UNIT – I

Introduction: Steps In powder metallurgy, advantage application limitation and recent trends.

Powder production methods and Properties: Metal production methods: Aromatization, Mechanical (Milling), Electro deposition, Spray drying. Powder Treatment- Screening, cleaning, annealing, and lubrication. Powder treatment and handling , coating and pyrophoracity, toxicity

UNIT – II

Characterization of metal powder: Sampling of metal powder, particle size and size distribution. Particle shape analysis, surface area, density and porosity, apparent density, tap density.

Compaction and shaping: powder pressing, compaction method, classification of parts. Cold Iso-static compaction, powder rolling. High temperature compaction – principle of pressure sintering

UNIT – III

Sintering and consolidation: Sintering, types of Sintering, theory of Sintering, Sintering of multi components, effect of Sintering, porosity in Sintered part, Sintering atmosphere, Sintering furnaces, metallographic of Sintering parts.

PM Products and their Applications: Electrical and magnetic applications (Resistance welding electrode, Metal graphite brushes, Tungsten etc),PM porous parts, PM Friction materials, Metal bearings, Dispersions strengthened materials ,Cutting tool materials, Cemented carbides and tools, cermet.

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UNIT – IV

Ceramics- Introduction and major applications, Nature and structure of ceramics, types and general characteristics of ceramics- oxide ceramics, carbides, nitrides, silica, glasses, graphite and diamond.

UNIT – V

Advance powder metallurgical process   technique- atomization and its types , process parameters and characteristics, mechanical alloying , process types and parameter , metal injection molding , steps, requirement, design application and defect .

Microwave sintering of metals - Applications in electrical and electronics including high temperature superconductors, frictional ceramics, refractory, Fabrication methods of ceramics.

Text Books:

1. Powder metallurgy by P.C.angelo, R. subramanian by PHI publication
2. Fundamentals of Powder Metallurgy :G.S.Upadhaya Cambridge International Science Publishing 1998
3. Fundamentals Principles of Powder Metallurgy : W.B.Jones Edward Arnold Publishing
4. First Course in Powder Metallurgy: Henry Hauser Chemicals Publishing Company
5. Handbook Of Powder Metallurgy : Hausner H.H and Mal M.K. Second Edition , Chemicals Publishing Company
6. Metals Handbook Vol.7 Powder Metallurgy : ASM 1998

Head of Department
Industrial & Production Engg.
Institute of Technology
G.G.V.V. Koni, Bilaspur (C. G.)

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SCHEME OF EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
FIRST YEAR , INDUSTRIAL PRODUCTION ENGINEERING
SEMESTER I (COURSE-B)
EFFECTIVE FROM SESSION 2018-19

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	IP01TBS01	MATHEMATICS-II	3	1	0	30	70	100	4
2	IP01TBS02	CHEMISTRY	3	1	0	30	70	100	4
3	IP01TES01	PROGRAMMING FOR PROBLEM SOLVING	3	0	0	30	70	100	3
4	IP01TES02	ENGINEERING MECHANICS	3	0	0	30	70	100	3
PRACTICAL									
1	IP01PBS01	CHEMISTRY LAB	0	0	3	30	20	50	1.5
2	IP01PES01	PROGRAMMING FOR PROBLEM SOLVING LAB	0	0	3	30	20	50	1.5
3	IP01PES02	WORKSHOP & MANUFACTURING PRACTICES	1	0	3	30	20	50	2.5
4	IP01PES03	ENGINEERING MECHANICS LAB	0	0	2	30	20	50	1
5	IP01PMC01	INDUCTION TRAINING PROGRAMME	-	-	2	-	-	-	-
								TOTAL	20.5

IA – INTERNAL ASSESSMENT   ESE – END SEMESTER EXAM.   L- LECTURE
T-TUTORIAL   P-PRACTICAL

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\multicolumn{10}{c}{**SCHEME OF EXAMINATION**}									

