

**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-301	Engineering Materials	3	1	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance /Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The objective of the course is to provide basic understanding of engineering materials, their structure and the influence of structure on mechanical properties,
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Draw crystallographic planes and directions; perform destructive and non-destructive testing of materials.</li> <li>2. Analysis of the phase diagrams, heat treatment methods, structures.</li> <li>3. About Heat treatment process and advanced Material.</li> <li>4. Concepts of corrosion formation and prevention.</li> <li>5. About Nano-materials, Conductors, Resistors.</li> </ol>

Unit	Contents(Theory)	Marks Weightage
I	<b>Introduction:</b> Structure of materials; fundamentals of crystallography, Types of bonding; Crystalline and non-crystalline materials, Miller Indices, Crystal planes and directions, Defects; Point, line and surface defects. <b>Testing:</b> Destructive testing: Tensile testing, Impact Testing, Hardness testing Non-destructive testing: Eddy-current, Magnetic-particle, Liquid penetration, radiographic, Ultrasonic and visual testing.	14
II	<b>Equilibrium diagram:</b> Solids solutions and alloys, Gibbs phase rule, Single-component Systems, Binary Phase Diagrams, The Lever Rule, Examples and applications of phase diagrams, Transformations in Steel, Precipitation Processes, Solidification and Crystallization, The Glass Transition, Recrystallization and Grain Growth	14
III	<b>Advanced Materials:</b> Properties & application of Ceramics, Polymers, Smart materials, Natural and synthetic rubber and glasses <b>Heat Treatment:</b> TTT diagram, Cooling curve, Heat treatment of ferrous and aluminum alloys; preparation of ceramic powders, sintering, and chemical vapors deposition, thin film growth phenomena.	14
IV	<b>Corrosion process:</b> The Principles of Corrosion, Cause of corrosion, Types of corrosion, Protection against corrosion. <b>Plastics:</b> Important sources of plastics, Classification, Various trade names of plastics, Plastic coatings, food grade plastics, Applications of plastics in automobile and domestic use.	14
V	<b>Conductors and Resistors:</b> The Resistivity Range, The Free Electron Theory, Conductor and Resistor Materials, Superconducting Materials, Semiconductors: The Energy Gap in Solids, Intrinsic & Extrinsic Semiconductors, Semiconductor Materials <b>Nanomaterials:</b> Classification of Nanomaterials, optical, Thermal, magnetic and electronic properties of Nanomaterials, Applications of Nanomaterials.	14

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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –III****Text Book/References Books/ Websites:**

1. K. Hazra Choudhury; Material Science and Processes; Indian Book Distributing.
2. O. P. Khanna; A Textbook of Material Science and Metallurgy; Dhanpat Rai.
3. William D Callister Jr; Material Science and Engineering; John Wiley and Sons; New York.
4. V. Raghavan; Material Science and Engineering – A First Course; Prentice Hall of India; New Delhi.
5. R.K.Jain; Production Technology; Khanna Publishers.

**Suggested List of Laboratory Experiments :-( Expandable): Nil**  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-302	Applied Thermodynamics	3	1	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test –Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance /Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objectives</b>	This course aim is to provide a good platform to understand the concept of dynamics involved in thermal energy transformation.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The fundamental concepts and solve the basic thermodynamic problems.</li> <li>2. Apply the concepts of first law of thermodynamics to solve related problems.</li> <li>3. Apply the concepts of second law of thermodynamics and solve problems related to it.</li> <li>4. The concept of laws of thermodynamics and energy principles.</li> <li>5. To understand and derive the general thermodynamic equations.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Fundamental Concepts:</b> Introduction of Thermodynamics, Basic concepts, Concept of continuum, Microscopic and Macroscopic approach, Thermodynamic systems, control volume, property, point and path functions, Thermodynamic equilibrium, State and process, Reversible and Quasi-static process, Work, Zeroth law, Concept of temperature and heat.	14
II	<b>First Law and Energy:</b> First law, Application to closed and open systems, Internal energy, Enthalpy, Steady flow process with reference to various engineering devices.	14
III	<b>Second Law, Entropy and Exergy:</b> Second law, Kelvin Planck and Clausius statements, Heat engine, Refrigerator and Heat pump, Efficiency and COP, Thermodynamic temperature scale, Reversibility and Irreversibility, Carnot theorem, Clausius Inequality, Concept of entropy, Entropy of ideal gases, Principle of increase of entropy, Quality of energy, Energy (Availability), Reversible work, Energy and Irreversibility for closed system and control volume, Second law efficiency.	14
IV	<b>Properties of Pure Substances:</b> Thermodynamic properties of pure substances in solid, liquid and vapor phases, P-V, P-T, T-V, T-S and H-S diagrams, PVT surfaces, Thermodynamic properties of steam, Use of steam tables and Mollier chart, Calculation of work done and heat transfer in non-flow and flow processes.	14
V	<b>Thermodynamic Relationships:</b> Helmholtz and Gibbs functions, isothermal compressibility, Differential relations of internal energy, Maxwell's Relation, T-ds equations, Clapeyron equation, Joule Thomson's coefficients. <b>Equation of State:</b> Ideal gas equation of state, Real gas deviation with ideal gas, limitations of ideal gas equation, Vander Waal's equation, Evaluation of its Constants, Limitations of the equation.	14

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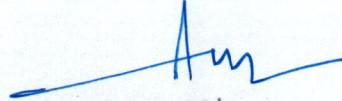
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1. Yunus A Cengel , Michael A Boles; Thermodynamics -An Engineering Approach, (SI Units);TMH
2. P.K. Nag; Basic and Applied Thermodynamics; Tata McGraw Hill Pub.
3. Arora and Domkundwar; Thermodynamics; Dhanpat Prakashan
4. R. Yadav; Fundamentals of Engineering Thermodynamics; Central Publishing House.
5. Y.V.C.Rao; An Introduction to Thermodynamics; Wiley Eastern.
6. B.K Venkanna, Swati B. Wadavadagi; Basic Thermodynamics; PHI, New Delhi.

**Suggested List of Laboratory Experiments :-(Expandable): Nil**

  
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Subject Code	Subject Title	Credit			Theory			Practical		
CBME-303	Machine Drawing and CAD	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 4 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance / Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Engineering Drawing.
<b>Course Objective</b>	To make the students acquainted with Indian Standards for drawing techniques and standard parts. To educate students how to read and understand machine component drawings so they can create assembly drawings.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Recognize the national and international standards for machine drawing in order to comprehend the common symbols for machine parts like fasteners and joints. Apply limits and tolerances to assemblies and choose appropriate fits.</li> <li>2. Orthographic and sectional views of various machine components.</li> <li>3. Interpret drawings and the assembly of a given set of details of machine components.</li> <li>4. Basic machine design procedure and other design factors.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Drawing conventions:</b> Introduction to Machine drawing and dimensioning, IS codes, Conventional representation of materials, Symbols of Machine elements, surface finish, Roughness number symbol, and welded joints. <b>Limits, Fits and Tolerances:</b> Nominal size and basic dimensions, Definitions, Basis of fit and limit system, Systems of specifying tolerances, Hole basis and Shaft Basis system. <b>Fasteners:</b> Drawings of various views of Screw threads, Drawing of different types of screw threads. Drawing of Nut bolts. <b>Riveted joints:</b> Forms and proportions of rivet heads, Different views of different types of Riveted Lap and Butt joints.	14
II	<b>Drawings of various views (Sectioning) of Machine Elements:</b> Introduction and types of sectioning drawing, Cotter joint, Knuckle joint, Muff and Flange coupling. Shaft bearing: Solid and bush bearing, <b>Pipe joint:</b> Flanged joint, Socket and Spigot joint.	14
III	<b>Assembly Machine Drawing:</b> Basic concept, types of assembly, title block and bill of materials, product data; Cotter and Knuckle joints, pedestal and footstep bearings, crosshead, stuffing box, IC engines parts - piston and connecting rods; lathe parts.	28
IV	<b>Basic design concepts,</b> design process, stages/phases in design, flowchart, design considerations (strength, manufacturing, maintenance, environment, economics and safety); design for recycle and reuse, steady and variable loads, impact and fatigue considerations, reliability and optimization, standardization in design. Introduction to Compute Aided Drafting software for 2D and 3D Modelling.	14

**Text Book/References Books/ Websites:**

1. N.D.Bhatt; Mechanical Drawing; Dhanpat Prakashan.
2. P.S.Gill; Mechanical Drawing; P.S.Gill; S.K. Kataria & Sons.

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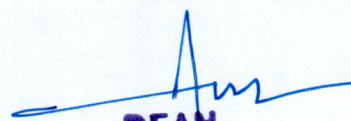


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3. K.L. Narayana, P. Kannaiah, k.V. Reddy; Machine Drawing; New Age Publications.
4. R.K.Dhawan; Mechanical Drawing; S. Chand Publication.

**Suggested List of Laboratory Practical (Expandable):**

1. Types of line, and Dimensioning System.
2. Conventional Representation as per SP – 46 (1988) - one sheet.
3. Drawing of Tolerance Symbols, Positioning, Surface Finishing and Welding Symbols.
4. Drawings of various views of Screw threads.
5. Drawings of nut and bolt.
6. Drawing of rivet heads.
7. Different views of Riveted Lap and Butt joints.
8. Use first angle method of projection, sectioning views: projects (One Sheet containing at least two problems and at least four problems for home assignment).
9. Details to Assembly: Draw sheets covering assembly drawing and its details for given machine parts.
10. Practice of above machine parts in Auto CAD software.

