List of New Course(s) Introduced

Department : Industrial and Production Engineering

Programme Name : B.Tech

Academic Year : 2023-24

List of New Course(s) Introduced

Sr. No.	Course Code	Name of the Course
01.	IP207TMC02	Environmental Sciences
02.	IP207TOE02	Manufacturing Processes
03.	IP208TPE71	Product Design and Manufacturing
04.	IP208TPE72	Microprocessors in Automation
05.	IP208TPE73	Computer Aided Process Planning (CAPP)
06.	IP208TOE03	Advanced Manufacturing Processes
07.	IPDATK6	Production and Operations Management
08.	IPDATK7	Industrial Engineering and Business Management
09.	IPDATK8	Principles of Management, Cost and Projects
10.	IPDATK9	Manufacturing Processes
11.	IPDATP6	Fundamentals of Green Manufacturing
12.	IPDATP7	Strategic Management in Supply Chain
13.	IPDATP8	Product Design and Manufacturing
14.	IPDATP9	Advanced Manufacturing Processes
15.	AMUCTE1	Mathematics-III
16.	IPUCTT1	Manufacturing Processes– I
17.	IPUCTT2	Fluid Mechanics
18.	IPUCTT3	Materials Science
19.	IPUCTK1	Industrial Engineering
20.	IPUCTK2	Work Study and Ergonomics
21.	IPUCTO1	I. C. Engine
22.	IPUCLE1	Programming in C & MATLAB
23.	IPUCLT1	Fluid Mechanics Lab
24.	IPUCTO1	I. C. Engine
25.	AMUDTT0	Statistical Methods
26.	IPUDTT1	Theory of Machines
27.	IPUDTT2	Strength of Materials
28.	IPUDTK1	Engineering Thermodynamics
29.	IPUDTK2	Plant Layout& Material Handling

New Course Introduced

30.	**IPUDLT1**	**Material Testing Lab**
31.	**IPUDLT2**	**Theory of Machines Lab**
32.	**IPUDPV1**	**Mini Project**
33.	**IPUDTO1**	**Automobile Engineering**

School : *School of Studies of Engineering and Technology*

Department : *Industrial and Production Engineering*

Date and Time : *Jul. 01, 2023*

Venue : *Online mode*

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 held on 01.07.2023 in online mode.

The following members were present in the meeting:

1. Prof. S.C. Shrivastava (HOD, Professor., Dept. of I.P.E., -cum Chairman, BOS)
2. Prof. M.K. Singh (Member BoS, Professor, Dept. of I.P.E)
3. Mr. C.P. Dewangan, (Member BoS, Associate Prof., Dept. of I.P.E)
4. Mr. Nitin Kumar Sahu, (Member BoS, Assistant Prof., Dept. of I.P.E)
5. Mr. Kawal Lal Kurrey (Invited Member BoS, Assistant Prof., Dept. of I.P.E)

Following External members has also participated in formulating the coding, scheme and syllabus of B. Tech. III and IV Semester by email.

1. Dr. A. R. Dixit (External Expert, Professor, Mechanical Engineering Department, Indian Institute of Technology ISM, Dhanbad)
2. Mr. Bhanja Prasad Patro (External Expert, Director & Head, CIPET: CSTS - Bhubaneswar)

The BOS meeting is conducted in online platform via Google meet link (https://meet.google.com/qrz-qmbd-gpq) for the following agenda.

Following points were discussed during the meeting

1. To approve the syllabus and scheme of B.Tech VII & VIII Semester and Ph.D of Industrial & Production Engineering for the session 2023-24
2. In the meeting, coding, scheme, syllabus of B. Tech. VII & VIII Semester and Ph.D of Industrial & Production Engineering department was discussed in detail and incorporated. The verbal suggestions received from the external experts are also incorporated and recommended for approval.
3. The departmental vision and mission is also discussed and approved by the BOS members.
4. All the members of BOS has approved the syllabus and scheme of B.Tech VII & VIII Semester and Ph.D of Industrial & Production Engineering department, where Mr. Bhanja Prasad Patro (External Expert- email: bppatra66@gmail.com) and Dr. A. R. Dixit (External Expert, email: amitraidixit@iitism.ac.in) has given approval via replying to the sent invitation mail.

5. The discussion regarding the honorarium payment for the external experts sitting is also decided and will be paid as per rule from the imprest fund.

   The coding, scheme, syllabus of B. Tech. VII & VIII Semester, Ph.D and Vision as well as Mission of Industrial & Production Engineering department have been accepted by the B.O.S. (I.P.E.) and attached herewith for approval from the competent authority. The B.O.S. meeting was concluded with vote of thanks.

The committee discussed and approved the scheme and syllabi. The following courses were revised in the B. Tech. Final year (VII and VIII Semesters) and Ph.D:

- Computer Aided Design & Manufacturing (IP07TPC14)
- Robotics and Robot Applications (IP08TPC16)
- Research Methodology in Engineering (IPDATT1)
- Computer Aided Design (IPDATK1)

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

- Environmental Sciences (IP207TMC02)
- Manufacturing Processes (IP207TOE02)
- Product Design and Manufacturing (IP208TPE71)
- Microprocessors in Automation (IP208TPE72)
- Computer Aided Process Planning (CAPP) (IP208TPE73)
- Advanced Manufacturing Processes (IP208TOE03)
- Production and Operations Management (IPDATK6)
- Industrial Engineering and Business Management (IPDATK7)
- Principles of Management, Cost and Projects (IPDATK8)
- Manufacturing Processes (IPDATK9)
- Fundamentals of Green Manufacturing (IPDATP6)
- Strategic Management in Supply Chain (IPDATP7)
- Product Design and Manufacturing (IPDATP8)
- Advanced Manufacturing Processes (IPDATP9)

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.)

School : *School of Studies of Engineering and Technology*

Department : *Industrial and Production Engineering*

Date and Time : *Oct. 06, 2023, 1:00PM*

Venue : *CAD Lab*

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 on 06.10.2023 in CAD Lab.

The following members were present in the meeting:

1. Prof. S.C. Shrivastava (HOD, Professor., Dept. of I.P.E., -cum Chairman, BOS)
2. Prof. M.K. Singh (Member BoS, Professor, Dept. of I.P.E)
3. Mr. C.P. Dewangan, (Member BoS, Associate Prof., Dept. of I.P.E)
4. Mr. Nitin Kumar Sahu, (Member BoS, Assistant Prof., Dept. of I.P.E)
5. Mr. Kawal Lal Kurrey (Invited Member BoS, Assistant Prof., Dept. of I.P.E)

   Following External members has also participated in formulating the coding, scheme and syllabus of B. Tech. III and IV Semester by email.
6. Dr. A. R. Dixit (External Expert, Professor, Mechanical Engineering Department, Indian Institute of Technology ISM, Dhanbad)
7. Mr. Bhanja Prasad Patro (External Expert, Director & Head, CIPET: CSTS - Bhubaneswar)

Following points were discussed during the meeting

1. The coding, scheme and syllabus of B. Tech. III and IV Semester (Industrial & Production Engineering) is shared with the external experts. Moreover, several conversations held from the external experts by the Head of the Department and Departmental BOS Coordinator and their suggestion and comments are considered in the same.
2. In the meeting, coding, scheme, syllabus of B. Tech. III and IV Semester (Industrial & Production Engineering) was discussed in detail and incorporated. The verbal suggestions received from the external experts in the meeting are also incorporated and recommended for approval. After incorporation of all the suggestions, the final updated syllabus has been send for their reference.
3. It is also decided that the subject code may be changed (if any, in future) as per university norms/ regulations/ ordinance/ policies from time to time.
4. Also, the open elective (name and subject code/ syllabus) may be changed in future as per the directions of the offering department in the scheme/ syllabus.

New Course Introduced

5. The discussion regarding the honorarium payment for the external experts sitting is also decided and will be paid as per rule from the imprest fund.

   The coding, scheme, syllabus of B. Tech. III and IV Semester of Department of Industrial & Production Engineering has been accepted by the B.O.S. (I.P.E.) and attached herewith for approval from the competent authority.

The following new courses were introduced in the of B. Tech. Third year (III and IV Semesters):

- Mathematics-III (AMUCTE1)
- Manufacturing Processes– I (IPUCTT1)
- Fluid Mechanics (IPUCTT2)
- Materials Science (IPUCTT3)
- Industrial Engineering (IPUCTK1)
- Work Study and Ergonomics (IPUCTK2)
- I. C. Engine (IPUCTO1)
- Programming in C & MATLAB (IPUCLE1)
- Fluid Mechanics Lab (IPUCLT1)
- I. C. Engine (IPUCTO1)
- Statistical Methods (AMUDTT0)
- Theory of Machines (IPUDTT1)
- Strength of Materials (IPUDTT2)
- Engineering Thermodynamics (IPUDTK1)
- Plant Layout& Material Handling (IPUDTK2)
- Material Testing Lab (IPUDLT1)
- Theory of Machines Lab (IPUDLT2)
- Mini Project (IPUDPV1)
- Automobile Engineering (IPUDTO1)

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

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

Scheme and Syllabus

New Course Introduced

B.O.S held on Date 01.07.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY
Department of Industrial & Production Engineering
CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2023-24
B. TECH FOURTH YEAR, VII SEMESTER

S. No	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP207TPC14	Computer Aided Design & Manufacturing	3	1	-	30	70	100	4
2.	IP207TPC15	Production Planning and Control	3	-	-	30	70	100	3
3.	IP207TPE5.	Professional Elective-05	3	-	-	30	70	100	3
4.	IP207TPE6.	Professional Elective-06	3	-	-	30	70	100	3
5.	XX207TOEXX	Open Elective-02	3	-	-	30	70	100	3
6.	IP207TMC02	Environmental Sciences	3	-	-	-	-	-	-
		Total	**18**	**1**	**-**	**150**	**350**	**500**	**16**
		PRACTICALS							
1.	IP207PPC08	CAD/CAM Lab	-	-	2	30	20	50	1
2.	IP207PSC02	Seminar on Summer Training	-	-	4	50	-	50	2
3	IP207PPR01	Minor Project	-	-	8	100	-	100	4
		Total	**-**	**-**	**14**	**180**	**20**	**200**	**7**

Total Credits: **23**
Total Contact Hour: **33**
Total Marks: **700**
INTERNAL ASSESSMENT: two class tests of 15 marks each will be conducted.
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE –END SEMESTER EXAMINATION

IP207TPE5. Professional Electives-05	
IP207TPE51 Fundamentals of Green Manufacturing	
IP207TPE52 Product Design & Development	
IP207TPE53 Engineering Economics	
IP207TPE6. Professional Electives-06	
IP207TPE61 Supply Chain Management	
IP207TPE62 Turbo Machinery	
IP207TPE63 Maintenance Management	
XX207TOEXX Open Elective-02	**Offering department**
CH207TOE02 Waste to Energy	Chemical
ME207TOE02 Principles of Management	Mechanical
EC207TOE02 CMOS Digital VLSI Design	ECE
CE207TOE02 Green Building and Sustainable Materials	Civil
IT207TOE02 Machine Learning	IT
CS207TOE02 GIS & Remote Sensing	CSE
IP207TOE02 Manufacturing Processes – I will be offered as an open elective for departments- Chemical, Civil, CSE, ECE, IT & MECH	

01/7/2023 1/7/2023 01/07/23 01/07/23

New Course Introduced

MODULE - II

Geometric modeling of curves, surface and solid: Basics representation of curves, parametric and non- parametric curves, mathematical representation of curves, Hermite curves, Bezier curves, B-spline curves and rational curves, basic of surface, techniques of surface modeling, plane surface, rule surface, surface of revolution and sweep, coons and bi-cubic patches, concept of Bezier and B-spline surfaces, basic concept of solid modeling technique, CSG and B-rep method for solid generation.