SCHEME OF EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
FIRST YEAR , INDUSTRIAL PRODUCTION ENGINEERING
SEMESTER II (COURSE-A)
EFFECTIVE FROM SESSION 2018-19

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	IP02TBS03	PHYSICS	3	1	0	30	70	100	4
2	IP02TES03	BASIC ELECTRICAL ENGINEERING	3	1	0	30	70	100	4
3	IP02TBS04	MATHEMATICS-I	3	1	0	30	70	100	4
4	IP02THS01	ENGLISH	3	0	0	30	70	100	3
5	IP02THS02	ENVIRONMENTAL SCIENCES	3	0	0	...	...	..	0
PRACTICAL									
1	IP02PBS02	PHYSICS LAB	0	0	3	30	20	50	1.5
2	IP02PES04	BASIC ELECTRICAL ENGINEERING LAB	0	0	2	30	20	50	1
3	IP02PES05	ENGINEERING GRAPHICS & DESIGN	1	0	3	30	20	50	2.5
								TOTAL	20

IA – INTERNAL ASSESSMENT   ESE – END SEMESTER EXAM.   L- LECTURE
T-TUTORIAL   P-PRACTICAL

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Subject code/SUBJECT	L	T	P	Credit
IP01TBS01/MATHEMATICS-II	3	1	0	4

Module 5a: First order ordinary differential equations(6 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 5b: Ordinary differential equations of higher orders (Prerequisite 2c, 4a) (8 hours)

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 5c: Partial Differential Equations–First order(Prerequisite 5a-b) (6 hours)

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Module 5d: Partial Differential Equations- Higher order(Prerequisite 5b-c) (10 hours)

Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006.

2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.

3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.

6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

7. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.

8. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.

9. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.

10. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010

11.Denian murry,defferential equations ,oxford publications

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SUBJECT CODE/NAME	L	T	P	Credit
IP01TBS02/CHEMISTRY	3	1	0	4

Unit-I **Concept of Quantum Energy and Spectroscopy:** Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fiesher rules for calculating λ_{max} of conjugated dienes & α,β-unsaturated carbonyl compound, various shifts in λ_{max} and intensities. Infra Red Spectroscopy: Conditions for Infra Red Spectroscopy, Molecular vibrations & factors affecting Infra Red frequencies. **[8 L]**

Unit-II **Chemical Bonding in Molecules:** Introduction of chemical bonding, VSEPER Theory, V.B.Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions. **[16 L]**

Unit-III Concept of Chirality, Enentiomers, Diastereomers,Meso-compounds and Recimic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and Cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Center of symmetry, Absolute and Relative Configuration (R &S, D & L and E & Z). **[8 L]**

Unit-IV Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions. **[12 L]**

Unit-V Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction involving Addition, Elimination, Substitution and Ring opening and Cyclization. **[16 L]**

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Subject code/NAME	L	T	P	Credit
IP01TES01/PROGRAMMING FOR PROBLEM SOLVING	3	0	0	3

Unit 1
Introduction to Programming (3 lectures)
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) -
Idea of Algorithm (3 lectures): steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit 2
Arithmetic expressions and precedence (12 lectures)
Conditional Branching and Loops
Writing and evaluation of conditionals and consequent branching
Iteration and loops
Arrays (6 lectures) Arrays (1-D, 2-D), Character arrays and strings

Unit 3
Basic Algorithms (6 lectures)
Searching ,concept of binary search etc , Basic Sorting Algorithms Bubble sort etc,Finding roots of equations, introduction of Algorithm complexity

Unit 4
Function (5 lectures)
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference binary search etc
Recursion functions (5 lectures) Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, etc.