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBME-304	Mechanics of Materials	3	1	1						

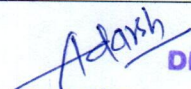
**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	To understand the various conditions of material under different loading conditions and also finding the various properties.
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. An ability to understand the basics material properties, stresses and strain.</li> <li>2. An ability to apply knowledge of stress distributions to calculate stresses in structures under combined loading.</li> <li>3. An ability to calculate stress during deflection of beams.</li> <li>4. An ability to develop an understanding about shaft failure during different load condition.</li> <li>5. An ability to understand theories of failure for different materials.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Mechanical Properties of Materials, Behavior of Materials Under Tension, Compression, Bending, Shear; Ductile and Brittle Materials & their Failure under Tension, Stress-Strain Diagram, Hooke's Law, Modulus of Elasticity, Stresses in the Components Subjected to axial Multi-loads, Deformation under Axial Loading, Analysis of Simple Structures, Stepped Rods, Members in Series and Parallel, Elastic and Plastic Behavior of Materials, Poisson's Ratio, Bulk Modulus, Shear Strain, Relation Among Elastic Constants, Residual Stress, Temperature Stresses, Factor of Safety.	14
II	<b>Principal Stresses and Strain:</b> Transformation of Stresses, Principal Stresses, Normal and Shear Stress, Torsion & Axial Loads, Mohr's Circle and its Application to Two- and Three-Dimensional Analysis, Principal Strains, Strain Energy. <b>Thin cylindrical shells:</b> hoop or circumferential stress, longitudinal stress, maximum shear stress, change in dimensions of thin cylindrical shell due to internal fluid pressure, thin cylindrical shell with hemispherical ends, spherical shells.	14
III	<b>Shear Force &amp; Bending Moment:</b> Types of Beam & Support, Theory of Simple Bending, Bending Equation, Traverse Shear Stress Distribution in Circular, Hollow Circular, I & T Section, Shear Force and BM Diagram, Pure Bending, point of contra- flexure. <b>Deflection Of Beam:</b> Relation Between Slope, Deflection and Radius of Curvature, Solution of Beam Deflection (simply supported beam only), Problem by Macaulay's Method, Moment Area Method.	14
IV	<b>Torsion:</b> Deformation in Circular Shaft, Angle of Twist, Shafts Angular Deflection, Hollow and Stepped Circular Shaft. <b>Springs:</b> Types of spring, analysis of close coiled and open coiled helical springs, leaf spring, springs in series and parallel.	14

  
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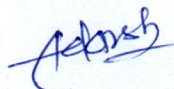
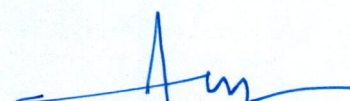
V	<b>Theories of Failures:</b> Maximum Normal Stress & Shear Stress Theory; Maximum Normal and Shear Strain Energy Theory; Maximum Distortion Energy Theory; Application of Theories to Different Materials and Loading Conditions <b>Columns and Struts:</b> Stability of Structures, Euler's Formula for Columns with Different End Conditions, and Rankin's Formula.	14
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**Text Book/References Books/ Websites**

1. Andrew Pytel, FedrinandL.Singer; Strength of Material; Addison Wesley Longman Inc.
2. G.H. Ruder; Strength of Material; ELBS with Macmillan third edition.
3. B.K. Sarkar, Strength of Material ; Tata McGraw hill New Delhi.
4. Dr. R. K.Bansal; A Text Book strength of Material; Laxmi Publication New Delhi.
5. S Ramamrutham, Strength of Material; Dhanpat Rai & Publication New Delhi.
6. R.S. Khurmi; Strength of Material;S. Chand Company Ltd. Delhi.

**Suggested List of Laboratory Experiments (Expandable): -**

1. Study and demonstration of Universal Testing Machine & its attachments.
2. Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.).
3. Tension Test on mild steel, Aluminium & compression test on cast iron on UTM.
4. Direct Shear Test of mild steel on Universal Testing Machine.
5. Brinell hardness Test on Mild Steel.
6. Rockwell hardness Test on Hardened Steel.
7. Izod & Charpy - Impact tests of a standard specimen.
8. Torsion Test on Mild steel bar.


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Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-305	Machine Tools and Operations	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		1	-	1			Min:40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks: 15</b>	Best of Two Mid Semester Test– Max Marks: 10	Assignment/Quiz/Attendance– Max.Marks:5
<b>Practical Internal Max Marks: 15</b>	Lab Performance/Quiz/Attendance – Max Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The prime objective of this course is to impart practical exposure on various machine tools used in manufacturing industries.
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The fundamentals knowledge of machine tools, Drive systems.</li> <li>2. To understand the basic operations of machining and metal cutting.</li> <li>3. The working mechanism of lathe and shaper</li> <li>4. The working process of Broaching, Grinding and Boring techniques.</li> <li>5. About concept of metrology and inspection tools.</li> </ol>

Unit	Contents(Theory)	Marks Weightage
I	<b>Introduction:</b> cutting motion in machine tools, elements of machine tool, kinematics of machine tool drives, hydraulic and electric drives, gearbox, chip disposal maintenance of machine tool.	07
II	<b>Theory of Metal Cutting:</b> Introduction to cutting tools, types, classification, nomenclature, geometry. Tool Wear and Tool failure, tool life. Effects of cutting parameters on tool life. Mechanics of chip Formation, Types of Chips. Desired properties and types of cutting tool materials. Cutting fluids, types of cutting fluid.	07
III	<b>Machining Tools:</b> Introduction to Lathe, specifications, various operations on lathe, work holding devices, mechanism and attachments for various operations. Shaper and Slotter, classification of shaper, operation performed on shaper machine. Types of Slotter.	07
IV	<b>Reaming &amp; Boring:</b> Principle of operation, parts and types of operations, tools. <b>Broaching:</b> Process, advantage and limitation, broaching tool, classification. <b>Grinding:</b> Processes, machines, design consideration for grinding, specification of grinding wheel, Finishing: micro finishing operations like honing, lapping and super finishing.	07
V	<b>Metrology and Inspection:</b> Limits, fits and tolerances; linear and angular measurements; comparators; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.	07

**Text Book / References Books / Websites:**

1. P. N. Rao; Manufacturing Technology(Vol.– I&II); Tata McGraw Hill; New Delhi.
2. P.C. Sharma; A Text Book of Production Technology (Manufacturing Processes); S. Chand and Company Ltd., New Delhi.
3. A. Ghosh & A .K .Mallik; Manufacturing Science; East West Press Pvt. Ltd., New Delhi.
4. R.K.Jain; Production Technology; Khanna Publishers, New Delhi.
5. O.P. Khanna; A Text Book of Production Technology (Vol. I&II); Dhanpat Rai & Sons.

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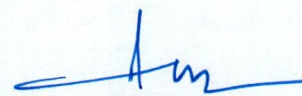


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Semester –III

**Suggested List of Laboratory Experiments (Expandable):**

1. Study of various types of machine tool.
2. Study of various types of cutting tool.
3. Study of mechanism of chips formations.
4. Study of tool failure.
5. Study of linear measuring instruments
6. Study of angular measuring instruments
7. Study of various types of operations performed on lathe machine
8. Study of various types of operations performed on shaper machine.
9. Study of various types of operations performed on milling machine
10. Study of various types of operations performed on grinding machine.

  
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Subject Code		Credit			Theory			Practical		
CBME-306	<b>Mechanical Engineering Software Lab-I</b>	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1			(Nil)			Min: 20 (D Grade)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Basic knowledge of Computer.
<b>Course Objective</b>	To learn software like Auto-CAD and to apply basic concept to drawing, editing, dimension, hatching etc.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>To Increase ability to communicate with people.</li> <li>Learn to sketch and take field dimensions.</li> <li>Learn to take data and transform it into graphic drawings.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction to CAD</b>  Introduction to Computer Aided Drafting software for 2D and 3D Modeling, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array, Creation of Simple Figures like polygon and General Multiline Figures. <ul style="list-style-type: none"> <li>Practicing commands under Draw and Dimension Menu</li> <li>Practicing commands under Modify Menu.</li> <li>Practicing commands under Tool Menu.</li> <li>Practicing commands under Format Menu.</li> <li>Practicing commands under Express Menu.</li> </ul>	50

**Text Book/References Books/ Websites:**

1. D. M Kulkarni ; A. P Rastogi; Sarkar; A. K. Engineering Graphics with AutoCAD. PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
2. Jeyapooan, T. Essentials of Engineering Drawing and Graphics using AutoCAD. Vikas Publishing House Pvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
3. Autodesk. AutoCAD User Guide. Autodesk Press, USA, 2015.
4. Sham, Tickoo. AutoCAD 2016 for Engineers and Designers. Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.
5. <https://www.ascented.com/courseware/product/autocad-2021-essentials>

**Suggested List of Laboratory Experiments: - (Expandable):**

Students should draw at least ten work sheets of machines parts by using AutoCAD command.



**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE-307	NCC-III	1	-	6						

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks:15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>Understand the life history and leadership qualities of great leaders, sportspersons &amp; entrepreneurs.</li> <li>Understand the various aspects of types of mindset.</li> <li>Understand public speaking methods &amp; qualities.</li> <li>Understand the organizations related to disaster management and their functioning.</li> <li>Understand the role of NCC cadets in disaster management.</li> <li>Understand the various types of adventure activities.</li> <li>Understand the History, Geography &amp; Topography of Border/ Coastal Areas.</li> </ol>
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>Admire and get inspired from the accomplishments of leaders from various walks of life.</li> <li>Develop public speaking skills.</li> <li>Understand the importance of positive mindset and optimistic attitude in life.</li> <li>Appreciate the need &amp; requirement for disaster management and his role in disaster management activities.</li> <li>Know the history &amp; geographical peculiarity of our borders &amp; coastal regions.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
<b>I</b>	<b>Personality Development</b> 1. Group Discussions - Change your Mindset 2. Public Speaking.	<b>07</b>
<b>II</b>	<b>Leadership Development:</b> Case Studies - APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murthy.	<b>07</b>
<b>III</b>	<b>Disaster Management</b> 1. Disaster Management Capsule. 2. Organization. 3. Types of Disasters. 4. Essential Services. 5. Assistance. 6. Civil Defence Organization.	<b>07</b>
<b>IV</b>	<b>Adventure:</b> Adventure activities.	<b>07</b>
<b>V</b>	<b>Border &amp; Coastal Areas:</b> History, Geography & Topography of Border/ Coastal	<b>07</b>

# Note: For NCC-III 05 credits will be allotted after successful completion of camp.

**Text Book/References Books/ Websites:**

- Cadet's handbook, NCC Directorate, MP, CG.
- Supplementary cadet's handbook, NCC Directorate, MP, CG.

**Suggested List of Laboratory Practical (Expandable):**

- Drill**
  - Arm Drill.