MODULE – III

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

MODULE – IV

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

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

MODULE - V

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

TEXT & REFERENCE BOOKS:

1. Principles of Computer Graphics, W. M. Neumann and R.F. Sproul, McGraw Hill.
2. Computer Graphics, D. Hearn and M.P. Baker, Prentice Hall Inc.
3. CAD/CAD Theory & Practice, I. Zeid & R. Sivasubramanium, TMH.
4. CAD/CAM, Groover & Zimmer, Prentice Hall, India.
5. Computer Graphics & CAD, Ramamurthy, T.M.H.
6. Industrial Robotics & CIM, Surendra Kumar I.B.H.

01/07/23 1/7/2023 01/07/23

7. CAD/CAM, P.N. Rao, Prentice Hall, India.
8. Mastering CAD CAM, Ibrahim Zeid, Tata McGraw Hill Publishing Co.
9. CAD/CAM Principles, C. McMohan & J. Browne, Pearson Education.

Course Outcomes and their mapping with Programme Outcomes and Program Specific Outcomes (PSOs):

COs	PO's												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	2	-	-	-	-	-	-	2	3	3	1
CO2	3	3	2	1	2	-	-	-	-	-	-	2	3	3	1
CO3	3	3	1	3	2	-	-	-	-	-	-	2	3	3	3
CO4	3	3	3	2	3	-	-	-	-	-	-	2	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/07/23

01/07/23

11/7/2023

01/07/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPC15	Production Planning and Control	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE – I

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.

01/7/2023 1/7/2023 01/07/23 01/07/23

New Course Introduced

MODULE – II

Aggregate planning: Definition, strategies, pure and mixed strategies, methods.
Master production schedule: Objective and functions, design of MPS, bill of materials.
Material requirement planning: Objectives, functions, MRP, MRP-II, limitations.
Capacity requirement planning: Definition, objectives, process of CRP, process sheet, rough cut capacity planning, loading, and preparation of CRP chart.

MODULE – III

Scheduling: Types, single machine scheduling, job shop scheduling, flow scheduling;
Sequencing: Various priority rules, line of balancing, rank and positional weight method, Kilbridge westner method.
Facility location and facility location problems: Factors affecting plant locations, single facility locations problems and its methods.

MODULE – IV

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

MODULE -V

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

TEXT & REFERENCE BOOKS:

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

Course Outcomes and their mapping with Programme Outcomes and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	2	1	-	-	-	-	2	-	3	2	2	2
CO2	3	3	2	3	2	-	-	1	-	2	3	2	3	3	3
CO3	3	3	2	3	2	-	-	2	-	2	3	3	3	2	3
CO4	3	2	3	2	2	2	-	-	2	2	-	2	3	3	3
CO5	3	3	2	1	3	2	-	-	-	2	-	3	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

11/7/2023 01/07/2023 01/07/23 01/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE51	Fundamentals of Green Manufacturing	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE-I

Introduction: Sustainable development, indicators of sustainability, sustainability strategies, sustainable manufacturing, evolution of sustainable manufacturing, elements of sustainable manufacturing, theory of green manufacturing and its principles, need for green manufacturing, drivers and barriers of green manufacturing.

01/7/2023 1/7/2023 01/07/23 01/07/23

MODULE - II

Green manufacturing strategy: Manufacturing strategy, elements of manufacturing strategy, manufacturing out puts, competitive priorities: quality, delivery speed and reliability, cost efficiency, flexibility, order winners and order qualifier, tradeoff, production systems, manufacturing levers, competitive analysis, level of manufacturing capability, framework for formulating manufacturing strategy, implications of green manufacturing for manufacturing strategy.

MODULE – III

Life cycle approach of green manufacturing: Holistic and total Life-cycle approach, six step methodologies for green manufacturing (6-R approach), life cycle assessment (LCA), elements of LCA, life cycle costing, eco labelling target setting, data collection and processing, final evaluation by virtue of criteria, environmental management systems.

MODULE – IV

Green manufacturing technology: Definition of green manufacturing technology and practices, classifications of green manufacturing technology, advantages and disadvantages of implementation of green technology.

MODULE – V

Lean and Green manufacturing: Introduction, lean evolution & steps, introduction to lean manufacturing, definition of lean manufacturing, lean vs. green manufacturing: similarities and differences.

TEXT & REFERENCE BOOKS:

1. Cleaner Production: Environmental and Economic Perspectives, Misra Krishna B., Springer, Berlin, Latest edition.
2. Environmental Management Systems and Cleaner Production, Dr. Ruth Hillary, Wiley, New York, Latest edition.
3. Pollution Prevention: Fundamentals and Practice, Paul L Bishop, TMH.
4. Costing the earth, Cairncrss and Francis, Harvard Business School Press – 2009.
5. The principle of sustainability, Simon Dresner, –Earth Scan publishers (2008).
6. Manufacturing strategy: How to formulate and implement a winning plan, Jhon Miltenburg, Productivity Press Portland, Oregon-2017.
7. Manufacturing strategy, Voss C. A, Chapman & Hall-1992
8. Manufacturing the future, Steve Brown, Prentice Hall, 2000
9. Manufacturing strategy, Terry Hill, Homewood, IL- 1989
10. Becoming Lean - Inside Stories of U.S. Manufacturers, Jeffrey K. Liker, Productivity Press, Portland, Oregon
11. Handbook of Sustainable Manufacturing, G. Atkinson, S. Dietz, E. Neumayer, Edward Elgar Publishing Limited, 2007.
12. Industrial Development for the 21st Century: Sustainable Development Perspectives, D. Rodick, UN New York, 2007.
13. An Introduction to Sustainable Development, P.P. Rogers, , K.F. Jalal & J.A. Boyd, J.A, Earth scan, London, 2007.

11/7/2023 21/7/2023 01/10/23 01/10/23

14. Sustainable Development Indicators in Ecological Economics, P. Lawn, Edward Elgar Publishing Limited.
15. The Economics of Sustainable Development, S. Asefa, W.E. Upjohn Institute for Employment Research, 2005.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	-	2	3	2	1	2	3	1	1	2	2	1	3	2	2
CO2	-	2	3	2	1	3	3	1	1	2	3	2	3	2	2
CO3	-	2	3	2	1	2	3	1	1	3	3	2	3	3	3
CO4	-	2	3	2	2	3	3	1	1	3	2	2	3	2	2
CO5	-	2	3	2	1	3	3	1	1	2	2	1	3	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

1/7/2023

01/07/23

01/07/23

01/7/2023

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE52	Product Design & Development	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE – I

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

MODULE – II

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

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

MODULE – III

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

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

New Course Introduced

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

MODULE – IV

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

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

MODULE -V

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

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

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	1	-	-	2	3	1	1	1	2	2	2
CO2	3	2	2	1	1	-	-	2	2	2	2	2	3	2	2
CO3	3	2	2	2	1	2	3	2	2	2	2	2	2	3	2
CO4	1	2	2	-	1	2	?	2	2	2	1	1	1	1	1
CO5	1	-	1	2	-	1	1	2	2	2	1	1	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/7/23 1/7/23 01/07/23 04/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE53	Engineering Economics	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE - I

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

MODULE - II

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

MODULE - III

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

MODULE - IV

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

MODULE - V

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

TEXT & REFERENCE BOOKS:

1. Principles of Economics, N. Mankiw Gregory (2002), Thompson Asia.

01/7/23 01/7/23 01/07/23 01/7/23

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	-	-	-	-	-	2	2	-	-	-	2	3	3	2	3
CO2	-	-	-	-	-	3	2	2	-	-	2	1	3	2	2
CO3	-	-	-	-	-	2	3	-	-	-	2	2	2	3	-
CO4	-	-	-	-	-	2	2	1	1	-	3	1	3	2	-
CO5	-	-	-	-	-	1	2	1	2	1	3	1	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

1/7/23

01/07/23

01/07/23

01/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE61	Supply Chain Management	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES

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

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

COURSE CONTENT:

MODULE - I

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

MODULE - II

Designing the supply chain network: Designing distribution networks and applications to e-

01/7/23 7/7/23 01/07/23 01/7/23

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

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

Network design in an uncertain environment: The impact of uncertainty on network design, discounted cash flow analysis, representations of uncertainty, evaluating network design decisions using decision trees, AM tires: evaluation of supply, chain design decisions under uncertainty, risk management and network design 175, making supply chain decisions under uncertainty in practice.

MODULE - III

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

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

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

MODULE - IV

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

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

MODULE - V

Designing and planning transportation networks: Transportation in a supply chain, the role

01/7/23 1/7/23 01/07/23 01/07/23

New Course Introduced

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

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

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	1	2	-	-	-	2	1	1	2
CO2	1	3	3	2	2	1	2	2	-	-	-	2	2	2	2
CO3	2	2	3	3	2	2	2	2	-	-	-	3	2	2	2
CO4	3	3	2	2	2	2	3	2	-	-	-	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE62	Turbo Machinery	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

- To study classifications of turbo-machines.
- To study construction and working of different turbo- machines.
- To acquire the knowledge and skill of analyzing different turbo- machines.

COURSE OUTCOMES:

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

- Apply knowledge of turbo machinery for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in the design and development of mechanical systems.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

COURSE CONTENT:

UNIT- I

Nozzles & Diffuser: Nozzles & Diffuser types, their efficiency, critical pressure & velocity, relationship between area, velocity & pressure in nozzles flow. Steam Turbine Types: Steam turbine-principal of operation of steam turbine, types, impulse turbine, compounding of steam turbine pressure compounded velocity compounded and pressure- velocity compounded impulse turbine. Velocity diagram for impulse turbine: force on the blade and work done, blade or diagram efficiency, gross stage efficiency, influence of ration of blade to steam speed on blade efficiency in a single stage impulse turbine, impulse blade section, choice of blade angle.

UNIT – II

Impulse-reaction turbine: Velocity diagram, degree of reaction, Impulse-Reaction turbines with similar blade section and half degree of reaction (parson's turbine) Height of reaction, blade section. Energy losses in steam turbine-internal and external losses in steam turbine.

01/07/23 1/7/23 01/07/23

UNITS – III

State points Locus & Reheat factors: Factor-stage, efficiency of impulse turbine, stage point locus of an impulse turbine, state point locus for multistage turbine reheat factor. Internal efficiency, overall efficiency, relative efficiency, Design procedures of impulse & impulse reaction turbine. Governing of steam turbine: Throttle governing, nozzle governing, bypass governing, combination of throttle and nozzle, governing and combination of bypass and throttle governing, Effect of governing on the performance of steam turbine.

UNIT – IV

Gas turbine: Classification of Gas turbine, simple open cycle gas turbine, ideal and actual (Brayton cycle) for gas turbine, Optimum pressure ratios for maximum specific output in actual gas turbine, Regeneration, reheat and inter cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

UNIT –V

Turbo compressors: Introduction, classification of Centrifugal Compressor- Component working, velocity diagram, calculations of power and efficiencies. Slip factor, surging and choking, power and efficiencies. Axial Flow Compressor: Construction and working, velocity diagram, calculation of power and efficiencies, Degree of reaction, work done factor, stalling, comparison of centrifugal and axial flow compressor.