Unit 5
Structure (4 lectures)
Structures, Defining structures and Array of Structures
Pointers (3 lectures) Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Suggested Text Books
    (i)   Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
    (ii)   E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
Suggested Reference Books
    (i)   Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP01TES02/ENGINEERING MECHANICS	3	0	0	3

ENGINEERING MECHANICS

UNIT-I
Introduction to Engineering Mechanics covering, Force SystemsBasic concepts,Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar,Concurrent Forces, Components in Space–Resultant- Moment of Forces and its Application;Couples and Resultant of Force System, Equilibrium of System of Forces, Free bodydiagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT-II
Friction covering, Types of friction, Limiting friction, Laws of Friction, Staticand Dynamic Friction; Motion of Bodies.
Basic Structural Analysis covering, Equilibrium in three dimensions; Method ofSections; Method of Joints; Simple Trusses; Zero force members.

UNIT-III
Centroid and Centre of Gravity covering, Centroid of simple figures from firstprinciple, centroid of composite sections; Centre of Gravity and its implications; Areamoment of inertia- Definition, Moment of inertia of plane sections from first principles,Theorems of moment of inertia, Moment of inertia of standard sections and compositesections.

UNIT-IV
Virtual Work and Energy Method- Virtual displacements, principle of virtualwork for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, mechanical efficiency.
Review of particle dynamics- Rectilinear motion; Newton's 2nd law (rectangular and path). Work-kinetic energy,power, potential energy.Impulse-momentum; Impact (Direct and oblique).

UNIT-V
Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principlesin dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simpleproblems; D'Alembert's principle and its applications in plane motion and connected bodies;Work energy principle and its application in plane motion of connected bodies; Kinetics ofrigid body rotation;

Text/Reference Books:
1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II,–Dynamics, 9th Ed, Tata McGraw Hill
3. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
4. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
5. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
6. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
7. Tayal A.K. (2010), Engineering Mechanics, Umesh Publication

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP01PBS01/CHEMISTRY LAB	0	0	3	1.5

List of Experiments:

Group – A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.

2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO4 solution as an intermediate.

3. To determine the concentration of hypo solution ($Na_2S_2O_3.5H_2O$) iodimetrically with given Iodine (N/50) solution.

4. Find out the Temporary hardness of given water sample using 0.01M EDTA solution, buffer solution (pH-10) and EBT as an indicator.

5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group – B:

6. Preparation of Urea Formaldehyde resin.
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of Dibenzalpropanone.
9. [4+2] Cycloaddition Reaction: Diels-Alder reaction.
10. Preparation of Asprin and calculate its yield.

Group – C:

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic ions by paper chromatography.
13. To determine the surface tension of a liquid by stalagmometer.
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer.

Note: At least two Experiments from each group must be performed.

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SUBJECT CODE/NAME	L	T	P	Credit
IP01PES01/PROGRAMMING FOR PROBLEM SOLVING LAB	0	0	3	1.5

[The laboratory should be preceded or followed by a tutorial to explain the approach or
algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

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SUBJECT CODE/NAME	L	T	P	Credit
IP01PES02/ WORKSHOP & MANUFACTURING PRACTICES	1	0	3	2.5

Lectures & videos 10 hours)

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4Th edition, Pearson Education India Edition, 2002.
(iii) Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology–I" Pearson Education, 2008.
(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP01PES03/ENGINEERING MECHANICS LAB	0	0	2	1

Engineering Mechanics - Lab

List of Experiments

1. Verification of law of parallelogram of forces.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces by universal force table.
4. Verification of law of moment by parallel forces apparatus.
5. Practical verification of forces in the member of jib crane.
6. Practical verification of forces in the member of the truss.
7. Determination of coefficient of friction between two given surfaces by inclined plane method.
8. Determination of efficiency of simple screw jack.
9. Determination of efficiency of single purchase winch crab.
10. Determination of efficiency of double purchase winch crab.
11. Determination of efficiency of simple wheel and axle.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP02TBS03/PHYSICS	3	1	0	4

Unit - 1: Optics: Interference and Diffraction
Introduction, Young's experiment, theory of interference, Coherent and non-coherent sources, Fresnel's Bi-prism and Newton's ring experiment.
Diffraction of light, Fresnel and Fraunhofer's diffraction, diffraction due to plane diffraction grating.