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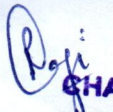
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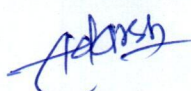


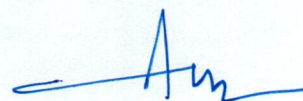
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- Rifle ke saath Savdhan, Vishram aur Aram se.
- Rifle ke saath Parade Par aur Saj, Rifle ke saath Visarjan, Line Tod.
- Bhumi Shastra aur Uthao Shastra, Bagal Shastra aur Baju Shastra.
- 2. **Weapon Training**
  - Short Range firing.
- 3. **Map Reading**
  - Setting of Map.
  - Findings North and Own Position.
- 4. **Field Craft & Battle Craft**
  - Observation.
  - Camouflage.
  - Concealment.
- 5. **Social Service and Community Development**  
Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days- National and State level.
- 6. **Obstacle Training**
  - Obstacle training - Introduction, Safety-measures, Benefits.
  - Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- ZagBalance, High Wall

Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE-308	Introduction to Internet of Things	2	-	1						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	Internet of Things is a course that deals with the study of how devices are connected and how it helps to stay connected over the Internet. The course teaches the individuals on how the Internet of Things is helpful in our daily lives and how to stay connected over the Internet.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Fundamental of Internet of Things and its technology.</li> <li>2. Recognize the factors that contributed to the emergence of IoT.</li> <li>3. Design and program IoT devices.</li> <li>4. Use real IoT protocols for communication.</li> <li>5. Security elements of an IoT device.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>IoT</b> - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.	14
II	<b>IoT Protocols</b> - Protocol Standardization for IoT – Efforts – M2M , WSN Protocols SCADA and RFID Protocols ,Issues with IoT Standardization – Unified Data Standards Protocols – IEEE802.15.4,BACNet Protocol– Modbus ,KNX , Zigbee, Network layer , APS layer – Security	14
III	<b>IoT Architecture</b> - IoT Open source architecture (OIC) - OIC Architecture & Design Principles- IoT Devices and deployment models- IoTivity: An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.	14
IV	<b>Web of Things</b> - Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence.	14
V	<b>IoT Applications</b> - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	14

**Text Book/References Books/ Websites:**

1. Arshdeep Bahga;Vijay Madisetti; Internet of Things (A Hands-on Approach); University Press.
2. Raj Kamal; Internet of things- Architecture and Design Principles; McGraw Hill.
3. Cuno Pfister;Getting Started with the Internet of Things; O'Reilly Media.
- 4.Francis da Costa; Rethinking the Internet of Things: A Scalable Approach to Connecting Everything; A press Open.

**Suggested List of Laboratory Practical (Expandable):**

1. Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface, connecting to ethernet, Monitor, USB.
2. Displaying different LED patterns with Raspberry Pi.

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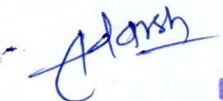
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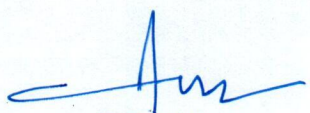


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3. Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.
4. Raspberry Pi Based Oscilloscope.
5. Setting up Wireless Access Point using Raspberry Pi.
6. Controlling Raspberry Pi with WhatsApp.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-309	Quantitative Aptitude & Logical Reasoning	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		1	-	-			Min: 20 (D Grade)			(Nil)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: 50</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance / Attendance/Quiz -Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The logical reasoning and quantitative ability represent a systematic way to judge a candidate's mental capability as how he/she performs certain tasks and reacts to different situations.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Solve the problem of number system.</li> <li>2. Discuss basic concept of algebra, geometry and complex number.</li> <li>3. Elaborate the concept of probability, set theory and trigonometry.</li> <li>4. Analyze actively to do logical reasoning such as binary logic, family tree, logical sequence, reflecting on their work.</li> <li>5. Explore and apply key concepts in logical and quantitative thinking to business problems.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Quantitative Aptitude I:</b> LCM and HCF, Percentages, Profit and Loss, Interest (Simple and Compound), Speed, Time and Distance; Time and Work; Averages; Ratio and Proportion, Number System	10
II	<b>Quantitative Aptitude II:</b> Algebra, Geometry/Mensuration, Pure Math, Venn diagrams, Linear Equations, Quadratic Equations, Complex Numbers, Logarithm, Progressions	10
III	<b>Quantitative Aptitude III:</b> Permutation and Combination, Binomial Theorem, Surds and Indices, Inequalities, Probability Functions, Set Theory, Mixtures and Allegations, Co-ordinate Geometry, Trigonometry	10
IV	<b>Logical Reasoning, I:</b> Clocks, Calendars, Binary logic, Seating Arrangement, Blood Relations (Family Tree), Logical Sequence, Assumption, Premise, Conclusion	10
V	<b>Logical Reasoning II:</b> Linear and matrix arrangement, Team Formation, Direction Sense and Decision Making, Syllogism, Cubes, Rows, Quantitative Reasoning, Puzzles, Logical Reasoning based on Rankings, Critical Reasoning	10

**Text Book/References Books/ Websites:**

1. Dr. R.S. Aggarwal; Quantitative Aptitude for Competitive Examinations; S. Chand Publication.
2. Dr. R.S. Aggarwal; A Modern Approach To Logical Reasoning; S. Chand Publication.
3. Arun Sharma; How to Prepare for QUANTITATIVE APTITUDE for CAT; Mc Graw Hill.
4. Arun Sharma; How to Prepare for LOGICAL REASONING for CAT; Mc Graw Hill.
5. Sarvesh K Verma; Quantitative Aptitude Quantum CAT; Arihant Publication.
6. Jaikishan, Premkishan; How to Crack Test of Reasoning; Arihant Publication.

**Suggested List of Laboratory Practical (Expandable): Nil**

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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology**

Semester –III

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total Nil	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-310	NSS-II/NSO-II	-	-	1						

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. The purpose of this course is to understand the community in which they work.</li> <li>2. To understand themselves in relation to their community.</li> <li>3. Identify the needs and problems of the community and involve them in problem solving process.</li> </ol>
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>1. The quality of educated manpower by fostering social responsibility.</li> <li>2. Raising society to a higher material and moral level by preparing students for final dedication in the service of nation.</li> <li>3. Introduce urban students to rural life by living in contact with the community in whose midst their institution is located.</li> <li>4. Making campus relevant to the needs of the community.</li> <li>5. To work for community services.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction and Basic Concepts of NSS:</b> History and Philosophy & Definition of NSS, Aims & Objectives of NSS, Emblem, flag, Motto, Song, Badge, NSS day etc, Organizational structure (from national to regional level), Roles and responsibilities of various NSS functionaries.	50
II	<b>NSS Programmes and Activities:</b> Concept of regular activities (one day camp), special seven-day conduction camping, day and night camps and relevance of celebration of important days recognized by united nations, Centre, State Govt. & University, Basis of adoption of village/slums, methodology of conduction survey, financial pattern of the scheme, Coordination with different agencies, Maintenance of the diary	
III	<b>Community Mobilization and Adoption of village:</b> Functioning of community stakeholders, Designing the message in the context of the problem and the culture of the community, Identifying methods of mobilization, Concept of Community development and village adoption. <b>Volunteerism and Shramdan:</b> Indian tradition of volunteerism, Value system of volunteerism, Motivation and constraints of volunteerism, Shramdan as a part of volunteerism, Role of NSS volunteers in Swatch Bharat Abhiyan, Role of NSS volunteers in Digital India	
IV	<b>National Sports Organization (NSO):</b> The following is the List of Sports and Games: Cricket/Volley Ball /Table Tennis / Foot Ball / Throw Ball (Only for Women) / Basket Ball / Athletics • 100 Meters Run • Long Jump • Shot Put Rules and Skills of the above Sports and Games should be taught to the students.	
V	<b>Project Work/Practical:</b> The Project should be related from the above topics.	

**Text Book/References Books/ Websites:**

1. <https://nss.gov.in/>

**Suggested List of Laboratory Practical (Expandable): Nil**

1. Project Work/Practical: The Project should be related from the above topics.

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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-311	Music Vocal-II/ Music Instruments-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1			Nil			Min: 20 (D Grade)

**Duration of Theory (Externals): -Nil**

<b>Theory Internal- Max Marks: -Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Basic knowledge of rag tal and musical instruments.
<b>Course Objective</b>	Impart a basic knowledge of music sound, sangeet and folk songs (Vocal and Instruments)
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic knowledge of Sound.</li> <li>2. Basic Knowledge of Rabindra &amp; Karnatak Sangeet.</li> <li>3. Knowledge of various Indian Folk Songs</li> </ol>

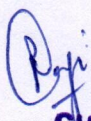
Unit	Contents (Theory)	Marks Weightage
I	Elementary Study of medium Sound, musical sound and Noise. Study of Vibratory motion, frequency, pitch, magnitude and timber quality duration. Study of Interval, scale, Octave, major tone, minor tone and semi tone & value of each of the three tones. General Knowledge of Rabindra Sangeet. General Knowledge of various folk songs as kajri, Baul, Chaiti, Bhatialimand, Garba, lavni, Hori, etc.	50

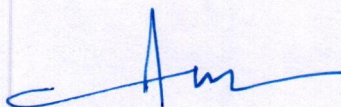
**Text Book/References Books/ Websites:**

1. Pt. Harishchandra Srivastava ; 'Raga Parichay' (Part 1, 2, 3 & 4).
2. Dr. Geeta Banerjee 'Raga Shashtra' (Part 1 & 2)
3. Shanti Govardhan 'Sangeet Shashtra Darpan' (Part 1 & 2)
4. Vasant Sangeet Visharad

**Suggested List of Laboratory Experiments: -(Expandable):**

1. Practices on of Rabindra Sangeet and any one folk songs (Vocal and Instrumental)

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –III**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-312	Social Engineering	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		-	-	-			Min: 20 (D Grade)			(Nil)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: 50</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The program's framework was inspired by the realization that an integrated systems approach is the best way to address the set of competencies needed to address societal problems. Numerous opportunities in the business world, the social sector, and government will arise as a result of this integrated programme.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Function effectively in teams to accomplish a common goal.</li> <li>2. An understanding of professional and ethical responsibility.</li> <li>3. Ability to self-learn and engage in life-long learning.</li> <li>4. Understanding of the impact of solutions in an economic, societal, and environment context.</li> <li>5. Psychological manipulation and human behavior of students into performing actions or divulging confidential information.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<p>Social engineering is one of the most prolific and effective means of gaining access to secure systems and obtaining sensitive information yet requires minimal technical knowledge. Social engineering works by manipulating normal human behavioral traits and as such there are only limited technical solutions to guard against it. As a result, the best defense is to educate users on the techniques used by social engineers, and raising awareness as to how both humans and computer systems can be manipulated to create a false level of trust. This can be complemented by an organizational attitude towards security that promotes the sharing of concerns, enforces information security rules and supports users for adhering to them.</p> <p><b>Contents are as follows:</b>  <b>Introduction of Social Engineering:</b> Definition; Types; Psychology in Social Engineering; The Social Engineering Life Cycle; Human Behavior; Weapons of a Social Engineer; Defense against Social Engineering; Social Engineering Attacks; Examples of Social Engineering Attacks; guidelines to Stay Protected Against Social Engineering Attacks; Reverse Social Engineering.</p>	50