TEXT BOOKS:

1. Steam and Gas Turbine – R. Yadav by C.P.H. Publication, Allahabad.
2. Turbine, Compressors and Fans – S.M. Yahya – TMH.
3. Gas Turbine – V. Ganeshan – TMH
4. Fundamentals of Turbo Machinery- Venkanna, PHI.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	2	2	3	3							3	3	2	3
CO2	3	3	3	3	2							3	3	2	2
CO3	3	3	3	3	3	2						3	2	3	-
CO4	3	1	2	1	1	3						2	3	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/7/23 1/7/23 01/7/23 01/7/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TPE63	Maintenance Management	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE - I

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

MODULE - II

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

6/7/23 7/7/23 8/7/23 01/07/23

New Course Introduced

MODULE - III

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

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

MODULE - IV

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

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

MODULE - V

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

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	3	2	3	-	2	-	-	-	1	2	3	3	3	2
CO2	3	3	3	3	-	2	-	-	-	-	-	3	3	3	2
CO3	3	3	3	3	-	2	3	-	-	1	-	3	3	3	2
CO4	3	3	3	-	-	2	2	1	1	3	-	3	3	3	2
CO5	3	3	3	3	-	1	2	1	2	3	2	3	2	2	1

- **1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**

01/7/23 1/7/23 04/09/23 01/09/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB–TOTAL	
						CT–1	CT–2			
B. Tech. VII Sem.	IP207TOE02	Manufacturing Processes I	3	–	–	15	15	70	100	3

COURSELEARNINGOBJECTIVES:

The objective of this course is to:

- Understand the principle, concept, thermal and metallurgical aspects during solidification of metal.
- Demonstrate about principles/ methods of casting with detail design of gating/ riser system needed for casting, defects in cast objects and requirements for achieving sound casting.
- Evaluate foundry practices like pattern making, mould making, core making and inspection of defects.
- Build knowledge about principles and criteria of yielding during forming of metals, analysis of different bulk metal forming processes following different analysis approach.
- Understand the application of jigs and fixtures.
- Analyze various metal forming processes and plastic deformation during forming processes.

COURSE OUTCOMES:

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

- Decide yield of a material according to different yield theory for a given state of stress.
- Analyze the different bulk metal forming process mechanics using different analysis approach and calculate the force, power requirements etc.
- Evaluate the effect of process parameters on the process mechanics during bulk metal forming.
- Select appropriate design of gating systems and manufacturing processes in order to design products.
- Identify the various metal forming techniques and the theory of plasticity and its application for analyzing various metal forming Processes.
- Select appropriate jigs and fixtures in various engineering applications.

01/07/23 01/7/2023 1/7/23 01/07/23

COURSE CONTENT:

Module –I

Foundry: Moulding method and materials, sand-clay-water system, additives, pattern making and types, pattern allowances & design considerations, types of moulding sand & their properties, testing, cores and sand core boxes, core making, moulding machine.

Gating system: Elements & design of gating system, design of riser, solidification of casting.

Module –II

Melting furnaces and practices: Melting cast iron, steel and non-ferrous material, cupola, charge calculation, open furnaces, converter and crucible furnaces, electric, direct arc furnace, inductive furnace.

Module –III

Special casting processes: Centrifugal and investment casting, shell, types and principle of die casting, squeeze casting, gravity and pressure die casting, die casting consideration, continuous casting, centrifugal casting, slush casting, casting defects.

Module –IV

Metal forming: Need and classification, elastic and plastic deformation, yield criteria, fundamentals of hot and cold working processes.

Drawing: Drawing process geometry and analysis of wire and sheet drawing for load and power calculations, maximum reduction possible.

Rolling: Classification of rolling, process geometry and analysis of plate rolling for rolling load, rolling pressure and power calculations, defects in rolled products.

Forging: Classification of Forging, determination of forces in disc forging considering sticking and slipping, forging defects.

Extrusion: Classification, process geometry and analysis of rod and sheet extrusion for load and power calculations, maximum reduction possible, defects in extruded product.

Module –V

Work holding device: Introduction to jigs, fixtures and their types, design criteria, economic justification, fundamental principles of design of jigs and fixtures, location and clamping in jigs and fixtures, drilling jigs, milling fixtures, indexing jigs and fixtures.

TEXT & REFERENCE BOOKS:

1. Manufacturing processes for engineering materials - Kalpakjian and Schmid, Pearson India.
2. Manufacturing Science- A. Ghosh and A. K. Mallik, East-West Press Pvt. Ltd. New Delhi.

3. Manufacturing Technology (Foundry, Forming and Welding) – P. N. Rao, Tata McGraw Hill Publishing Company.
4. Materials and Processes in Manufacturing - E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi.
5. Production Engineering Sciences - P. C. Pandey and C. K. Singh, Standard Publishers Ltd.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	-	2	-	-	-	-	2	1	2	2	2
CO2	3	2	1	2	1	2	2	1	-	-	2	2	3	3	3
CO3	3	2	2	2	2	1	2	2	-	-	2	3	2	3	3
CO4	3	2	2	2	2	2	2	1	-	-	2	2	2	3	3
CO5	3	1	2	2	1	2	2	1	-	-	2	2	2	2	3
CO6	2	2	2	2	1	2	2	-	-	-	1	2	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

11/7/23

01/7/2023

01/07/23

01/07/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VII Sem.	IP207TMC02	Environmental Sciences	3	-	-	-	-	-	-	-

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

- To learn the importance of Ecosystems, Natural Resources and Energy resources
- To learn the importance of Biodiversity and Environmental pollution
- To understand the Environmental ethics

COURSE OUTCOMES:

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

- To understand the importance of Ecosystems, Natural Resources and Energy resources, learn the importance of Biodiversity and Environmental pollution and understand the Environmental ethics

COURSE CONTENT:

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) Forces: 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. Deforestations: 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. Bio geographic 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

New Course Introduced

studies. Environmental potencies & 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. Hunan 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 birds and basic principles of identification Study of simple ecosystems-pond river- etc.

TEXT BOOKS:

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.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	-	-	-	-	-	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
B. Tech. VII Sem.	IP207PPC08	CAD/CAM Lab			2	30	20	50	1

COURSE LEARNING OBJECTIVES:

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

COURSE OUTCOMES:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	2	3	-	-	-	-	-	-	1	2	2	1
CO2	3	-	3	2	3	-	-	-	-	-	-	1	2	2	1
CO3	3	1	-	1	-	-	-	-	-	-	-	1	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

New Course Introduced

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

COURSE LEARNING OBJECTIVES:

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

COURSE OUTCOMES:

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

01/7/23 1/7/23 04/07/23 01/07/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGVV, BILASPUR CG

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	2								2	2	1
CO2	2	2	2	1	1								1	1	1
CO3	2	3	3	2	1								1	1	2
CO4	-	-	-	-	1								1	2	2
CO5	-	-	-	-	-								1	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

New Course Introduced

BOS held on Date 01.7.2023

GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY
Department of Industrial & Production Engineering
CBCS-New, Study & Evaluation Scheme W.E.F. Session: 2023-2024
B. TECH FOURTH YEAR, VIII SEMESTER

SN	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	INTERNAL ASSESSMENT	ESE	SUB-TOTAL	
1.	IP208TPC16	Robotics and Robot Applications	3	1	-	30	70	100	4
2.	IP208THS4.	Electives from Humanity Science-04	3	-	-	30	70	100	3
3.	IP208TPE7.	Professional Elective-07	3	-	-	30	70	100	3
4.	XX208TOEXX	Open Elective-03	3	-	-	30	70	100	3
5.	IP208TMC03	Essence of Indian Knowledge Tradition	3	-	-	-	-	-	-
		Total	**15**	**1**	**-**	**120**	**280**	**400**	**13**
		PRACTICALS							
1.	IP208PPR02	Major Project	-	-	12	120	80	200	6
2.	IP208PCV01	Comprehensive Viva	-	-	-	-	50	50	2
		Total	**-**	**-**	**12**	**120**	**130**	**250**	**8**

Total Credits: **21**
Total Contact Hour: **28**
Total Marks: **650**
INTERNAL ASSESSMENT: -two class tests of 15 marks each will be conducted.
L-LECTURE, T-TUTORIAL, P-PRACTICAL, ESE –END SEMESTER EXAMINATION

IP208THS4. Electives from Humanity Science-04	
IP208THS41 Intellectual Property Rights	
IP208THS42 Safety Management and Labour Law	
IP208TPE7. Professional Electives-07	
IP208TPE71 Product Design and Manufacturing	
IP208TPE72 Microprocessors in Automation	
IP208TPE73 Computer Aided Process Planning (CAPP)	
XX208TOEXX Open Elective-03	Offering department
CH208TOE03 Project Engineering Economics and Management	Chemical
ME208TOE03 Supply Chain Management	Mechanical
EC208TOE03 Introduction to IOT	ECE
CE208TOE03 Infrastructure Planning and Management	Civil
IT208TOE03 Soft Computing	IT
CS208TOE03 Artificial Intelligence	CSE
IP208TOE03 Advanced Manufacturing Processes will be offered as an open elective for departments- Chemical, Civil, CSE, ECE, IT & MECH	

01/7/23 01/07/23 01/07/23 17/7/2023

New Course Introduced

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208TPC16	Robotics and Robot Applications	3	1	-	15	15	70	100	4

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE -I

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

MODULE – II

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

MODULE – III

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

MODULE – IV

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

New Course Introduced

MODULE – V

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

TEXT & REFERENCE BOOKS:

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

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2								3	1	2
CO2	3	3	3	2	3								2	3	2
CO3	3	3	3	2	3								2	3	2
CO4	3	2	2	2	2		2						3	2	2
CO5	3	2	3	2	2	3					1		2	2	3

Weightage: 1-Slight, 2-Moderate, 3-Strong

01/07/23

01/7/2023

01/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech VIII Sem.	IP208THS41	Intellectual Property Rights	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE - I

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

MODULE - II

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

01/7/2023 01/08/23 01/08/23

New Course Introduced

MODULE - III

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

MODULE - IV

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

MODULE - V

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

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	-	1	3	3	1	2	1	3	2	3	2	2	2	2	2
CO2	-	2	3	3	1	1	1	3	3	2	3	2	3	2	3
CO3	-	3	3	2	1	2	2	3	2	3	3	2	2	3	1
CO4	-	2	3	3	2	2	1	3	2	3	2	2	3	2	2
CO5	-	2	3	3	1	1	2	3	3	2	2	1	3	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/7/23 7/7/2023 01/07/23 01/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208THS42	Safety Management & Labour Law	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE -I

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

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

MODULE -II

Design of air pollution control system: Industrial sources of air pollution, emission factors, regulations control strategies, policies, gaseous pollutant control: gas absorption in tray and packed towers, absorption with/without chemical reaction, removal of SO_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.

01/7/23 11/7/2023 01/7/2023 01/07/23

MODULE –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.

MODULE -IV

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

MODULE -V

Explosion protecting systems: Principles of explosion, detonation and blast waves, explosion, parameters, explosion protection, containment, flame arrestors, isolation, suppression, venting, explosion relief of large enclosure, explosion venting, inert gases, plant for generation of inert gas rupture disc in process vessels and lines explosion, suppression system based on carbon dioxide (CO_2) and halons-hazards in LPG, ammonia (NH_3), sulphur dioxide (SO_2), chlorine (Cl_2) etc.