Unit - 2: Electromagnetic Theory
Coulomb's law, electrostatics field and potential, electric flux, Gauss' law, Poisson's and Laplace's equation, Equation of continuity for charge conservation, Ampere's and Faraday's laws, Maxwell's Electromagnetic equations.

Unit - 3: Laser and Fiber optics
Introduction, elementary idea of spontaneous and stimulated emission, active medium, population inversion, Einstein's coefficients, Types of lasers and important applications of lasers.
Introduction to optical fibers, basic principles of optical fiber, critical angle, numerical aperture, maximum acceptance angle, classification of optical fiber.

Unit -4: Semiconductor Physics and Devices
Formation of energy in solids, Energy band gap of metals, insulators and semiconductors, classification of semiconductor: Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, working of P-N Junction diodes and Bipolar Junction transistor.

Unit - 5: Introduction to Quantum Mechanics
Introduction to QuantumMechanics, Photoelectric effect, Compton effect, wave-particle duality, uncertainty principle, wave function, De-Broglie waves, Phase and Group velocity, Davisson and Germer experiment, Schrodinger wave equation, particle in a box (1-Dimentional).

Text Books and References
1) Applied Physics – I and II by Navneet Gupta, Dhanpat Rai & Co.
2) Engg. Physics by S. K. Srivastava and R. A. Yadav, New Age Pub. New Delhi
3) Engg. Physics by Uma Mukherjee, Narosa Publication
4) Engg. Physics by M. N. Avadhanulu, S. Chand Pub.
5) Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill, 1998
6) Concepts of Physics Part -II by H. C. Verma, BharatiBhawan (P&D), 1998
7) Modern Physics by Beiser, McGraw Hill Inc. New York, Publication 1995
8) Modern Physics by Mani and Mehta, East-West Press Pvt. Ltd. 1998
9) Introduction to Electrodynamics, David Griffith
10) J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
11) B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., 2007.
12) S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
13) Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
14) P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
15) Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
16) Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

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SUBJECT CODE/NAME	L	T	P	Credit
IP02TES03/ BASIC ELECTRICAL ENGINEERING	3	1	0	4

Module 1 : DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase
Balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers (6 hours)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and
working of synchronous generators.

Module 5: Power Converters (6 hours)

DC-DC bucks and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthling. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

(i)D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii)D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
(iii)L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
(iv)E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(v)V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

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Subject code	L	T	P	Credit
IP01TBS01/ **MATHEMATICS-I**	3	1	0	4

Calculus (Single Variable)
Module 2a: *Calculus:* (6 hours)
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Asymptotes: definition, properties and problems.

Module 2b: *Calculus:* (6 hours)
Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.
Module 2c:*Sequences and series:* (Prerequisite 2b) (10 hours)
Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.
Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

Multivariable Calculus
Module 3a:*Multivariable Calculus (Differentiation)* (Prerequisite 2b) (10 hours) Limit, continuity and partial derivatives, direct ional derivat ives, total derivat ive; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.
Module 3b: *Multivariable Calculus (Integration)* (Prerequisite 3a) (10 hours)
Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple
applications involving cubes, sphere and rectangular parallelepipeds.

Textbooks/References:
1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathemat ics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
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Matrices and Linear Algebra
Module 4a: *Matrices (in case vector spaces is not to be taught)* (14 hours)

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Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Module 4b: *Matrices (in case vector spaces is to be taught)* (8 hours)
Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

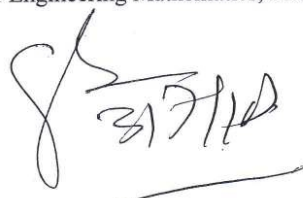### Module 4c: *Vector spaces* (Prerequisite 4b) (10 hours)
Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, ranknullity theorem, composition of linear maps, Matrix associated with a linear map.