**Text Book/References Books/ Websites:**

1. Kevin Mitnick; The book of the Art of Deception.
2. [www.socialengineer.com/wpcontent/uploads/2017/02/AdvancedPracticalSocialEngineering-Syllabus.pdf](http://www.socialengineer.com/wpcontent/uploads/2017/02/AdvancedPracticalSocialEngineering-Syllabus.pdf).
3. <https://www.exploit-db.com/docs/english/18135-social-engineering---the-human-factor.pdf>.
4. <https://www.jigsawacademy.com/blogs/cyber-security/what-is-social-engineering/>

**Suggested List of Laboratory Practical (Expandable): Nil**

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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-401	Entrepreneurship and IPR	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The course's major objectives are to educate students with various concepts that are essential to comprehend the processes involved in entrepreneurship, grow small and medium-sized businesses, and promote the entrepreneurial spirit of self-employment. To recognize the importance of IP and to educate the students on basic concepts of Intellectual Property Rights.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Create and exploit innovative business ideas and market opportunities.</li> <li>2. Turn market opportunities into a business plan.</li> <li>3. Demonstrate and present successful work, collaboration and division of tasks in a multidisciplinary and multicultural team.</li> <li>4. Entrepreneurship and Innovation minors will be able to find problems worth solving. Students advance their skills in customer development, customer validation, competitive marketing and financial analyses, and iteration.</li> <li>5. Enhanced capability to secure new intellectual properties through Patents and Copyrights.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Entrepreneurship:</b> Definition and Functions of an Entrepreneur, Qualities of a good entrepreneur; Role of Entrepreneur in Economic Development; Theories of entrepreneur, Socio, Economic, Cultural and Psychological; Entrepreneur Traits and Behavior, Roles in economic growth, employment, social stability, export promotion and indigenization, Creating A Venture, Opportunity Analysis Competitive and Technical Factors, Sources of Fund. Forms of Business Organizations/Ownership – Formation of a Company – procedures and formalities for setting up of New Industry-Sources of information to contact for what and where.	14
II	<b>Management:</b> Importance, Definition and functions; Dimensions of Organizations, Size/Specialization, Behavior Formalization, Authority Centralization, Departmentalization, Span and Line of Control, Technology and Minzberg Organization Typology, Line, Staff & Matrix Organization. <b>Motivation Theories–</b> Maslow, Mc Cullen – Motivation model – need, want, motive and Behavior-Attitude Towards work – Self Assessment and Goal Setting – Achievement, Motivation and Behavior Measurement, SWOT analysis and TA analysis – Stress and Conflict Management; with uncertainty; Creativity and Innovation.	14
III	<b>Marketing:</b> Importance, Definition, Core Concepts of need want and Demand, Project identification and formulation: Sources of Information – Opportunity Guidance – Choice of Technology and its evaluation; Consumer Behavior; Market Survey and research; Preliminary Project Report, Detailed Project Report, Assessing Viability and feasibility of a report. Exchange & Relationships, Product Value, Cost and satisfaction (goods and services) Marketing Environment; Selling, Marketing and Societal Marketing Concepts; Four P's, Product, Price, Placement, Promotion.	14

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PEOPLE'S UNIVERSITY, BHOPAL (M.P.)




**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

	<b>Finance:</b> Nature and Scope, Forms of Business Ownerships, Balance Sheet, Profit and loss Account, Fund Flow and Cash Flow Statements, Breakeven Point (BEP) and Financial Ratio analysis, pay-back period, NPV and capital budgeting. Subsidies and concessions for SSI – role of State and Central Government Agencies in Promotion of Small-Scale Industry	
<b>IV</b>	<b>Concept of Property:</b> Theories of Property, Types of Intellectual Property- Origin and Development, Theories of Intellectual Property Rights, Need for Protecting Intellectual Property, Commercialization of Intellectual Property Rights by Licensing, Determining Financial Value of Intellectual Property Rights, Negotiating Payments Terms in Intellectual Property Transaction.	<b>14</b>
<b>V</b>	<b>Introduction to Patent Law,</b> (a) Paris Convention, (b) Patent Cooperation Treaty, (c) WTO-TRIPS, Indian Patent Law, The Patents Act, 1970, Patentable Subject Matter, Patentability Criteria, Procedure for Filing Patent Applications, Patent Granting Procedure, Revocation, Patent Infringement and Remedies, Relevant Provisions of the Biological Diversity Act, 2002, Access and Benefit Sharing Issues.	<b>14</b>

**Text Book/References Books/ Websites:**

1. Arvindrai N. Desai; Environment and Entrepreneur; Ashish Publishing House, New Delhi.
2. Dr. P. Saravanavel; Entrepreneurial Development; Learntech Press, Trichy.
3. P Narendra Singh.; Emerging Trends in Entrepreneurship Development Theories & Practices – Entrepreneurship.
4. Dr. S.R.Myneni; Law of Intellectual Property; 9th Ed, Asia law House, 2019.
5. Dr.G.B Reddy; Intellectual Property Rights and Law; Gogia Law Agency.

**Suggested List of Laboratory Practical (Expandable): Nil**
  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-402	Modern Manufacturing Techniques	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	-	1			Min: 40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The purpose of this course is to learn the need for various non-traditional/advance manufacturing and machining methods.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To perform mathematical analyses of conventional manufacturing processes.</li> <li>2. Analyze and access the use of advance casting, welding and metal forming processes in manufacturing and understand their working.</li> <li>3. The student is able to identify the process parameters, their effect and applications of different Unconventional Machining processes.</li> <li>4. Ability to perform Planning, Scheduling and Control of Flexible manufacturing systems.</li> <li>5. Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping technologies.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Conventional Manufacturing Processes:</b> Introduction to Metal casting processes and equipment, pattern making, types of moulding, sand and their types. Types of casting process, Special casting, application and casting defects, Heat transfer and solidification, Introduction to bulk and sheet metal forming, plastic deformation and yield criteria, fundamentals of hot and cold working processes (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending), principles of powder metallurgy, introduction to forging, types of forging process and application, Introduction to welding process, types of welding process, welding defects and application.	14
II	<b>Advanced Casting Processes:</b> Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting. <b>Advanced Welding Processes:</b> Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW). <b>Advanced Metal Forming Processes:</b> Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, stretch forming, and Contour roll forming.	14
III	<b>Unconventional Machining Methods:</b> Limitations of conventional machining and advantages of Unconventional Machining, Working Principle, Operating Parameters and Applications of Unconventional Machining Methods-Electro Chemical Machining, Electric Discharge Machining, Electron beam Machining, Ultra Sonic Machining, Abrasive Jet Machining, LASER Beam Machining, Plasma Arc Machining, Water jet machining. Introduction to MEMS (Micro Electro Mechanical Systems) and Nano-materials.	14
IV	<b>Flexible Manufacturing Systems:</b> Types of flexibility, Key characteristics of various manufacturing systems, Concept of FMS, Basic components of FMS, Operational problems in FMS, Layout considerations Sequencing of Robot moves in Robotic cell, FMS benefits.	14

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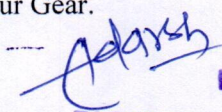
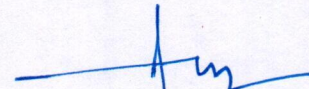
V	<b>Additive Manufacturing:</b> Introduction, Advantages, Limitations, Classifications, need of 3D printing, 3D technology steps, 3D printing application fields, Additive v/s subtractive Manufacturing processes, Examples of 3D Printing, Construction, Working and Applications of -Fused Deposition Modeling (FDM), Stereo lithography (STL), Selective Laser Sintering (SLS), Multi Jet Fusion (MJF), Laminated object Manufacturing (LOM). Additive Manufacturing/3D printing equipment's: Process Design and process parameters.	14
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**Text Book/References Books/ Websites:**

1. Pandey, P.C. and Shan H.S., A textbook of Modern Machining Processes, Tata McGraw Hill.
2. R.K. Jain; A textbook of Production Technology; Khanna publishers.
3. Ranjeet Kumar Sahu, Jitendra Kumar Katiyar; Modern Manufacturing Technology: Spotlight on Future; CRC Press.
4. A. Ghosh, and A.K. Mallik; Manufacturing Science; Affiliated East-West Press Pvt. Ltd. New Delhi.
5. E.P. DeGarmo, J. T Black, R.A. Kohser; Materials and Processes in Manufacturing" (8th Edition), Prentice Hall of India, New Delhi (ISBN 0-02-978760).
6. Mikell P. Groover; Fundamentals of Modern Manufacturing: Materials, Processes, and Systems; Prentice Hall, 1996

**Suggested List of Laboratory Practical (Expandable):**

1. To Prepare Mould for Casting.
2. Study of Sand Properties (Strength and Permeability) and Its Testing Procedure.
3. Study different Welding Processes, Weld Joint Design as per I.S. code and Weld Symbols
4. To perform Plasma welding and Brazing.
5. To join the sheets by Spot Welding operation.
6. Visit to a nearby installation / Study and practice at least two of the following:
  - a) Electric Discharge Machining
  - b) Electro Chemical Machining
  - c) Electron beam Machining
  - d) Ultra-Sonic Machining
  - e) Abrasive Jet Machining
  - f) Plasma Arc Machining
7. To study about FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS)
8. To Study of 3D Printing.
9. To Study 3D Printing of Spur Gear.