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	2	3	1	-	2	2	-	2	-	2	2	3	2	3
CO2	3	2	2	2	-	3	2	-	-	-	2	1	3	2	2
CO3	3	3	2	3	-	2	3	-	-	-	2	2	2	3	2
CO4	3	3	3	3	-	2	2	-	1	-	2	2	3	2	2
CO5	3	3	3	2	-	2	2	-	2	-	2	2	2	2	-

- **1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**

01/7/23 1/7/2023 01/07/23 01/07/23

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208TPE71	Product Design and Manufacturing	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this Course is to:

- Competence with a set of tools and methods for product design and manufacturing
- Develop confidence in your own abilities to create a new product.
- Create awareness of the role of multiple functions in creating a new product (e.g., marketing, finance, industrial design, engineering, production).
- Apply creative process techniques in synthesizing information, problem-solving and critical thinking

COURSE OUTCOMES:

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

- Understand the product design and manufacturing process
- Design and validate technological solutions to defined problems and write clearly and effectively for the practical utilization of their work
- Discuss various phases of value engineering, analyse the function, approach of function and evaluation of function and to determine the worth and value
- Select suitable manufacturing processes to manufacture the products optimally and to identify/control the appropriate process parameters.
- Use basic fabrication methods to build prototype models for hard-goods and soft-goods

COURSE CONTENT:

Module 1

Introduction to Product Design and Manufacturing: Design by evolution, Design by innovation, Production□Consumption cycle, Ideas and methods of product realization process, Manufacturing, Logistics & Producibility, Problem Confronting the Designers, Steps of the Engineering Design Process, Defining the Problem and Setting Objectives

Module 2

Product design morphology: Developing Provisional Designs, Evaluation and Decision□Making, The morphology of design (the seven phases)

Product Characteristics: Developing successful products, Attributes of successful product developments, Key factors for successful products, Product Characteristics, Aesthetic Design, Design Principles, Product Message, Visual Design, Elements of Visual Design

New Course Introduced

Module 3

Value engineering in product design: Advantages, Applications in product design, Problem identification and selection, Analysis of functions, Anatomy of function. Primary versus secondary versus tertiary/unnecessary functions, Functional analysis: Functional Analysis System Technique (FAST), Why poor Value? The Value Engineering Methodology, Information phase, Function Phase, Creativity Phase, Evaluation Phase, Development Phase, Implementation Phase, Case studies

Module 4

Material and Manufacturing process selection: Importance of material selection, Factors affecting the material selection process, Material selection procedures, Design Recommendations, how to select manufacturing process? Primary, secondary and tertiary manufacturing process, Design guidelines, Design for Manufacturing, Design for Assembly, Design for Environment

Product costing: Cost and Price Structure Information Need Sources, Estimating Direct and Indirect Costs, Design and Manufacturing Costs, Ways to Model Manufacturing Costs

Module 5

Rapid Prototyping an introduction: Rapid Prototyping or Additive Manufacturing, Rapid Prototyping: Topography and Photosculpture, Rapid Prototyping □ An Integral Part of Concurrent Engineering, Geometrical Modelling Techniques, Rapid Prototyping Information Workflow, Rapid Prototyping Processes

Reverse Engineering: Reverse Engineering-Definition, Importance, Applications, Process ,3D Scanning Process

Managing Competitiveness: Benchmarking, Outsourcing, Mass customisation

TEXT & REFERENCE BOOKS:

1. Product design and development, Eppinger, S. and Ulrich, K., 2015. McGraw-Hill Higher Education
2. Integrated product and process design and development: the product realization process, Magrab, E.B., Gupta, S.K., McCluskey, F.P. and Sandborn, P., 2009. CRC Press.
3. Product design for manufacture and assembly. Computer-Aided Design, Boothroyd, G., 1994.
4. Product design and manufacturing by Prof J Ramkumar and Prof Amandeep Singh Oberoi IIT Kanpur, NPTEL sources

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	2	-	-	-	2	1	1	2
CO2	3	2	3	2	2	2	2	2	-	-	-	2	2	2	2
CO3	3	2	3	2	2	2	2	2	-	-	-	2	2	2	2
CO4	3	2	3	2	2	2	2	2	-	-	-	2	2	2	2
CO5	3	2	2	2	1	2	1	2	-	-	-	1	1	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/7/23 1/7/2023 03/07/23 01/07/23

New Course Introduced

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208TPE72	Microprocessors in Automation	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE - I

Number Systems: Codes, digital electronics, logic gates, combinational circuits design, flip-flops, sequential logic circuits design, counters, shift registers.
Introduction to 8085 functional block diagram, registers, ALU, bus systems, timing and control signals.

MODULE - II

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

MODULE - III

Assembly language programming: Addressing modes, instruction set, simple programs in 8085, concept of interrupt, need for interrupts, interrupt structure, multiple interrupt requests and their handling, programmable interrupt controller, interfacing peripherals, programmable peripheral interface (8255).

MODULE - IV

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

New Course Introduced

MODULE - V

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

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	1	2	-	-	-	2	1	1	3
CO2	2	3	3	2	2	1	2	2	-	-	-	2	2	3	1
CO3	2	2	3	3	2	2	2	2	-	-	-	3	3	2	2
CO4	3	3	2	1	2	1	3	2	-	-	-	2	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

New Course Introduced

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208TPE73	Computer Aided Process Planning (CAPP)	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this Course is to:

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

COURSE OUTCOMES:

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

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

COURSE CONTENT:

MODULE -I

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

MODULE – II

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

New Course Introduced

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

MODULE –III

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

MODULE – IV

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

MODULE – V

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

TEXT & REFERENCE BOOKS:

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

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2								2	1	2
CO2	3	2	2	2	1					1			2	2	2
CO3	3	1	3	1	2								2	1	2
CO4	3	2	3	1	2								2	1	2
CO5	3	2	1	1	2				1		3		2	1	2

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B. Tech. VIII Sem.	IP208TOE03	Advanced Manufacturing Processes	3	-	-	15	15	70	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

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

COURSE CONTENT:

MODULE – I

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

MODULE – II

Advanced machining theory & practices: Mechanisms of chip formation, shear angle relations, and theoretical determination of cutting forces in orthogonal cutting, analysis of turning, drilling and milling operations, mechanics of grinding, dynamometry, thermal aspects of machining, tool wear, economics of machining, processing of polymers, ceramics, and composites.

MODULE – III

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

MODULE – IV

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

01/07/23 01/07/23 01/07/23

New Course Introduced

MODULE -V

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

COURSE OUTCOMES:

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

- Basic understanding of advanced casting processes and able to analyze real-life application in various organizations.
- Categorize different material removal, joining processes as per therequirements of material being used to manufacture end product.
- Choose material processing technique with the aim of cost reduction, reducing material wastage & machining time.
- Estimate process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.
- Evaluation and Analysis of the different advanced welding process to select most suitable welding procedure and consumables for a product.

TEXT & REFERENCE BOOKS:

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

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	2	2	2	-	1	1	2	1	2	2
CO2	2	2	2	1	1	-	-	1	1	1	1	2	1	2	2
CO3	1	2	2	2	1	1	2	1	2	1	1	2	2	2	2
CO4	2	3	3	3	1	-	-	2	-	1	1	2	2	2	2
CO5	2	2	2	3	2	1	1	2	-	2	1	2	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

01/7/23 01/07/23 01/07/23

New Course Introduced

Course Name & Semester	Course No.	SUBJECT	PERIODS			EVALUATION SCHEME				CREDITS
			L	T	P	INTERNAL ASSESSMENT		ESE	SUB-TOTAL	
						CT-I	CT-II			
B.Tech VIII Sem.	IP208TMC03	Essence of Traditional Knowledge	3	-	-	-	-	-	-	-

COURSE LEARNING OBJECTIVES:

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

COURSE OUTCOMES:

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

COURSE CONTENT:

- Basic structure of Indian knowledge system: अष्टादशविद्या -४वेद, ४उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थापत्य आदि) ६वेदांग (शिक्षा, कल्प, निरुक्त, ज्योतिष, छंद) ४उपाङ्ग (धर्मशास्त्र, मीमांसा, पुराण, तर्कशास्त्र).
- Modern science and Indian knowledge system.
- Yoga and holistic health care.
- Case studies.

TEXT & REFERENCE BOOKS:

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

7. **Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):**

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	2	-	-	-	2	1	1	2

8. **1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)**

01/07/23 01/7/23 11/7/2023 01/07/23

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY
Department of Industrial & Production Engineering
Choice based credit system (CBCS)–New, Scheme of Teaching& Examination
W.E.F. Session: 2023–24
B. TECH SECOND YEAR, III SEMESTER

SN	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
			L	T	P	CIA	SEA		
1	AMUCTE1	Mathematics-III	3	–	–	40	60	100	3
2	IPUCTT1	Manufacturing Processes– I	3	–	–	40	60	100	3
3	IPUCTT2	Fluid Mechanics	3	–	–	40	60	100	3
4	IPUCTT3	Materials Science	3	–	–	40	60	100	3
5	IPUCTO1	*Open Elective*	3	–	–	40	60	100	3
6	IPUCTK_	*1. Program Elective-1* *2. Program Elective-2*	3	–	–	40	60	100	3
Total			**18**	**–**	**–**	**240**	**360**	**600**	**18**
PRACTICALS									
1	IPUCLE1	Programming in C & MATLAB	–	–	3	25	25	50	1.5
2	IPUCLT1	Fluid Mechanics Lab	–	–	3	25	25	50	1.5
Total			**–**	**–**	**6**	**50**	**50**	**100**	**3**
GRAND TOTAL			**18**	**-**	**6**	**290**	**410**	**700**	**21**

List of Department/ Program Elective

SN	Course No.	Subject
1.	IPUCTK1	Industrial Engineering
2.	IPUCTK2	Work Study and Ergonomics

List of Institute Core/ Open Elective

SN	Course No.	Subject	Offering Department
1.	CHUCTO1	Engineering Materials	Chemical
2.	MEUCTO1	Introduction to Thermodynamics	Mechanical
3.	ECUCTO1	Data Communication	ECE
4.	CEUCTO1	Green Buildings	Civil
5.	ITUCTO1	Computer Organization & Architecture	IT
6.	CSUCTO1	Data Structure with C++	CSE
7.	IPUCTO1	I. C. Engine	IPE

Internal Assessment: – Two class tests of 15 marks each will be conducted. Moreover, 5 marks will be for attendance and 5 marks are allocated for the Assignments. surprise test, quiz test etc.

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New Course Introduced

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	AMUCTE1	Mathematics-III	3	-	-	15	15	5	5	60	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Provide the information related to existence and uniqueness criteria applied to numerical methods.
- Providing the knowledge of convergences criteria and awareness of reasons behind the failure of numerical methods.
- Find numerical approximations to the roots of equation by various method.
- Find numerical solution to a system of linear equations by Gaussian elimination and Gauss–Siedel iterative etc.
- Learn the numerical solution for ordinary differential equation.

COURSE CONTENT:

Module – I

Laplace Transforms: Linearity, Existence, Laplace Transforms of derivatives and integrals, Shifting theorem Inverse Laplace Transforms: Linearity property of inverse transform, convolution theorem.

Complex Variables: Analytic functions, Cauchy's integral theorem, Taylor series.

Module –II

Numerical solution of algebraic and transcendental equations: Secant method, Regula–falsi method, Newton Raphson method. Solution of a system of simultaneous linear algebraic equations direct method: Gauss elimination method, Iterative methods, Gauss Seidel iterative method.

Module –III

Calculus of finite differences: Finite differences, difference formula, operators and relation between operators, inverse operator. Interpolation with equal intervals: Newton's forward and backward interpolation formula. Interpolation with unequal intervals: Lagrange's interpolation.

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Module –IV

Numerical differentiation and integration: Numerical differentiation, maxima and minima of a tabulate function. Numerical integration: Trapezoidal rule, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule, Boole's rule, Weddle rule.

Module–V

Numerical solution of ordinary differential equation: Taylor series method, Euler's method, modified Eule method, Runge's method, Runge Kutta method.

TEXT & REFERENCE BOOKS:

1. Numerical methods for scientific and engineering computations–Jain &Iyngar, New Age Internationa Publications.
2. Numerical analysis – G.S. RAO, New Age International Publications.
3. Numerical methods in engineering and science– B.S.Grewal, Khanna Publishers.
4. Advance engineering methods – H. K. Das, S. Chand Publications.
5. Computer oriented numerical methods V.Rajaraman, PHI Learning Publications.

COURSE OUTCOMES:

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

CO1. Apply knowledge of numerical analysis for understanding, formulating and solving engineering problems.

CO2. Identify, analysis, and solve mechanical engineering problems useful to the society.

CO3. Work effectively with engineering and science teams as well as with multidisciplinary analysis.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1							2	1	2	1
CO2	3	2	2	2	1							2	3	2	2
CO3	3	3	2	3	2							2	1	2	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	IPUCTT1	Manufacturing Processes– I	3	-	-	15	15	5	5	60	100	3

COURSELEARNINGOBJECTIVES:

The objective of this course is to:

- Understand the principle, concept, thermal and metallurgical aspects during solidification of metal.
- Demonstrate about principles/ methods of casting with detail design of gating/ riser system needed for casting, defects in cast objects and requirements for achieving sound casting.
- Evaluate foundry practices like pattern making, mould making, core making and inspection of defects.
- Build knowledge about principles and criteria of yielding during forming of metals, analysis of different bulk metal forming processes following different analysis approach.
- Understand the application of Powder metallurgy.
- Analyze various metal forming processes and plastic deformation during forming processes.