Module 4d: *Vector spaces* (Prerequisite 4b-c) (10 hours)

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1.D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2.V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.
3.Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

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Subject code	L	T	P	Credit
IP02THS01/ ENGLISH	3	0	0	3

1. Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills

Sentence Structures , Use of phrases and clauses in sentences , Importance of proper punctuation , Creating coherence , Organizing principles of paragraphs in documents , Techniques for writing precisely

3. Identifying Common Errors in Writing

3.1 Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

4. Nature and Style of sensible Writing

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.

5. Writing Practices

Comprehension, Précis Writing, Essay Writing.

6. Oral Communication (This unit involves interactive practice sessions in Language Lab)
  - Listening Comprehension
  - Pronunciation, Intonation, Stress and Rhythm
  - Common Everyday Situations: Conversations and Dialogues
  - Communication at Workplace
  - Interviews
  - Formal Presentations

Suggested Readings:
(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
(iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

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CODE/SUBJECT	L	T	P	CREDIT
IP02TMC01/ENVIRONMENTAL SCIENCES	3	0	0	0

ENVIRONMENTAL STUDIES

GR-4 NC 04 Classes

Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development. Ecosystems: Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries), Natural Resources Renewable and Non---renewable Resources: Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over---exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India;

Biodiversity patterns and global biodiversity hot spots. India as a mega---biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex--situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value. Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks. Solid waste management: Control measures of urban and industrial waste. Pollution case studies. Environmental Policies & Practices. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, human wildlife conflicts in Indian context. Human Communities and the Environment, Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements Chipko, silent valley, Bishnois of Rajasthan. Environmental ethics: role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Field work: Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river etc.

Suggested Readings:

1. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
2. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36---37.
3. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
4. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP02PBS02/PHYSICS LAB	0	0	3	1.5

List of Experiments:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colors of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of lines per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the Energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by Thomson's method
11. To study the P-N junction diode characteristics, in forwarded and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.

8/7/18

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SUBJECT CODE/NAME	L	T	P	Credit
IP02PES04/ BASIC ELECTRICAL ENGINEERING LAB	0	0	2	1

List of experiments/demonstrations:

➢ Basic safety precautions. Introduction and use of measuring instruments–voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

➢ Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).

➢ Sinusoidal steady state response of R-L, and R-C circuits–impedance calculation and verification. Observation of phase differences between current and voltage. Resonancein R-L-C circuits.

➢ Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidalwave-shapeduetoB-Hcurvenonlinearityshouldbeshownalongwitha discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

➢ Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).

➢ Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

➢ Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

➢ Torque Speed Characteristic of separately excited dc motor.

➢ Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronousspeed.

➢ Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.

➢ Demonstration of (a) dc-dc converters (b) dc-ac converters–PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

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SUBJECT CODE/SUBJECT	L	T	P	Credit
IP02PES05/ENGINEERING GRAPHICS & DESIGN LAB	1	0	3	2.5

ENGINEERING GRAPHICS & DESIGN

UNIT-I
Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, usage of Drawing instruments,lettering, Conic sections including the Rectangular Hyperbola (General method only);Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

UNIT-II
Orthographic Projections
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.
Projections of Regular Solids
Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioningand scale.

UNIT-III
Sections and Sectional Views of Right Angular Solids
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of RightRegular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic viewsof geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT-IV
Isometric Projections covering,
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions;Isometric Views of lines, Planes, Simple and compound Solids; Conversion of IsometricViews to Orthographic Views and Vice-versa, Conventions;

UNIT-V
Overview of Computer Graphics
listing the computer technologies that impact on graphical communication, Demonstratingknowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard,Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs,Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), TheCommand Line (where applicable), The Status Bar, Different methods of zoom as used inCAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compoundSolids].

Suggested Text/Reference Books:
(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii)Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
(v) (Corresponding set of) CAD Software Theory and User Manuals