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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-403	Mechanics of Mechanisms and Machines	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance /Attendance / Quiz - Max. Marks: 15	

Pre-Requisite	Nil
Course Objectives	The primary purpose of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering.
Course Outcome	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Able to understand the concept of various machine components and its mechanism.</li> <li>2. To understand the types of absolute and relative motion &amp; their analysis diagram</li> <li>3. Study the various types of Gear and terminology associated.</li> <li>4. Able to construct different types of cam profile for a given data.</li> <li>5. To understand the power transmission of belt &amp; chain drive</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Mechanisms and Machines:</b> Mechanism, machine, plane and space mechanisms, link, kinematic pairs, kinematic chains and their classification, degrees of freedom, Grubler's criterion, kinematic inversions of four bar mechanism and slider crank mechanism, pantograph, Davis and Ackermann's steering mechanisms. Numerical	14
II	<b>Kinematic Analysis:</b> Absolute and relative motion, kinematics quantities and their relationship: vector diagrams, instantaneous centers and Kennedy's theorem, velocity analysis, acceleration analysis, velocity and acceleration of reciprocating parts.	14
III	<b>Gears:</b> Fundamental law of gearing, classification and terminology, involutes and cycloid tooth profile properties, contact ratio, interference and undercutting, helical, spiral, bevel and worm gears. <b>Gear Trains:</b> types of gear train; determination of gear speeds using analytical method; torque calculations in compound and epicyclic gear trains. Numerical	14
IV	<b>Cams:</b> Classification of followers and cams, terminology used in cam, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours. Spring surge, unbalance and jump phenomenon. Numerical	14
V	<b>Friction:</b> Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria. Concept of friction circle and axis, rolling friction. Boundary and fluid film lubrication, friction in journal and thrust bearings, lubricants, their types and properties, <b>Belt and Chain Drives:</b> Methods of power transmission, flat belt and pulley; V-belts and sheave design; chain drives, roller chain. Numerical	14

**Text Book/References Books/ Websites:**

1. R.S. Khurmi; A Textbook of Theory of Machine; S Chand.
2. S S Rattan; Theory of machines; TMH.

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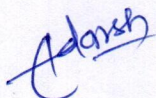


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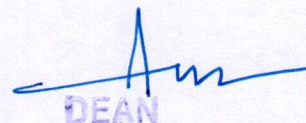
3. AG Ambekar; Mechanism and Machine Theory; PHI.
4. CS Sharma; Purohit K; Theory of Mechanism and Machines; PHI.
5. Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.
6. Ghosh and Mallick, theory of machine & mechanism.
7. T. V. Ramachandra; Management of Municipal Solid Waste; TERI press.

**Suggested List of Laboratory Practical (Expandable):**

1. To study of inversion of four bar mechanism.
2. To study of inversion of single slider crank mechanism.
3. To study of inversion of double slider crank mechanism
4. To study various types of kinematics links, pair, chains & mechanisms.
5. To study of simple four bar linkage mechanism
6. To study of various types of gears
7. To study of various types of gear trains.
8. To study of various types of Cam & follower arrangements.
9. To study of different types of belt drives.
10. To find the co-efficient of friction between wooden block and glass surface with horizontal surfaces.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-404	Fluid Mechanics and Hydraulics Machinery	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance – Max. Marks: 15	

<b>Pre-Requisite</b>	Basic knowledge of mathematics such as algebra and trigonometry.
<b>Course Objective</b>	To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic fluid properties and classification of fluids flow.</li> <li>2. Ability to understand various dimensionless numbers associated with fluid flow.</li> <li>3. Apply Bernoulli's equation to fluid flow problems and boundary layer.</li> <li>4. Different types of turbines used in hydro power plant.</li> <li>5. Various hydraulic machines commonly used.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Review of Fluid Properties:</b> Fluid properties. Fluid Statics, pressure, Pascal's law, hydrostatic law, pressure measurement, buoyant force, stability of floating and submerged bodies, relative equilibrium. <b>Kinematics of Flow:</b> Types of flow, one, two and three dimensional flow, path lines, streak-lines, streamline. Acceleration of a fluid particle, motion of fluid particle along curved path, normal and tangential acceleration, rotational flow. Continuity equation for one and three dimensional flow, stagnation point, flow separation.	14
II	<b>Dynamics of Flow:</b> Euler's equation of motion along a streamline. Application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor, moment of momentum equation. Fluid measurements, velocity measurement, flow measurement. <b>Dimensional Analysis:</b> Dimensional analysis, Rayleigh method, Buckingham-pi theorem, model analysis, similarity law, dimensionless numbers.	14
III	<b>Flow through Pipes:</b> Loss of energy in pipes, hydraulic gradient and total energy line, Pipe in series and parallel, equivalent pipe. <b>Boundary Layer Flow:</b> Introduction to laminar & turbulent flow, boundary layer thickness, boundary layer theory, separation of boundary layer. Reynolds experiment & Reynolds number, relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel plates, kinetic energy & momentum correction factor, Stoke's law.	14
IV	<b>Introduction to Turbo Machinery:</b> Layout of a hydroelectric power plant. Basic principles and classification of turbines. Velocity triangle, fundamental equations, different efficiencies, degree of reaction. Numerical. <b>Fluid system:</b> Hydraulic accumulator, hydraulic intensifier, hydraulic press, hydraulic crane, hydraulic lift, hydraulic ram, hydraulic coupling, hydraulic torque converter, air lift pump.	14
V	<b>Hydraulic Turbines:</b> Classification & layout of hydraulic power plant, different efficiencies, velocity triangles, design parameters. Maximum efficiency of: Pelton, Francis & Kaplan turbines. Characteristic curve of hydraulic turbines, specific speed, governing of turbines. Numerical.	14

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**PEOPLE'S UNIVERSITY, BHOPAL*****(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology**

Semester –IV

	<b>Draft tubes:</b> Types and functions. <b>Centrifugal Pumps:</b> Classification and parts of centrifugal pump, different heads. Centrifugal Compressors.	
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**Text Book/References Books/ Websites:**

1. B.S Massey; Mechanics of Fluid; English Language Book Society (U.K.).
2. Jagdish Lal; Hydraulic Machines; S.K.Kataria & Sons.
3. S.K. Som & G. Biswas; Introduction to Fluid Mechanics and Fluid Machines TMH.
4. R. K. Rajput; A text of Fluid Mechanic; S. Chand & Company Ltd.

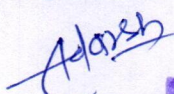
**Suggested List of Laboratory Practical (Expandable):**

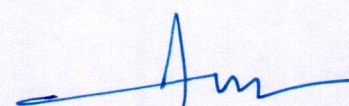
1. To determine the local point pressure with the help of pitot tube.
2. Calibration of Orifice meter and Venturimeter.
3. To verify Bernoulli's equation.
4. To determine losses in pipe due to friction.
5. To study the constructional details of turbines and draw its fluid flow circuit.
6. To study of draft tubes.
7. To study the constructional details of a centrifugal pump and draw its characteristic curves.
8. To study the model of hydro power plant and draw its layout.



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Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-405	Thermal Engineering	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		2	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks: 15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance- Max. Marks: 5
<b>Practical Internal Max Marks: 15</b>	Lab Performance/Attendance /Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Applied Thermodynamics.
<b>Course Objective</b>	Students will get enough knowledge about all the devices such as steam generators, steam nozzles, steam turbines, I.C. engines and gas turbines.
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Energy conversion in power plants.</li> <li>2. Working principle of steam nozzle and steam condenser.</li> <li>3. Working principles of steam turbines and its performance.</li> <li>4. Understand the various components and mechanisms of I. C. Engines.</li> <li>5. Working principle of gas turbines and its performance.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Power Cycles:</b> Carnot and Rankine vapor cycles, effect of operating conditions on thermal efficiency of Rankine cycle, Rankine cycle with superheat, reheat and regeneration, Brayton cycles Binary vapor cycle, Air standard Cycles used in I.C. engine (Otto, Diesel, Dual) Numerical	07
II	<b>Steam Nozzles:</b> Expansion of steam through nozzle-types of nozzles-condition for maximum discharge-critical pressure ratio-effect of friction-super saturated flow-steam jet pump. <b>Steam Condensers:</b> Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, sources of air leakage and its disadvantages, vacuum efficiency and condenser efficiency. Numerical	07
III	<b>Steam Turbines:</b> Principles of impulse, reaction and impulse-reaction turbines-compounding-velocity diagrams for simple and multistage turbines-work done on turbine blades and efficiencies-losses in steam turbines governing of steam turbines.	07
IV	<b>Internal Combustion Engines:</b> Engine Types and Applications-Actual Cycles-Valve and Port Timing Diagrams-Fuel Supply-Ignition-Cooling and Lubrication Systems for SI Engines & CI Engines. Cetane and Octane Numbers of Fuels-Combustion-Knocking and Detonation-Scavenging, Turbo charging and Supercharging- Performance of I.C. Engine frictional Power and Various Efficiencies and Energy Calculations.	07
V	<b>Gas Turbines:</b> Open and Closed gas turbines-ideal and actual cycles-compressor and turbine efficiency-effect of operating variables on thermal efficiency and work out put-work ratio-types of combustion of chambers combustion efficiency-methods to improve performance-inter cooling reheating and regeneration.	07

**Text Book/References Books/ Websites:**

1. P.K.Nag; Basic and Applied Thermodynamics; Tata McGrawHill Pub.
2. Arora and Domkundwar; Thermodynamics; Dhanpat Rai & Co., New Delhi.
3. V. Ganeshan; Internal Combustion Engines; McGraw-Hill Education.

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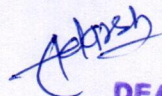


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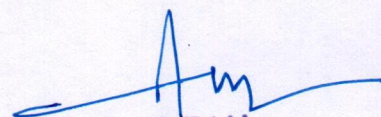
4. R. K. Rajput; Thermal Engineering; Laxmi Publications; New Delhi.
5. R. Yadav, Steam & Gas Turbines; Central Publishing House.
6. G.J.Van Wylen and R.E .Sonntag; Fundamentals of Classical Thermodynamics; Wiley Eastern.
7. B.L.Singhal; Internal Combustion Engines; McGraw-Hill Education.