COURSE CONTENT:

Module –I

Foundry: Moulding method and materials, sand-clay-water system, additives, pattern making and types, pattern allowances & design considerations, types of moulding sand & their properties, testing, cores and sand core boxes, core making, moulding machine.

Gating system: Elements & design of gating system, design of riser, solidification of casting.

Module –II

Melting furnaces and practices: Melting cast iron, steel and non-ferrous material, cupola, charge calculation, open furnaces, converter and crucible furnaces, electric, direct arc furnace, inductive furnace.

Approved in BOS meeting held on 06.10.2023

06/10/23

4

Module –III

Special casting processes: Centrifugal and investment casting, shell, types and principle of die casting, squeez casting, gravity and pressure die casting, die casting consideration, continuous casting, centrifugal casting, slus casting, casting defects.

Module –IV

Metal forming:

Metal forming: Need and classification, elastic and plastic deformation, yield criteria, fundamentals of hot and cok working processes. Introduction, classification and analysis of Bulk deformation process (Rolling, Forging, wire drawing, and Extrusion) and Sheet metal forming process (bending, deep drawing, punching & blanking coining,

Module –V

Powder metallurgy:

Introduction: scope of powder metallurgy, characterization of metal powders, physical properties size and shape determination, technological properties-apparent density, tap density, green density, sintered density, flow rate, post-processing operations etc.

TEXT & REFERENCE BOOKS:

1. Manufacturing processes for engineering materials - Kalpakjian and Schmid, Pearson India.
2. Manufacturing Science- A. Ghosh and A. K. Mallik, East-West Press Pvt. Ltd. New Delhi.
3. Manufacturing Technology (Foundry, Forming and Welding) – P. N. Rao, Tata McGraw Hill Publishing Company.
4. Materials and Processes in Manufacturing - E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi.
5. Production Engineering Sciences - P. C. Pandey and C. K. Singh, Standard Publishers Ltd.
6. R.M. German, Powder Metallurgy Science, Metal Powder Industries Federation, Princeton, New Jersey

COURSE OUTCOMES:

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

CO1. Decide yield of a material according to different yield theory for a given state of stress.
CO2. Analyze the different bulk metal forming process mechanics using different analysis approach and calculate the force, power requirements etc.
CO3. Evaluate the effect of process parameters on the process mechanics during bulk metal forming.
CO4. Select appropriate design of gating systems and manufacturing processes in order to design products.
CO5. Identify the various metal forming techniques and the theory of plasticity and its application for analyzing various metal forming Processes.
CO6. To have an idea about powder metallurgy products used in the industry.

Approved in BOS meeting held on 06.10.2023

06/10/23

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcome (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO
CO1	3	2	1	2	-	-	-	-	-	-	2	1	2	2	2
CO2	3	2	1	2	-	-	-	-	-	-	2	2	2	2	2
CO3	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2
CO4	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2
CO5	3	1	2	2	-	-	-	-	-	-	2	2	2	2	2
CO6	2	2	1	1	-	-	-	-	-	-	1	2	1	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA				SEA		
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance			
B. Tech III Sem.	IPUCTT2	Fluid Mechanics	3	-	-	15	15	5	5	60	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Explain fundamentals of fluid mechanics, which is used in the applications of aerodynamics, hydraulics, marine engineering, gas dynamics etc.
- Develop an understanding about hydrostatic law, principles of buoyancy and stability of a floating body and its application on mass, momentum and energy equation in fluid flow.
- Explain basic laws and equations used for analysis of static and dynamic fluids.
- Inculcate the importance of fluid flow measurement and its applications in industries.
- Determine the losses in a flow system, flow through pipes and flow past immersed bodies.

COURSE CONTENT:

Module – I

Introduction of Fluid: Introduction, continuum, density, specific weight, specific gravity, kinematic and dynamic viscosity, variation of viscosity with temperature, Newton law of viscosity, vapour pressure, boiling point, cavitation surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics: Fluid Pressure, pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Pressure measurement devices: Piezometer, U–tube manometer, single column manometer, U–tube differential manometer, micro–manometers, pressure gauges.

Approved in BOS meeting held on 06.10.2023

06/10/23

7

New Course Introduced

Module –II

Fluid Kinematics: Classification of fluid flow: steady and unsteady flow, uniform and non–uniform flow, lamina and turbulent flow, rotational and irrotational flow, compressible and incompressible flow, ideal and real fluid flow one, two and three dimensional flows. Stream line, path line, streak line and stream tube, stream function, velocit potential function. One, two and three – dimensional continuity equations in Cartesian coordinates.

Module –III

Fluid Dynamics: Surface and body forces, equations of motion, Euler's equation, Bernoulli's equation, derivation energy principle, practical applications of Bernoulli's equation, Venturimeter, Orifice meter and Pitot tube momentum principle, forces exerted by fluid flow on pipe bend, vortex flow: free and forced.

Module –IV

Dimensional analysis and dynamic similitude: Definitions of Reynolds number, Froude number, Mach number, Weber number and Euler number, Rayleigh's method, Buckingham's π–theorem. Model studies: similitude, dimensionless number and its significance.

Module –V

Laminar Flow: Reynold's experiment, flow of viscous fluids in circular pipe, shear stress and pressure gradient relationship, velocity distribution, Hagen-Poiseuille equation, flow of viscous fluids between two parallel plates (Counter flow), shear stress and pressure gradient relationship, velocity distribution, drop of pressure head.

Turbulent Flow: Effect of turbulence, expression for loss of head due to friction in pipes (Darcy-Weisbach equation) and expression force-efficient of friction in terms of shear stress.

Flow through pipe: Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipepower transmission through pipe, water hammer in pipes.

COURSE OUTCOMES:

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

CO1-Develop the concept and Solve problems based on mass, momentum and energy conservation and fluid properties.
CO2- Relate different fluid properties with flow characteristics.
CO3-Knowledge of dimensional analysis and physical significance of dimensionless numbers as well as the concept of drag and lift in viscous fluid flow and losses due to viscous flow in pipes
CO4-Apply the similitude concept and set up the relation between a model and a prototype.
CO5- Develop the analytical skills in designing the pipe line and losses in pipes.

TEXT & REFERENCE BOOKS:

1. Fluid Mechanics and Machinery–C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010.
2. Hydraulics and Fluid Mechanics–P. M. Modi and S. M. Seth, Standard Book House.
3. Theory and Applications of Fluid Mechanics–K. Subramanya, Tata McGraw Hill.

Approved in BOS meeting held on 06.10.2023

06/10/23

. Fluid Mechanics with Engineering Applications–R.L. Daugherty, J.B. Franzini and E.J. Finnemor International Student Edition, McGraw Hill.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	3	2	3	-	-	1	-	-	-	-	1	3	2	2
CO2	3	3	3	2	-	-	-	-	-	-	-	1	3	2	2
CO3	3	3	2	2	-	-	-	-	-	-	-	-	3	1	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-	2	2	1

Weightage1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	IPUCTT3	Materials Science	3	-	-	15	15	5	5	60	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- To classify the material and select the material for different application.
- Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
- To apply different theory of failure and predict the failure in material.
- To know different phases and heat treatment methods to tailor the properties of Fe–C alloys.

COURSE CONTENT:

Module – I

Crystal Structure: Unit cells, metallic crystal structures, ceramics. Imperfection in solids: point, line, interfacial and volume defects, dislocation strengthening mechanisms and slip systems, critically resolved shear.

Module – II

Mechanical property measurement: Tensile, compression and torsion tests, Young's modulus, relations between true and engineering stress–strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery.

Hardness: Rockwell, Brinell and Vickers and their relation to strength.

Module – III

Static failure theories: Ductile and brittle failure mechanisms, Tresca, Von–mises, maximum normal stress, Mohr–Coulomb and modified Mohr–Coulomb.

Fracture mechanics: Introduction to stress intensity factor approach and Griffith criterion.

Approved in BOS meeting held on 06.10.2023

06/10/23

10

Fatigue failure: High cycle fatigue, stress–life approach, SN curve, endurance and fatigue limits, effects of mean stress using the modified Goodman diagram, fracture with fatigue.

Module – IV

Introduction to non–destructive testing (NDT) alloys, substitutional and interstitial solid solutions. Phase diagrams interpretation of binary phase diagrams and microstructure development, eutectic, peritectic, peritectoid an monotectic reactions. Iron, iron–carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrit and cementite, cast iron.

Module – V

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe–C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties: austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo–nitriding, flame and induction hardening, vacuum and plasma hardening alloying of steel.

Properties of stainless steel and tool steels, maraging steels, cast irons, grey, white, malleable and spheroidal cast irons, copper and copper alloys, brass, bronze and cupro–nickel, aluminium and Al–Cu– Mg alloys, nickel based super alloys and titanium alloys.

TEXT & REFERENCE BOOKS:

1. Materials Science and Engineering: An Introduction – W. D. Callister.
2. Engineering Materials – Kenneth G. Budinski and Michael K. Budinski.
3. Material Science and Engineering – V. Raghavan.
4. Engineering Materials and Metallurgy – U. C. Jindal.

COURSE OUTCOMES:

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

- Explain and analyse the effect of crystal structure on the properties of material.
- Apply the knowledge of material science for selection of best material in various application of engineering.
- Compare the material properties of ferrous and non-ferrous material.
- Analyse the heat treatment process and relate cooling rate on the properties of material.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	-	1	-	-	1	-	-	1	-	-	-	-
CO2	2	1	1	2	1	-	-	-	-	-	-	-	1	1	2
CO3	2	-	-	2	2	-	-	-	-	-	-	-	1	2	1
CO4	1	1	1	2	-	-	-	-	-	-		-	1	-	2
CO5	1	1		2	1	-	-	-	-	-	-	-	1	1	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

Approved in BOS meeting held on 06.10.2023

06/10/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	IPUCTO1	I. C. Engine	3	-	-	15	15	5	5	60	100	3

COURSE OBJECTIVES:

1. To study classifications of internal combustion engine.
2. To understand how and why actual cycles deviate from air standard cycle and fuel-air cycle.
3. To understand combustion in spark ignition engine and diesel engines.
4. To impart knowledge about carburetion, gasoline injection and diesel injection.
5. To impart knowledge about ignition, cooling, lubrication and governing systems.
6. To impart knowledge about various engine performance characteristics and its testing.

COURSE CONTENT:

Module-I

Introduction of internal combustion engines, classification of I.C. engines, engines components, basic engine nomenclature, four stroke S.I. and C.I. engine, two stroke engines, comparison of two stroke and four stroke engines, comparison of S.I. and C.I. engines.

Module -II

Air Standard Cycle: Otto cycle, Diesel cycle, Dual cycle, comparison between Otto, diesel and dual cycles, fuel-air cycles and actual-cycles.

SI Engines: Combustion phenomenon in S.I. Engines.Flame development and its propagation, ignition lag, knocking in S.I. engines, Carburetor,Theory of carburetion.

06/10/23

12

Approved in BOS meeting held on 06.10.2023

Module -III

CI Engine: Combustion phenomenon in CI engines, p-v diagram and their study for various stage of combustion delay period, detonation in C.I. engines, Fuel injection in CI engines

Module -IV

Engine Friction and Lubrication: Total engine friction, blow by losses, pumping losses, factors effecting engine friction, mechanism of lubrication, lubrication system.

Module - V

Cooling system: Piston and cylinder temperature distribution, principles and various methods of cooling.Measurement of performanceParameters.