**Suggested List of Laboratory Practical (Expandable):**

1. Study of working of four stroke petrol engine and four stroke diesel engines with the help of cut section models.
2. To calculate the indicated power, friction power and mechanical efficiency of four stroke four
3. cylinder petrol engine at full load and rated speed by Morse test
4. To determine the full load performance of 4stroke single cylinder spark ignition system.
5. To determine the part load performance of 4stroke single cylinder spark ignition system.
6. To determine the brake, mean effective pressure of 4stroke single cylinder spark ignition system.
7. To determine the full load performance of 4stroke single cylinder compression ignition system.
8. To determine the part load performance of 4stroke single cylinder compression ignition system.
9. To prepare heat balance sheet on multi-cylinder diesel engine / petrol engine.
10. To study of the principle of Vapor power cycles.
11. To study of the different kind of steam condenser used in steam power plant.
12. To study of steam nozzles.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-406	Mechanical Engineering Software Lab-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total Nil	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	Develop Solid models of given machine components using any parametric CAD software.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Ability to draw the various components using software.</li> <li>2. Ability to understand the knowledge of fluid mechanics using software.</li> <li>3. Study the various machines parts and its applications.</li> </ol>

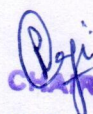
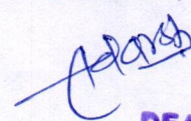
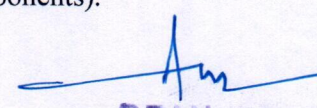
Unit	Contents (Theory)	Marks Weightage
I	<b>Solid Modeling Software:</b> In this lab student will get an opportunity to learn any one solid modeling software from Autodesk Inventor, Pro/ENGINEER, CATIA, SOLID EDGE, SOLID WORKS, UNIGRAPHICS etc as assigned by the faculty. Students will be required to learn the methods related to Sketching, part modeling, assembly, wireframe / surfacing modeling & Drafting of various mechanical components.	50

**Text Book/References Books/ Websites:**

1. K.L. Narayana, P. Kannaiah; Production Drawing; New Age publishers.
2. Goutham Pohit, Goutham Ghosh; Machine Drawing with Auto CAD, Pearson;
3. Web References: <https://nptel.ac.in/courses/112107240/>

**Suggested List of Laboratory Practical (Expandable):**

1. Familiarization and practicing of drawing and modifying commands, template creation, lettering, object snapping and sectioning
2. Prepare the 2D drawings using draw and modify commands for simple geometric assemblies, sectional views for part drawing and assemblies.
3. Preparing the 2D and 3D models (wire frame, surface and solid models)
4. Introduction of Boolean operations.
5. Generation of 2D, 3D models, through protrusion, revolve, sweep.
6. Development of orthographic views for assembly drawings and preparation of bill of materials(IC engine components, Machine tool accessories, other mechanical components).

  
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**Department: Mechanical Engineering**



**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE -407	NCC-IV	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		2	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks:15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. Develop a sense of time management and social skills.</li> <li>2. Understand the life history &amp; leadership qualities of personalities who have contributed in Nation Building and Literature.</li> <li>3. Understand the role of NCC cadets as 2<sup>nd</sup> line Defence in 1965 War.</li> <li>4. Develop awareness about various types of Natural and manmade disasters.</li> <li>5. Know about life saving tips during disasters.</li> <li>6. Acquainted about Fire Services.</li> <li>7. Understand importance of Environmental Awareness &amp; conservation.</li> <li>8. Understand importance of General Awareness.</li> <li>9. Know about Armed Forces.</li> </ol>
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Effectively manage time.</li> <li>2. Develop the qualities of social skills.</li> <li>3. Imbibe leadership qualities.</li> <li>4. Do group discussions effectively.</li> <li>5. Be motivated to serve the nation by joining Armed forces.</li> <li>6. Contribute in environmental awareness and conservation activities.</li> <li>7. Keep abreast of current affairs &amp; general awareness.</li> <li>8. Effectively contribute in managing disaster relief tasks.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Personality Development :</b> Group Discussions –Social Skills & Time management	07
II	<b>Leadership Development:</b> Case Studies – Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965 war.	07
III	<b>Disaster Management:</b> (i) Initiative Trg, Organising Skills. (ii) Do's and Don'ts . (iii) Natural Disasters. (iv) Man Made Disasters. (v) Fire Services and Fire Fighting.	07
IV	<b>Environmental Awareness:</b> Adventure Environmental Awareness and Conservation. <b>General Awareness:</b> General Awareness.	07
V	<b>Armed Forces:</b> Army, Navy, Air Force and Central Armed Police Forces.	07

**Text Book/References Books/ Websites:**

1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV****Suggested List of Laboratory Practical (Expandable):****1. Drill**

- Arm Drill.
- Salami Shastra.
- Squad Drill with Arms

**2. Weapon Training:** Short Range firing**3. Map Reading**

- Map to Ground.
- Ground to Map.


**4. Field Craft & Battle Craft**

- Fire and Move Capsule.
- Field signal- with hand, with Weapons, Signal with Whistle.
- Field signals as means of giving orders.
- Field signals by day, Field signals by night.
- Section Formation.

**5. Social Service and Community Development:** Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days- National and State level**6. Health & Hygiene**

- Hygiene & Sanitation (Hygiene- Personal & Camp Hygiene).
- First Aid in common medical emergencies.
- Treatment & Care of Wounds

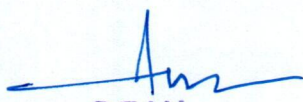
Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.

  
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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-408	Research Methodology	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		1	-	-			Min: 20 (D Grade)			(Nil)

Duration of Theory (Externals): Nil

Theory Internal- Max Marks: 50	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	


Pre-Requisite	Nil
Course Objective	To get to know about research and its analysis.
Course Outcomes	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand the objective and types of research.</li> <li>2. To understand basic concepts of research formulations.</li> <li>3. About various design methods.</li> <li>4. To know about how data is collected for analyzing process &amp; thesis writing.</li> <li>5. To understand report and thesis writing.</li> </ol>


Unit	Contents (Theory)	Marks Weightage
I	<b>Objectives and Types of Research:</b> Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.	10
II	<b>Research Formulation:</b> Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem.	10
III	<b>Research Design and Methods:</b> Research design – Basic Principles- Need of research design, Features of good design – Important concepts relating to research design – Observation and Facts. Developing a research plan - Exploration, Description, Diagnosis, and Experimentation.	10
IV	<b>Data Collection and Analysis:</b> Execution of the research - Observation and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies - Data Analysis with Statistical Packages - Hypothesis-testing, Generalization and Interpretation.	10
V	<b>Reporting and Thesis Writing:</b> Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes.	10

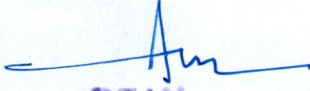
**Text Book/References Books/ Websites:**

1. B. L. Garg., Karadia, R. Agarwal ;An introduction to Research Methodology; RBSA Publishers.
2. C. R. Kothari; Research Methodology: Methods and Techniques; New Age International.
3. S. C. Sinha and Dhiman; Research Methodology; Ess Publications.

**Suggested List of Laboratory Practical (Expandable): Nil**

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-409	Environmental Science	L	T	P	End Sem (Nil)	Internal (100)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		1	-	-			Min: 40 (D Grade)			(Nil)

Duration of Theory (Externals): Nil

<b>Theory Internal- Max Marks: 100</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 100
<b>Practical Internal Max Marks: Nil</b>	Lab Performance / Quiz/Attendance -Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	Imparting basic knowledge about the environment and its allied problems and developing an attitude of concern for the environment.
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>1. Conceptual knowledge of energy resources with its applications.</li> <li>2. To understand the ecosystems and value of these ecosystems to humans and to animals and plants.</li> <li>3. Developing awareness of biodiversity and its conservation.</li> <li>4. Categorize different types of pollutions and their control measures. Discover effective methods of waste Management. Analyze global environmental problems and come out with best possible solutions.</li> <li>5. Understand environmental laws and sustainable development.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Energy Resources:</b> Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. The multidisciplinary nature of environmental studies Definition, scope and importance, Need for public awareness.	20
II	<b>Ecosystems:</b> Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries).	20
III	<b>Biodiversity and its Conservation:</b> Introduction – Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values. Biodiversity at global, national and local level. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. In-situ and Ex-situ conservation of biodiversity.	20
IV	<b>Environmental Pollution:</b> Definition, Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides.	20
V	<b>Environmental Policy, Legislation, Rules and Regulations :</b> National Environmental Policy Environmental Protection act, Legal aspects Air (Prevention and Control of pollution )	20

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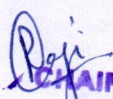
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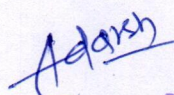
Act1981, Water ( Prevention and Control of pollution ) Act-1974, Water pollution Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .
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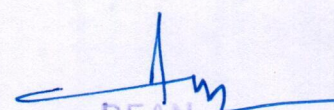
**Text Book/References Books/ Websites**

1. Dr. S. S. Dara and Dr. D. D. Mishra; A textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd.
2. Dr. Suresh K. Dhameja; Environmental studies; S K Kataria and Sons.
3. A. Ristinen and Jack J. Kraushaar; Energy and the Environment, 2nd Edition: Robert; Shree Sai Publication
4. Anindita Basak ; Environmental Studies; Pearson Publications.
5. Gilbert M. Masters; Introduction to Environmental Engineering and Science; Prentice-Hall Publications.

**Suggested List of Laboratory Practical (Expandable): Nil**

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-410	Massive Open Online Courses (MOOCs)-I	-	-	1						

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/Attendance /Quiz - Max. Marks: 50	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	MOOCs build on the engagement of learners who self-organize their participation according to learning goals, prior knowledge and skills, and common interests. Objective of this course is to improve the technical skills of students and its gives an opportunity to explore themselves beyond class room teaching.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> New interesting courses of their own curiosity and improve their knowledge and skills. MOOCs give an opportunity to connect openly on a global scale, with global learners. The ability to experiment with pedagogical methods on a vast scale.

Unit	Contents (Theory)	Marks Weightage
I	<p>Massive Open Online Courses (MOOCs) are online courses that allow participants free access and unrestricted participation in any course of their choice. Besides the conventional modes of teaching such as lectures, videos and reading material, MOOCs also provide a platform for interactive forums.</p> <p>After the III semester End Sem Examination, all students are instructed to register themselves in a minimum IV (Four weeks) MOOC/NPTEL/SWAYAM Certification course in their Engineering discipline.</p> <p>Students must appear in the certification examination conducted by NPTEL/ SWAYAM and submit his/her assignment/assessment sheets to their respective assigned faculty of the department before the end of the semester. A student should give an effective PowerPoint presentation of a chosen course in the class seminars and receive feedback from each other. This effort will help them to communicate their ideas more clearly.</p> <p>The final evaluation of this course will base on a Power Point Presentation and Certification during the academic session by the assigned faculty.</p>	50

**Text Book/References Books/ Websites:**

1. <https://swayam.gov.in/>
2. <http://nptel.ac.in>
3. <https://onlinecourses-archive.nptel.ac.in>

**Suggested List of Laboratory Practical (Expandable): Nil**

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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –IV**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-411	Sociology	L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
		1	-	-			Min: 20 (D Grade)			(Nil)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: 50</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance – Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance /Quiz - Max. Marks: Nil	


<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The objective of this course is to provide students a basic understanding of sociological concepts.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The meaning of Sociology and its importance.</li> <li>2. The basic concepts involved in sociology.</li> <li>3. About the social changes</li> <li>4. About the Basic Social structure.</li> <li>5. Understand the social law and its control.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Sociology: definitions, aim and objective; Relation with other social sciences – law and history; Important theoretical approaches: evolutionism, functionalism, conflict theory, interactionist theory; Law as a tool of social engineering: Durkheim, Weber, Pound and Bentham.	10
II	<b>Basic Concepts:</b> Social Groups: Cooley and Sumner; Community; Association; Tribes; Social Groups; Status and Role.	10
III	<b>Social Change:</b> Social Reform Movements in India – Raja Ram Mohan Roy, Jyotiba Phule, Naicker, etc.; Modernization and Post Modernization; Liberalization and Globalization; Fordism and Mc Donaldization.	10
IV	<b>Social Structure:</b> Culture: Culture Relativism, Racism, Ethnicity and Ethnocentricism; Socialization; Status and Role.	10
V	<b>Social Control:</b> Custom as an Agency of Control; Law as an Agency of Control; Media as an Agency of Control; Public Opinion as an Agency of Control.	10


**Text Book/References Books/ Websites:**

1. Vidya Bhushan and D.R. Sachdeva; An Introduction to Sociology; KitabMahal Publisher; New Delhi
2. Desai, N. and M. Krishnaraj Women and Society in India; Ajanta Publications; 1987.
3. Myneni Sociology; Allahabad Law Agency, Faridabad; 2004 Goode, W.J. and P.K. Hatt Methods in Social Research; McGraw- Hills; New York; 1952.
4. Giddens; A. Sociology; Polity Press, UK; 1993.

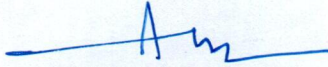
**Suggested List of Laboratory Practical (Expandable): Nil**

  
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**PEOPLE'S UNIVERSITY, BHOPAL*****(Applicable for Admitted from Academic Session 2021-22 onwards)***

Programme: Bachelor of Technology

Semester –IV

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-412	Fine Arts-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total Nil	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

**Duration of Theory (Externals): -Nil**

<b>Theory Internal- Max Marks: -Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/Attendance / Quiz - Max. Marks: 50	

<b>Pre-Requisite</b>	Basic knowledge of art and drawing.
<b>Course Objective</b>	To teach the core competencies of critical and conceptual thinking through the continual observation and analysis of the visual and social world also provide a strong philosophical and historical foundation of the visual arts and its impact
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Increase ability to communicate with people.</li> <li>2. Learn to sketch and take field dimensions.</li> <li>3. Skillfully create artistic form using techniques and methods appropriate to the intended result.</li> <li>4. Learn to take data and transform it into graphic drawings.</li> </ol>

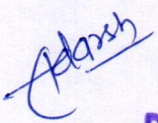
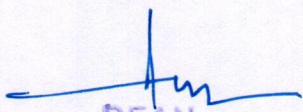
Unit	Contents (Theory)	Marks Weightage
I	<b>History of Indian Painting II</b> :Cave Paintings of India- Ajanta, Bagh, Jain, Pal (Apabhransh), Mughal Painting- Akbar and Jahangir Rajasthani painting- Mewar, Kishangarh, Jaipur	50

**Text Book/References Books/ Websites:**

1. Lokesh Chandra Sharma; A Brief History of Indian Painting.
2. R.A. Agrawal; Roop Prad Kala Ke mool Adhar.

**Suggested List of Laboratory Experiments :- (Expandable):**

1. Composition :- Human Figure with Background Poster Colour
2. Copy work :- Indian Miniature

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology**

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5101	Gender Equality	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Basic knowledge about Constitutional Law and Criminal Law.
<b>Course Objective</b>	This course is aimed at discussing the interface between law and gender equality. It also aims to sensitize and create awareness about gender related issues.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The concept of gender equality.</li> <li>2. Relationship between gender and the law.</li> <li>3. Different aspects of gender discrimination and reforms</li> <li>4. National and International efforts towards creating gender equality.</li> <li>5. Presence of Women-Centric Laws in India</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Meaning of Sex and Gender; History of Gender Movements; Gender roles and gendered division of labour, Private vs public divide and gender inequality; Physical difference, attributes and behavioural dispositions.	14
II	<b>Women as Workers:</b> Unpaid, underpaid and casual work; Women in primary, secondary and tertiary sectors; Classification of work in Indian census and NSSO – Main workers, marginal workers, non-workers; Invisibility of women's work, problems in measurement; Non-recognition of women's work in national income accounting.	14
III	<b>Gender and Health:</b> Poverty, Gender Discrimination and Under Nutrition; Epidemiology of Menstruation and Menstrual Disorder; Early Marriage, Unwanted Pregnancy and Unsafe Abortions; Adolescent Pregnancy and Sexually Transmitted Infection and HIV/AIDS; Health issues relating to Violence: Sexual Abuse, Immoral Trafficking, Rape.	14
IV	<b>Gender Based Violence in Community and State:</b> Rape as a weapon of oppression – causes and implications; Sexual abuse and harassment; Trafficking of Women and Girls; State Violence; Custodial violence; Violence by law enforcing agency; Genocide; Armed Conflict, Displacement and Gender Abuse; War crimes and Sexual abuse; Sexual Assault of Refugees and Displaced Women; New Forms of Violence against Women - Online Violence and its Implications.	14
V	<b>Response to Violence Against Women:</b> International & National response: International Initiatives – legal and policy framework, National Human Rights Commission, National Commission for Women, Law Enforcing Agencies: All Women's Police Stations, Vigilance Cells; Legal Aid Cells; Judiciary: Family Courts/ Mahila Courts; Service Providers: Helplines, Women and Children Help lines; Non-State Actors: INGOs and NGOs, Collective protests, Restorative justice in the context of gender violence.	14

**Text Book/References Books/ Websites:**

1. Chaudhuri, Maitrayee ;Feminisms in India. Kali for Women; New Delhi
2. Chaudhuri, Maitrayee ;The Indian Women's Movement: Reform and Revival ;Reprinted. Delhi: Palm Leaf. pp. 1-68.

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3. Gandhi, N.; When the rolling Pins hit the street: a case study of the Anti-price rise Movement in India; New Delhi.
4. Alexander; Linda Lewis et al (eds) ; New Dimensions in Women & Health.

**Suggested List of Laboratory Practical (Expandable): Nil**

  
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Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-5102	Human Health & Nutrition	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		3	-	-			Min: 40 (D Grade)			

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	A study of nutrition and food as applied to daily living. The course provides information on basic nutrition and wellness concepts in relation to the individual and family throughout life.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic concepts in food and nutrition.</li> <li>2. Know different types of nutrients.</li> <li>3. The basic food groups.</li> <li>4. Various cooking methods</li> <li>5. Normal body parameters.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Basic Concepts in Food and Nutrition:</b> Basic terms used in study of food and nutrition, Understanding relationship between food nutrition and health, Functions of food-Physiological, Psychological and social.	14
II	<b>Nutrients:</b> Functions, dietary sources and clinical manifestation of deficiency / excess of the following nutrients: Carbohydrates, Lipids and Proteins, Fat soluble vitamins – A,D,E and K, Water soluble vitamins- thiamin, riboflavin, niacin, pyridoxine, Folate, vitamin B12 and vitamin C, Minerals- calcium, iron and iodine.	14
III	<b>Food Groups:</b> Selection, nutritional contribution and changes during cooking of the following food group: <ul style="list-style-type: none"> <li>▪ Cereals</li> <li>▪ Fats and oils</li> <li>▪ Eggs</li> <li>▪ Pulses</li> <li>▪ Fruits and vegetables</li> <li>▪ Milk and milk products</li> <li>▪ Meat, poultry and fish</li> </ul>	14
IV	<b>Methods of Cooking and Preventing Nutrient Losses:</b> Dry, moist, frying and microwave cooking, Advantages disadvantages and the effect of various methods of cooking on nutrition's, Minimizing nutrient losses.	14
V	<b>Basic Concepts in Food and Nutrition:</b> Basic terms used in study of food and nutrition, Understanding relationship between food nutrition and health, Functions of food-Physiological, Psychological and social.	14

**Text Book/References Books/ Websites:**

1. Swaminathan; M Hand book of foods and nutrition fifth Ed;Bappco.
2. Srilakshmi B; Nutrition Science 2012; New Age international (P) LTD.
3. Mudambi, SR and Rajagopal; Mv fundamentals of foods Nutrition and Diet Therapy; Fifth Ed: 2012
4. Khanna K Gupta S Seth R Mahana R. Rekhi T.; The AM an and Science of cooking .