TEXT BOOKS:

1. A Course in IC Engines - M.L. Mathur and R.P. Sharma, Laxmi Publication.
2. Internal Combustion Engines –V. Ganesan, TMGH Publication.
3. Internal Combustion Engines: Theory and Practice - G.F. Taylor.
4. Introduction to IC Engine -Stone, Richard.
5. Fundamentals of I.C. Engine- Gupta, PHI.

COURSE OUTCOME:

The after completion of the course the student will be able to

CO1: Demonstrate the components & combustion phenomenon of SI and CI engines.

CO2: Perform a thermodynamic analysis of Otto, Diesel, and Dual cycle models

CO3: Demonstrate the combustion phenomenon of SI engine and CI engine

CO4: Understand cooling, friction & lubrication systems in engines

CO5: Evaluate the performance parameters of IC engines.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	3	1	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	1	1
CO4	3	1	-	-	-	-	-	-	-	-	-	1	3	1	-
CO5	3		-	-	-	-	-	-	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Approved in BOS meeting held on 06.10.2023

06/10/23

13

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	IPUCTK1	Industrial Engineering	3	-	-	15	15	5	5	60	100	3

COURSE OBJECTIVES:

1. To impart capability of successfully planning, controlling, and implementing projects.
2. To apply the principles of engineering science, maths, technology and human engineering, involving industry-relevant problems.
3. To contribute to the profitable growth of industrial economic sectors by using IE analytical tools, effective computational approaches and systems thinking methodologies.
4. To recognize the tools of efficiency, effectiveness and productivity for the resources of the plant and facility.
5. To implement the policy of wage administrations for making the labour more and higher productive in their work.

COURSE CONTENT:

Module-I

Introduction: History & development of industrial engineering. Productivity, means of increasing productivity, work study, productivity and work study, human factor in the fabrication, work of F. W. Taylor, Frank and Lillian Gilberth and their contribution.

Module-II

Method study: Definition & basic procedure, selection of jobs. Recording technique: micro motion study, Therbligs, cyclograph,chronocyclo graph, principle of motion economy, design of work place layout, analysts in the form of chart, operation chart, flow process chart, flow diagram, string diagram, man machine chart, two hand chart, Simo chart.

Module-III

Work measurement: Definition, objectives, application, number of cycles to be timed, time study equipment, performance rating, allowance, lumber of cycle to be studied, determination of standard time, predetermined motion time system, conducting work sampling study & establishing standard time.

Approved in BOS meeting held on 06.10.2023

06/10/23

14

New Course Introduced

Module-IV

Wages & incentives: Characteristics of a good wage or incentive system, method of wage payment, concept o wage & incentive schemes, financial and non-financial: Taylor's differential piece rate, Halsey premium plan Merric's multiple piece rate system, group incentive scheme.

Ergonomics: Work space dimension, design of work place, environmental stresses & impacts on human work.

Module-V

Value engineering: Introduction, concept of value, value analysis approaches, job plan, value tests.

Industrial safety: Analysis of cost of accident, hazards in various fields like fire, electrical shocks, chemical organization for safety, plant safety, govt. legislation for safety, safety rules.

TEXT BOOKS:

1. Introduction to work study–I.L.O., Oxford Press.
2. Motion and time study – Mundel, Prentices Hall India.
3. Motion and Time Study– Ralph M Barnes, John Wiley and sons.
4. Industrial Engineering – M. I. Khan, New Age International Publication.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Ability to apply mathematics and science in Industrial engineering.

CO2: Ability to design and conduct experiments, as well as to analyse and interpret data.

CO3: Ability to identify, formulate and solve engineering problems.

CO4: Ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practice.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	3	2	2	2	2	-	2	2	2	2	2	3	2	3
CO2	3	2	2	2	2	2	-	2	-	-	2	1	3	2	2
CO3	3	3	2	2	2	-	-	3	-	-	2	2	2	3	-
CO4	3	3	2	3	3	1	1	2	1	-	2	1	3	2 .	-
CO5	3	3	2	2	2	-	-	2	2	-	1	2	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech III Sem.	IPUCTK2	Work Study and Ergonomics	3	-	-	15	15	5	5	60	100	3

COURSE OBJECTIVES:

1. To provide the knowledge of interaction of man, machine and integration of their tools.
2. To apply the principles of math, science, technology and engineering, involving industry-relevant problems.
3. To provide the comfort ability in working environment of all the employee, labour.
4. To apply the concept in the examination of human and work in all their contexts.

Module - I

Introduction to man machine systems and ergonomics, human factors in design and engineering, needs of ergonomics and aesthetic design, physiological aspects of work.

Module - II

Work measurement through physiological tests, work physiology, paced and unpaced work performance, data logging, data collection, data reduction and analysis techniques, gross human anatomy, anthropometry, bio mechanics, muscle strength and exertion potential of different limbs.

Module - III

Work capacity, environmental effects, exercises for evaluation of pastoral form and work spaces, environmental conditions including temperature, illumination, noise and vibration.

Module - IV

Perception and information processing, design of displays, hand control, typography, and readability, layout and composition.

Approved in BOS meeting held on 06.10.2023

06/10/2023

16

New Course Introduced

Module - V

Exercises in evaluation of human response to product interface, product safety and product liability, desig consideration for appearance, colour, texture and form.

TEXT BOOKS:

1. Applied Ergonomics– D. C. Alexander, Taylor & Francis.
2. Ergonomics for Beginners– Jan Dul, Taylor & Francis.
3. The Nature & Aesthetics of Design–David Pye, Cambium Press.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Ability to design and conduct experiments, as well as to analyse and interpret data.

CO2: Ability to identify, formulate and solve engineering problems.

CO3: Ability to use the techniques, skills, and modern engineering tools necessary for work study practice.

CO4: Assess the effect of physical environment factors on comfort and performance.

CO5: Explain the influence of ergonomic principles on work organisation and culture.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	2	3	2	-	3	2	-	-	-	-	2	3	2	2
CO2	2	3	3	2	-	2	2	-	-	-	2	2	3	2	2
CO3	3	2	2	2	-	2	3	-	-	-	2	2	2	3	2
CO4	3	2	2	2	-	2	2	-	-	-	1	2	3	2	2
CO5	3	2	2	2	-	2	2	3	-	-	-	2	2	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
			L	T	P				
B. Tech III Sem.	IPUCLE1	Programming in C & MATLAB	-	-	3	25	25	50	1.5

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Familiarize the student in introducing and exploring MATLAB & C software's.
- Enable the student on how to approach for solving engineering problems using simulation tools.
- Prepare the students to use MATLAB/C in their project works.
- Provide a foundation in use of this software's for real time applications

LIST OF EXPERIMENT (Minimum 10 experiments to be performed):

1. Write a program in 'C' to find simple interest'
2. Write a program in 'C' to calculate sum of three numbers.
3. Write a program in 'C' to calculate number of months and days.
4. Write a program in 'C' to find whether a year is leap or not.
5. Write a program in 'C' to convert the given temperature in Fahrenheit to Celsius.
6. Write a program in 'C' to find whether a number is odd or even.
7. Write a program in 'C' to calculate factorial of a given number.
8. Write a program in 'C' to find the real roots of a quadratic equation.
9. Write a program in 'C' for secant method.
10. Write a program in 'C' for Newton Raphson method.
11. Write a program in 'C' for Regula Falsi method.
12. Write a program in 'C' for Gause elimination and Gause Seidel methods.
13. Write a program in 'C' for Lagrange's interpolation.
14. Write a program in 'C' for Simpson Rule.
15. Write a program in 'C' for Euler method and Runge- Kutta Method.
16. A programme to show conversion from string to integer and vice versa.
17. To know the history and features of MATLAB & the local environment of MATLAB.

18

Approved in BOS meeting held on 06.10.2023

18. Find the roots of equations find the values at different points and plot the graph.
19. Find the derivative of an equation in MATLAB.
20. Find the area enclosed between the curves in MATLAB.
21. Find the addition, subtraction, multiplication, transpose and inverse of matrices.
22. Find the rank: Eigen values and Eigen vector of matrices.
23. Write a program to find the roots of an equation using Bi–section method, Regula–falsi method and Newtor Raphson method.
24. Plot the surface for an equation using MATLAB.

COURSE OUTCOMES:

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

CO1. Perform the programming & simulation for engineering problems.

CO2. Learn importance of this software for lab experimentation.

CO3. Articulate importance of software's in research by simulation work.

CO4. In-depth knowledge of providing virtual instruments on *C* language environment.

CO5. Ability to write basic mathematical, numerical method problems in MATLAB.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO2	3	2	1	3	2	-	-	-	-	-	-	2	1	2	2
CO3	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO4	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO5	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
			L	T	P				
B. Tech III Sem.	IPUCLT1	Fluid Mechanics Lab	-	-	3	25	25	50	1.5

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Provide practical knowledge in verification of principles of fluid flow.
- Demonstrate the classical experiments in fluid mechanics.
- Correlate various flow measuring devices such as Venturimeter, orifice meter and notches etc.
- Impart knowledge in measuring pressure, discharge and velocity of fluid flow
- Explain practically the major and minor losses.

LIST OF EXPERIMENT:

1. Measurement of viscosity.
2. Study of pressure measuring devices.
3. To determine the stability of floating body.
4. To determine hydrostatics force on flat surfaces/curved surfaces.
5. To verify the Bernoulli's theorem.
6. To determine flow rate using Venturimeter.
7. To determine flow rate using Orifice meter.
8. Velocity distribution in pipes.
9. To study Laminar flow in a pipeline.

COURSE OUTCOMES:

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

- Present experimental results in the form of written report.
- Measure pressure, velocity and flow rate.
- Conduct experiments (in teams) in pipe flows and open-channel flows and interpreting data from model studies to prototype cases, as well as documenting them in engineering reports.
- Analyze practical problems related to peer industries such as power plants, chemical industries etc.
- Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design.

Approved in BOS meeting held on 06.10.2023

06/10/23

20

Course Outcomes and their mapping with Programme Outcomes:

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO
CO1	1	1	1	1	1	-	1	-	-		-	-	-	-	-
CO2	2	2	-	-	1	-	-	-	-	-	-	-	1	1	2
CO3	2	-	1	1	1	-				1	-	-	1	2	-
CO4	1	1	1	-		-	-	-	-	-	-	-	1	-	2
CO5	1	1	-	3	1	-	-	-	-	-	-	-	1	1	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

06/10/23

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GURU GHASIDAS VISHWAVIDYALAYA (A CENTRAL UNIVERSITY), BILASPUR, CG
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY
Department of Industrial & Production Engineering
Choice based credit system (CBCS)–New, Scheme of Teaching& Examination
W.E.F. Session: 2023–24
B. TECH SECOND YEAR, IV SEMESTER

			Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
SN	Course No.	Subject	L	T	P	CIA	SEA	L	
1	AMUDTT1	Statistical Methods	3	–	–	40	60	100	3
2	IPUDTT1	Theory of Machines	3	–	–	40	60	100	3
3	IPUDTT2	Strength of Materials	3	–	–	40	60	100	3
4	IPUDTO1	*Open Elective*	3	–	–	40	60	100	3
5	IPUDTK_	1. *Program Elective-1* 2. *Program Elective-2*	3	–	–	40	60	100	3
		Total	**15**	–	–	**200**	**300**	**500**	**15**
		PRACTICALS							
1	IPUDLT1	Material Testing Lab	–	–	3	25	25	50	1.5
2	IPUDLT2	Theory of Machines Lab	–	–	3	25	25	50	1.5
3	IPUDPV1	Mini Project	–	–	4	50	50	100	2
		Total	–	–	**10**	**100**	**100**	**200**	**5**
		GRAND TOTAL	**15**	–	**10**	**300**	**400**	**700**	**20**

List of Department/ Program Elective		
SN	Course No.	Subject
1.	IPUDTK1	Engineering Thermodynamics
2.	IPUDTK2	Plant Layout& Material Handling

List of Institute Core/ Open Elective			
SN	Course No.	Subject	Offering Department
1.	CSUDTO1	Introduction to Information Science	CSE
2.	IPUDTO1	Automobile Engineering	IPE
3.	ECUDTO1	Introduction to Electronics Devices and Circuits	ECE
4.	CEUDTO1	Remote Sensing & GIS	Civil
5.	ITUDTO1	Computer Network	IT
	ITUDTO2	Fundamentals of Python Programming	
6.	CHUDTO1	Fluidization Engineering	Chemical
7.	MEUDTO1	introduction to Fluid Mechanics	Mechanical
8.	ESUDTO1	Effective Technical Communication	English

Internal Assessment: – Two class tests of 15 marks each will be conducted. Moreover, 5 marks will be for attendance and 5 marks are allocated for the Assignments, surprise test, quiz test etc.

Approved in BOS meeting held on 06.10.2023

1

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech IV Sem.	AMUDTT1	Statistical Methods	3	-	-	15	15	5	5	60	100	3

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

- Demonstrate knowledge of probability and the standard statistical distributions.
- Demonstrate understanding of how to design experiments and surveys for efficiency.
- Demonstrate the ability to perform complex data management and analysis.
- To enable the students to deal with uncertainty problems.
- To enable the students to establish the relation among the statistical data.

COURSE CONTENT:

Module – I

Introduction to statistics, mathematical statistics, variable, frequency distribution, type of series, measure of centra tendency various types of averages, mean median mode for grouped and ungrouped data, measure of dispersion.

Module – II

Curve fittings by method of least square, straight line parabola correlation, Karl Pearson's coefficient of correlation, limits for correlation coefficient, rank correction, regression linear regression, equation to the line of regression, regression coefficient, angle between two lines of regression.

Module – III

Theory of probability: Mathematical and statistical definition of probability sample space, finite sample space sample point, events theorem of total probability, sample and compound event, conditional probability, theorem of compound probability, Baye's theorem.

Module – IV

Theoretical distribution: Binominal distribution mean, standard deviation, Poisson distribution, mean, and standard deviation, normal distribution: mean and standard deviation.

Approved in BOS meeting held on 06.10.2023

06/10/23

2

New Course Introduced

Module – V

Random and simple sampling: Mean standard deviation in simple sampling of attribute, test of significant fc large sample test of significance based on Chi square, T, F and Z distribution degree of freedom, condition fo applying Chi-square test.

TEXT & REFERENCE BOOKS:

1. Mathematical Statistics– M. Roy, Ram Prasad Publications, Agra.
2. Probability & Statistics –P.C. Biswal, PHI Learning.
3. Statistics Analysis– A.A. Afti, Orioited Approach Academic Press.
4. Fundamental of Mathematical Statistics– S. C. Gupta and Kapoor, Sultan Chand and Sons, 1980.

COURSE OUTCOMES:

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

- Analyse and apply measures of location and measures of dispersion grouped and ungrouped series.
- Apply discrete and continuous probability distributions to various business problems.
- Perform test of hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases and learn the concept of p–values.
- Learn non–parametric test such as the Chi–square test for independence as well as goodness of fit.
- To enable the students to analyze data and draw appropriate statistical conclusions.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	3		-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	3	1	-	-	-	-	-	-	-	1	1	2
CO3	2	2	1	3	1	-	-	-	-	-	-	-	1	2	1
CO4	1	1	1	3	-	-	-	-	-	-	-	-	1	1	2
CO5	1	1	-	3	1	-	-	-	-	-	-	-	1	1	1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

06/10/23

Approved in BOS meeting held on 06.10.2023

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
			L	T	P	CIA				SEA		
						CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance			
B. Tech IV Sem	IPUDTT1	Theory of Machines	3	-	-	15	15	5	5	60	100	3

COURSELEARNINGOBJECTIVES:

The objective of this course is to:

- Impart knowledge of various types of links, mechanisms and machines and kinematics inversions.
- Familiarize the kinematics of mechanisms by drawing the velocity and the accelerations diagrams.
- Solving practical problems related to design of linkage mechanisms and cam and follower systems to generate specified output motions.
- Learn the importance of kinematics behind gear, gear trains and fundamental principles of flywheel.
- Explain the types of mechanical governors and to analyze its performance parameters.

COURSE CONTENT:

Module – I

Classification of mechanisms, basic kinematic concepts and definitions, degree of freedom, mobility, Grashof's law kinematic inversions of four bar chain and slider crank chains, limit positions, mechanical advantage, transmissior angle, description of some common mechanisms, quick return mechanism, straight line generators, universal joint rocker mechanisms.

Module –II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centre, velocity and acceleration analysis using loop closure equations kinematic analysis of simple mechanisms, slider crank mechanism dynamics, coincident points, Coriolis component of acceleration, introduction to linkage synthesis, three position graphical synthesis for motion and path generation.

Module –III

Classification of cams and followers, terminology and definitions, displacement diagrams, uniform velocity, parabolic, simple harmonic and cycloidal motions, derivatives of follower motions, specified contour cams, circular and tangent cams, pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers.

Approved in BOS meeting held on 06.10.2023

06/10/23

4

Module –IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gea contact ratio and interference/undercutting, helical, bevel, worm, rack & pinion gears, epicyclic and regular gea train kinematics, compound, reverted and epicyclic gear trains, velocity ratio of epicyclic gear trains.

Module –V

Turning moment of Flywheel: Function of a flywheel, crank effort diagrams, fluctuation of speed and energy effect of centrifugal tension of flywheel, inertia torque and its effects on crank effort diagrams.

Governors: Characteristics of centrifugal governors, Gravity controlled governors, Porter and Proell. Spring controlled centrifugal governor: Hartung and Hartnell governor, performance parameter: sensitivity, stability isochronisms, governor effort and power.

TEXT & REFERENCE BOOKS:

1. Theory of Machines– Thomas Bevan,CBS Publishers.
2. Mechanisms of Machines– W.L. Cleghorn, Oxford University Press, 2015.
3. Kinematics and Dynamics of Machinery– L. Norton Robert, McGraw-Hill.
4. Theory of Mechanisms and Machines – A. Ghosh, A. K. Mallik – EWP Press.
5. Theory of Machines and Mechanisms - J.Uicker, Gordon R Penstock & J.E. Shigley – Oxford International Edition.
6. Theory of Machines- by R S Khurmi, S Chand & Co Ltd.
7. Theory of Machines- by Rattan S S, McGraw Hill Education India Private Limited.

COURSE OUTCOMES:

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

CO1: Apply knowledge of Kinematics of machine for understanding, formulating and solving engineering problems.
CO2: Analyse the position, velocity and acceleration of mechanisms.
CO3: Construct cam profiles and analysis of their velocity and acceleration.
CO4: Understand the different types of gears, gear terminology, important gear trains and their practical applications.
CO5: Understand the various types of governors and its applications.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3
CO2	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3
CO3	3	2	2	3	2	-	-	-	-	-	-	2	3	1	3
CO4	3	2	2	3	2	-	-	-	-	-	-	2	3	1	3
CO5	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech IV Sem	IPUDTT2	Strength of Materials	3	-	-	15	15	5	5	60	100	3

COURSELEARNINGOBJECTIVES:

The objective of this course is to:

- Use different material properties and characteristics for various mechanical and structural applications.
- Categorize the stress and strain on the basis of different conditions/type of loading/nature of loading.
- Determine the various parameters such as stress, strain and deflection for various specimens.
- Compare the result using theoretical, graphical and experimental approach.
- Draw stress strain curve to show mechanical properties of material.
- Propose technique/methods to solve problems that match the one's strength.

COURSE CONTENT:

Module – I

Simple stresses and strains: Concept of stress and strain, St. Venant's principle, stress and strain diagram, elasticity and plasticity, types of stresses and strains, Hooke's law, stress–strain diagram for mild steel, working stress, factor of safety, lateral strain, Poisson's ratio, volumetric strain. Elastic moduli and relationship between them, bars of varying section, composite bars, temperature stresses. Strain energy, resilience, gradual, sudden, impact and shock loadings, simple applications.

Module –II

Compound stresses and strains: Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress–strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain.

Module –III

Bending moment and Shear force diagrams: Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Approved in BOS meeting held on 06.10.2023

06/10/23

6

New Course Introduced

Module –IV

Bending stress: Flexural stresses, theory of simple bending, assumptions, derivation of bending equation: M/I = f/ = E/R, neutral axis, determination of bending stresses, section modulus of rectangular and circular sections (soli and hollow), I,T, angle and channel sections, design of simple beam sections.

Shear stresses: Derivation of formula, shear stress distribution across various beam sections like rectangular circular, triangular, I, T angle sections.

Slope and deflection: Relationship between moment, slope and deflection, moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Module–V

Torsion: Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close coiled helical springs.

Thin cylinders and spheres: Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder and sphere subjected to internal pressures.

COURSE OUTCOMES:

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

CO1. Propose material properties for different mechanical and structural applications.
CO2. Formulate the fundamental concepts of stress/strain.
CO3. Examine various techniques to solve structural/mechanical members subjected to combined loading.
CO4. Apply various failure criteria for general stress states at points.
CO5. Use method of solution that matches one's capability.

TEXT & REFERENCE BOOKS:

1. Elements of Strength of Materials–S.Timoshenko and D. H. Young, Affiliated East-West Press.
2. Solid Mechanics –S. M. A Kazmi,McGraw-Hill.
3. Mechanics of Materials–R.C.Hibbeler, Pearson.
4. An Introduction to the Mechanics of Solids–S. H. Crandall, N. C. Dahl and T. J. Lardner,Tata McGraw Hill Education Private Limited (2012).
5. Laboratory Manual of Testing Materials – William Kendrick Hall, Prentice Hall of India.
6. Mechanics of Materials – Ferdinand P. Beer, E. RusselJhonston Jr., John T. D E Wolf, McGraw Hill.
7. Strength of Materials– R. Subramanian, Oxford University Press.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3
CO2	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3
CO3	3	2	2	3	2	-	-	-	-	-	-	2	3	1	3
CO4	3	2	2	3	2	-	-	-	-	-	-	2	3	1	3
CO5	3	3	2	2	2	-	-	-	-	-	-	2	3	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Approved in BOS meeting held on 06.10.2023

06/10/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech IV Sem.	IPUDTO1	Automobile Engineering	3	-	-	15	15	5	5	60	100	3

COURSE OBJECTIVES:

1. To provide the knowledge of basic structure of an automobile.
2. To provide the knowledge of transmission system and its various elements.
3. To provide the knowledge of clutches and suspension system
4. To provide the knowledge of braking system.
5. To provide the knowledge of steering system and engine emissions.

COURSE CONTENT:

Module - I

Introduction of an automobile: Component and basis structure of automobile, classification, difference between automobile and automotive, the chassis construction & classification, defect in frames, frameless construction & specifications. Wheel and tyres: Types of wheel, wheel dimension, desirable tyres properties, types of tyres, tyre material, tyre dimension, factors affecting tyre life.

Module - II

Transmission system: Function of transmission types, sliding mesh gear box, constant mesh gear box, synchro mesh gear box, torque converter, propeller shaft, universal joint, hook joint, final drive, differential, performance of gear box.

Module - III

Clutches: Requirement, function & type of clutch, dry friction clutch, wet friction clutch, clutch plate, single plate & multiple plate clutch, centrifugal clutch and fluid fly wheel.

Suspension system function and requirement, leaf spring, torsion bar, telescopic shock absorber.

Approved in BOS meeting held on 06.10.2023

06/10/23

New Course Introduced

Module - IV

Brakes: Function and requirement, brake efficiency, wheel skidding, types of brake, electrical, mechanical and hydraulic & pneumatic brakes, master cylinder, wheel cylinder, self-actualizing brakes, brake drum, brake liners brake shoe, trouble shooting.

Module - V

Front axle and suspension wheel alignment purpose: Factor of front wheel alignment, steering geometry, correct steering angle, steering mechanism, under steer and over steer, steering gear, power steering, reversibility of steering gears, steering gear ratio, calculation of turning radius.

Engine emission: Emission standard of vehicle in India, Euro norms, emission, testing. Principle of multipoint fuel injection (MPFI), component of MPFI, different sensors of MPFI system, vehicle air conditioning.

TEXT & REFERENCE BOOKS:

1. Automobile Engineering - Kripal Singh Vol. I, II.
2. Automobile Mechanics - Joseph Heitner.
3. Automobile Engineering - N.K Giri
4. Automobile Engineering - Shrinivasan T.M.H.
5. Automobile Engineering - K.K. Jain, R.B. Asthana T.M.H.
6. Automobile Engineering - R.B. Gupta Tech India Publication Series.

COURSE OUTCOMES:

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

CO1: Graduates will gain a strong foundation in core automobile engineering, both in theoretical and applied concepts.

CO2: Acquire knowledge and hands-on competence in the design and development of automobile.

CO3: Graduates will develop an ability to identify and solve automobile engineering maintenance problems.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	1	1	1	-	-	-	-	-	-	-	1	3	1	1
CO2	3	3	3	3	2	1	-	-	-	-	-	2	3	1	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1	3	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Approved in BOS meeting held on 06.10.2023

06/10/23

New Course Introduced

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech IV Sem	IPUDTK1	Engineering Thermodynamics	3	-	-	15	15	5	5	60	100	3

COURSELEARNINGOBJECTIVES:

The objective of this course is to:

1. Learn the fundamentals principles of classical thermodynamics and prepare them to apply basic conversion principles of mass and energy to closed and open systems.
2. Applications of laws of thermodynamic while solving engineering problems.
3. Understand second law of thermodynamics and apply it to various systems, note the significance of the results and to know about entropy and second law.
4. Importance of pure substances and analyse the performance of thermodynamic air and of vapour power cycles.

COURSE CONTENT:

Module –I

Basic concepts:

Microscopic & macroscopic point of view, Thermodynamic system and control volume, Thermodynamic properties. processes and cycles, equilibrium, Quasi-static process, reversible and irreversible process, concept of temperature. Zeroth law of thermodynamics, Heat and Work transfer, pure substance.

First law of thermodynamics: Concepts of internal energy, specific heat capacities, enthalpy, energy balance for closed and open systems, energy balance for steady and unsteady flow processes, and its applications.

Module –II

Second law of thermodynamics: Thermal energy reservoirs, Limitations of first law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Perpetual motion machine of the second kind, Carnot cycle, Heat Engine,reversed Carnot cycle, refrigerator and heat pump.

Approved in BOS meeting held on 06.10.2023

06/10/23

New Course Introduced

Entropy: Clausius theorem, Concept of entropy, Clausius inequality,entropy change in an open system, reversibl and irreversible process, principle of increase of entropy, Third law of thermodynamics, Entropy and disorder concept of exergy.

Module –III

Properties of pure substances: Thermodynamic properties of pure substances in solid, liquid and vapour phases Phase rule, p–V, p–T, T–v, T–s, h–S diagrams, pvT surfaces, thermodynamic properties of steam, calculations of work done and heat transfer in non– flow and flow processes.

Module –IV

Vapour power cycles: Carnot cycle,Rankine cycle,reheatcycle, Regenerative cycle, Binary vapour cycle,thermal efficiency and work ratios, factors affecting efficiency and work output.

Module – V

Heat Transfer: Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzmann's law, combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient. Basic concept of convection and its application, Thermal Radiation: black and non-black bodies, Kirchhoff's law, intensity of radiation, radiation exchange between black surface, geometric configuration factors.

TEXT & REFERENCE BOOKS:

1. Engineering Thermodynamics – P.K. Nag, Tata McGraw Hill Education.
2. Thermodynamics – An Engineering Approach – Cengel, McGraw Hill Education.
3. Fundamentals of thermodynamics – Sonntag & G. J. V. Wylen, John Wiley and Sons.
4. Fundamentals of Engineering Thermodynamics – M. J. Moran, H. N. Shapiro, D. D. Boettner& M. Bailey, John Wiley & Sons.
5. Engineering thermodynamics – J. B. Jones & R. E. Dugan, Prentice Hall.
6. Outline of Thermodynamics for Engineers – M. C. Potter& C. W. Schaum's Somerton, McGraw-Hill Education.

COURSE OUTCOMES:

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

CO1. Describe the basic concepts of thermodynamics such as conservation of mass and energy, work interaction, heat transfer, Zerothand first law of thermodynamics.

CO2. Explain the second law of thermodynamics, and concept of entropy.

CO3. Assess thermodynamic applications using second law of thermodynamics.

Approved in BOS meeting held on 06.10.2023

06/10/23

New Course Introduced

CO4. Demonstrate the importance of phase change diagrams of various pure substances.

CO5. Analyze the performance of vapor power cycles and identify methods to improve thermodynamic performance.

CO6.Explain the basics of heat transfer and different modes of heat transfer.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOs1	PSOs2	PSOs3
CO1	3	3	2	3	-	-	1	-	-	-	-	1	2	2	-
CO2	3	3	3	2	-	-	-	-	-	-	-	1	2	2	
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO6	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

Approved in BOS meeting held on 06.10.2023

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme						Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment				Semester Examination Assessment	Total Marks	
						CIA						
			L	T	P	CT–1	CT–2	Assignments, surprise test, quiz test etc	Attendance	SEA		
B. Tech IV Sem	IPUDTK2	Plant Layout& Material Handling	3	-	-	15	15	5	5	60	100	3

COURSE LEARNING OBJECTIVES:

The objectives of this course are:

1. To provide the basic concepts related to the interactions between the production system parameters and their impact on materials handling systems design.
2. To familiarize students with different methods available for the generation of plant layouts.
3. To provide students with information on materials handling systems design for various aspects of the manufacturing and service industry.

COURSE CONTENT:

Module - I

Plant facility locating: Concept of plant facility, its scope, importance and objectives nature of location decision, need for facility location planning, general procedures and factors influencing location decision, facility location models, economics and cost analysis, rural and urban location pattern in India.

Module - II

Layout designs: Industrial plant design consideration, types of production types of layout, factors affecting layout tools, techniques and procedure used in workstation and plant layout, quantitative technique in plant layout, developing product and process layout, comparing layouts, criteria for computerized facility layout, concept of computerized layout programs like CRAFT, CORELAP, ALDEP and PLANET.

Module - III

Flow pattern design: Overall system flow cycle, need and advantage of planned material flow, factors for consideration, designing flow pattern, flow patterns for production lines and assembly lines methods.

Module - IV

Approved in BOS meeting held on 06.10.2023

06/10/23

New Course Introduced

Material Handling: Scope and functions of material handling, manual mechanical handling ratio, principles o material handling, analysis of material handling problem, classification of material handling system, salient features and application of general purpose material handling equipment, material handling in stores and warehouses, automation in part handling and industrial robots, optimum allocation of material handling equipment.

Module - V

Automated material handling system: Concept of AGVs, AR/RS and methods to minimize cost of material handling, safety in material handling, evaluation of material handling process, design procedure of cranes, lifts.

TEXT & REFERENCE BOOKS:

1. Practical plant layout - Muther Richard, New York, McGraw-Hill
2. Plant layout and design - James More, New York, Macmillan
3. Manufacturing Management: A Quantitative approach - Robert Aolsem, International Textbook Co.
4. Productions and Operation Management - K.G. Lockyer, Alan Muhlemann, John Oakland, Financial Times Prentice Hall

COURSE OUTCOMES:

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

CO1: To describe and determine the effect of product, process, and schedule design parameters on plant layout and materials handling systems design.

CO2: To identify the characteristics of product and process layouts and their needs in terms of materials handling.

CO3: To develop and analyze plant layouts using manual and computer aided software methodologies.

CO4: To identify and select various types of material handling equipment.

CO5: To design material handling systems for a variety of scenarios pertaining to manufacturing and service industry

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	1	-	-	-	-	-	1	3	1	3
CO2	3	2	2	1	1	-	-	-	-	-	-	1	3	1	3
CO3	3	2	2	3	-	-	-	-	-	-	-	1	3	2	3
CO4	3	3	2	3	-	-	-	-	-	-	-	1	3	2	3
CO5	3	3	1	2	1	-	-	-	-	-	-	1	3	3	2

Approved in BOS meeting held on 06.10.2023

06/10/23

DEPARTMENT OF INDUSTRIAL & PRODUCTION ENGINEERING, GGV, BILASPUR CG

Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
			L	T	P				
B. Tech IV Sem.	IPUDLT1	Material Testing Lab	-	-	3	25	25	50	1.5

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.
4. Ability to communicate effectively the mechanical properties of materials

LIST OF EXPERIMENT (Minimum 10 experiments to be performed):

1. To perform torsion test on mild steel specimen.
2. To perform bending tests on simply supported beam and cantilever beam.
3. To perform compression test on concrete.
4. To perform impact test.
5. To perform shear test.
6. Investigation of Hook's law that is the proportional relation between force and stretching in elastic deformation.
7. Determination of torsion and deflection.
8. Measurement of forces on supports in statically determinate beam.
9. Determination of shear forces in beams.
10. Determination of bending moments in beams.
11. Measurement of deflections in statically determinate beam.
12. Measurement of strain in a bar.
13. To perform bend test on steel bar.
14. To determine yield/tensile strength of steel bar.

06/10/23

Approved in BOS meeting held on 06.10.2023

15

COURSE OUTCOMES:

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

GO1. Perform the function on multi-disciplinary teams in the area of materials testing.

CO2. Use the techniques, skills and modern engineering tools necessary for engineering.

CO3. Apply professional and ethical responsibility in the areas of material testing.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO2	3	2	1	3	2	-	-	-	-	-	-	2	1	2	2
CO3	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

06/10/23

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Semester	Course No.	Subject	Teaching Hours/ Week/ Periods			Evaluation Scheme			Credits
			Theory Lectures	Tutorials	Practical	Continuous Internal Assessment	Semester Examination Assessment	Total Marks	
			L	T	P				
B. Tech IV Sem.	IPUDLT2	Theory of Machines Lab	-	-	3	25	25	50	1.5

COURSE LEARNING OBJECTIVES:

The objective of this course is to:

1. Proficiency in the use of mathematical methods to analyze the forces and motion of complex systems of linkages, gears and cams.
2. Design linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship.
3. Analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams.

LIST OF EXPERIMENTS (Minimum 10 experiments to be performed):

1. To study about the Oldham Coupling Mechanism with the help of Virtual-LAB.
2. To study about the quick return mechanism with the help of Virtual-LAB.
3. To study about the CAM follower mechanism with the help of Virtual-LAB.
4. Position analysis of Slider crank mechanism with the help of Virtual-LAB.
5. Velocity analysis of Slider crank mechanism with the help of Virtual-LAB.
6. To study about theElliptical Cam Mechanism with the help of Virtual-LAB.
7. To study about theCrank and Slotted Mechanism with thehelp of Virtual-LAB.
8. To study about theUniversal Joint with thehelp of Virtual-LAB.
9. To determine the jump phenomena of cam follower apparatus.
10. To draw displacement, velocity and acceleration curve of cam motion
11. To find the speed and torque of different gear in an epicyclic gear train.
12. To Study and analysis of Pantograph.
13. To study Four-bar mechanism and its inversions.

06/10/23

Approved in BOS meeting held on 06.10.2023

COURSE OUTCOMES:

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

CO1: Identify mechanisms in real life applications.

CO2: Perform kinematic analysis of simple mechanisms

CO3: Perform static and dynamic force analysis of slider crank mechanism.

CO4: Determine moment of inertia of rigid bodies experimentally.

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO2	3	2	1	3	2	-	-	-	-	-	-	2	1	2	2
CO3	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2
CO4	3	2	1	3	2	-	-	-	-	-	-	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

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