**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-5103	Ethical Hacking and Cyber Security	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Student should have basic knowledge of computer.
<b>Course Objective</b>	To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Identify and analyze the stages an ethical hacker requires to take in order to compromise a target system.</li> <li>2. Techniques to carry out a penetration testing.</li> <li>3. About various types of attacks, attackers and security threats.</li> <li>4. Gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities.</li> <li>5. Understand details of cybercrime.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Understanding the importance of security, Concept of ethical hacking and essential Terminologies- Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit, Phases involved in hacking.	14
II	<b>Foot printing:</b> Introduction to foot printing, Types of foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase.	14
III	<b>System Hacking:</b> Aspect of remote password-guessing Role of Eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS, and IP Sniffing, HTTPS Sniffing.	14
IV	<b>Hacking Wireless Networks:</b> Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.	14
V	<b>Introduction to Cybercrime:</b> Defining Cybercrime, Understanding the Importance of Jurisdictional Issues, Quantifying Cybercrime, Differentiating Crimes That Use the Net from Crimes That Depend on the Net, working toward a Standard Definition of Cybercrime, Categorizing Cybercrime, Developing Categories of Cybercrimes, Prioritizing Cybercrime Enforcement, and Reasons for Cybercrimes.	14

**Text Book/References Books/ Websites:**

1. Rajat Khare; Network Security and Ethical Hacking; Luniver Press
2. Thomas Mathew; Ethical Hacking; EC Council
3. Debby Russell and Sr. G.T Gangemi; Computer Security Basics; O' Reilly Media
4. Thomas R Peltier, Justin Peltier and John blackley; Information Security Fundamentals; Prentice Hall

**Suggested List of Laboratory Practical (Expandable): Nil**

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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-5104	Industrial Safety and Environment	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total
		3	-	-			Min: 40 (D Grade)			(Nil)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Student has fundamental knowledge about various types of industries.
<b>Course Objective</b>	To make the students familiar with various industrial safety and their relative acts.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Demonstrate an integrative approach to analyses of safety in various industries.</li> <li>2. Ability to analyses various types industrial accidents.</li> <li>3. The ability to apply the fundamental knowledge in environmental factors.</li> <li>4. Students will understand the basic about industrial hazards.</li> <li>5. To identify types of industrial acts.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Industrial Safety:</b> Electrical safety, Construction safety, Chemical safety, Fire safety, Need of safety, Safety programmes, Industrial safety principle, Safety policy, Safety inspection, Safety legislation, Safety measures, Safety audit.	14
II	<b>Industrial Accidents:</b> Types of accidents, Nature and effect of accidents, Causes, Preventions, Accident management, Reporting, Investigations, Laws and Acts, Safety education and training.	14
III	<b>Environmental Factors:</b> Environment introduction, Need of environment control, Safe working environment, Entry and exit, Housekeeping, Work area, Floors and other surfaces, Workstations, Welfare facilities, Air quality, Temperature, Illumination, Noise, Vibrations, Plant layout, Lighting, Ventilations.	14
IV	<b>Industrial Hazards:</b> Classification, Categories, Hazard management, Identification and hazard control, Physical hazard, Chemical hazard, Biological hazard, Psychosocial hazard, Fire hazard, Health hazard, HAZOP, Major industrial hazard, Security management.	14
V	<b>Industrial Acts:</b> Factories act, 1948, Workers safety act, Provision of acts, Requirements of acts, Duties of inspector, OSHA, Indian electricity act -1910, Indian boiler act -1923, Mines act-1952, Petroleum act-1934, Minimum wages act-1948, The payment of wages Act-1936, Employee state insurance act, Workmen compensation act.	14

**Text Book/References Books/ Websites:**

1. Anupama Prashar; Industrial Safety & Environment, S.K. Kataria and Sons Publication.
2. R. K. Jain and Sunil S. Rao; Industrial Safety, Health and Environment Management Systems; Khanna Publishers.
3. Thomas D. Schneid; Safety Law: Legal Aspects in Occupational Safety and Health (Occupational Safety & Health Guide Series), CRC Press.
4. Pravin M.Pathak & Jayant P. Khairnar; Industrial Safety Management: Safety, Health & Environment Management; Notion Press.
5. R.K. Mishra ; Safety Management: Safety, Health & Environment Management; AITBS Publishers.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-502	Power Plant Engineering	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks:10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Engineering Thermodynamics, Fluid Mechanics, Heat Transfer.
<b>Course Objective</b>	The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Identify various components of Hydro, Steam, Gas, Diesel power plants.</li> <li>2. Measure waste heat recovery in a typical thermal power plant.</li> <li>3. To give fundamental knowledge of construction and working of various types renewable sources solar, Wind, Geothermal etc.</li> <li>4. Understand the different power generation methods, its economics and global energy situation</li> <li>5. Apply the basic thermodynamics and fluid flow principles to different power generation methods.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Coal Based Thermal Power Plant:</b> Layout of modern coal power plant, site selection criteria, Rankine cycle and its improvisations, Supercritical, High Pressure Boilers, FBC Boilers, Steam Nozzles, Steam Turbines, Steam Condensers, Cooling Towers, Steam & Heat rate, Combined Cycle Power Plant : Binary Cycles and Cogeneration systems. Subsystems of thermal power plants – Draught system, Fuel and ash handling, Feed water treatment,	14
II	<b>Hydroelectric Power Plant:</b> Classification, General arrangement, operating principle, advantages and limitations, Maintenance. <b>Diesel Power Plant:</b> Introduction, components, advantages and limitations, Diesel generating set, Maintenance.	14
III	<b>Nuclear Power Plant:</b> Nuclear fusion and fission, Chain reaction, nuclear fuels, Components of nuclear reactor, Classification of reactors, Pressurized water reactor, Boiling water reactor, Gas cooled reactor, Nuclear waste and its disposal, Nuclear power plants in India.	14
IV	<b>Renewable Energy Sources:</b> Introduction to Fossil fuels, Potential of wind electricity generation in India and its current growth rate. Solar energy, Characteristic advantages and disadvantages., Fuel cell, Tidal power plants, Basic principle of power generation in a PV cell , Geo-thermal and Geothermal sites in India, Biomass Energy.	14
V	<b>Energy, Economic and Environmental issues of Power Plants:</b> Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.	14

**Text Book/References Books/ Websites:**

1. Frederick T. Morse; Power Plant Engineering; East West Press.
2. EI-Wakil M.M; Power Plant Technology; Tata McGraw-Hill.
3. P.K. Nag; Power Plant Engineering; Tata McGraw Hill, New Delhi.
4. G.R .Nagpal; Power Plant Engineering; Khanna Publishers.
5. R. Yadav; Fundamental of Power Plant Engineering; Central Publishing House Allahabad.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-503	Production Planning and Control	3	1	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Nil Max. Marks: Nil	

<b>Pre-Requisite</b>	General study of Production and operations management
<b>Course Objective</b>	To give fundamental knowledge of cost analysis, inventory and production management, it also able to understand the role of procurement and supply chain management.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Understand the various elements of costs and Inventory. It also able to understand the sales forecasting.</li> <li>2. Know types of organization, the organization structure of an industry</li> <li>3. Understand the different aspects of production management.</li> <li>4. Understand the role of materials management industries.</li> <li>5. Able to understand the role of procurement and supply chain management.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Costing and Cost Analysis:</b> Elements of costs Break even analysis, Incremental costs, decision. <b>Inventory models:</b> Necessity of inventory in process and safety stock, problem of excess inventory and cycle time (WIP/ Throughput), JIT/ lean mfg.; basic EOQ/ EPQ models for constant review Q-system (S, s); periodic review, base stock P-system; service level, lead time variance and safety stock; ABC, VED and other analysis based on shelf life, Inventory control under risk and uncertainty. <b>Sales Forecasting:</b> Purposes, Methods – Delphi, Linear regression, Economic indicators, Time-series analysis, Moving average, Exponential smoothing.	14
II	<b>Production Planning and Control:</b> Functions, Organization, Master Scheduling, Aggregate planning and strategies, Materials requirement planning, Product structure tree, Routing, Loading, Scheduling – forward and backward, Dispatching – priority rules, Sequencing, Gantt's Chart, Bar chart, Flow process chart.	14
III	<b>Production Management:</b> Definition, Objectives, Scope, Benefits, Functions of production management, Place of production management in an organization, Types of production system, Product life cycle, Product design and development, production cycle.	14
IV	<b>Material Management:</b> Objectives and functions of materials management, Organization of materials management, MRP technique and Calculations, lot sizing in MRP, linking MRP with JIT; evolution of MRP&ERP, MRP I and MRP II. <b>Materials Handling:</b> Principles of materials handling, Unit load, Types of materials handling equipment, Relation between materials handling and plant layout.	14
V	<b>Procurement:</b> Objectives of purchase department, Purchase responsibilities and organization, Types of purchasing, Purchase procedures, Import and Export. <b>Stores Keeping:</b> Stores management, Functions of stores, Classification of materials, Standardization of materials, Identification and maintenance of layout of stores, Physical control of materials, Pricing of stores, Issuing of stores. <b>Supply Chain Management:</b> Introduction, Definition of supply Chain, Major drivers of	14

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	supply chain, Supply Chain Strategies, A model for strategy formulation in SCM. Information Systems in supply chain.	
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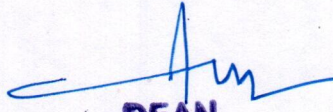
**Text Book/References Books/ Websites:**

1. P. Ramamurty; Production and operation Management; New Age International Publication.
2. MartandTelsang; Industrial Engineering & Production Management; S. Chand & Co.
3. R.P. Mohanty & S G Deshmukh; Supply Chain Management; SBiztantra Publications.
4. R. Mayer; Production and operation Management; Tata McGraw Hill publication.
5. Juran and Gryna; Quality Planning and Analysis, Tata McGraw Hill publication
6. Adam and Ebert; Production and operations Management; PHI

**Suggested List of Laboratory Practical (Expandable): Nil**

  
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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-504	Heat and Mass Transfer	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance /Attendance / Quiz - Max. Marks: 15	

Pre-Requisite	Student should have general knowledge Mechanical engineering.
Course Objectives	The primary objective is to introduce the phenomena of heat transfer between metals, fluids and vapours.
Course Outcome	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand heat transfer rate between metals, fluid and vapours.</li> <li>2. To understand the concepts of heat transfer in metal fins.</li> <li>3. To understand the phenomena of free and forced convection.</li> <li>4. To understand the concepts of heat transfer by radiation and study different heat transfer law.</li> <li>5. To study heat transfer equipment.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Basic Concepts:</b> Modes of heat transfer, Fourier's law, Newton's law, Stefan Boltzmann law; thermal resistance and conductance, analogy between flow of heat and electricity, combined heat transfer process; <b>Conduction:</b> Fourier heat conduction equation, its form in rectangular, cylindrical and spherical coordinates, thermal diffusivity, linear one-dimensional steady state conduction through a slab, tubes, spherical shells and composite structures, electrical analogies, critical-insulation-thickness for pipes, effect of variable thermal conductivity. Numerical.	14
II	<b>Extended surfaces (fins):</b> Heat transfer from a straight and annular fin (plate) for a uniform cross section; error in measurement of temperature in a thermometer well, fin efficiency, fin effectiveness, applications; Unsteady heat conduction: Transient and periodic conduction, heating and cooling of bodies with known temperatures distribution, systems with infinite thermal conductivity, Response of thermocouples.	14
III	<b>Convection:</b> Introduction, free and forced convection; principle of dimensional analysis, Buckingham 'pie' theorem, application of dimensional analysis of free and forced convection, empirical correlations for laminar and turbulent flow over flat plate and tubular geometry; calculation of convective heat transfer coefficient using data book.	14
IV	<b>Thermal radiation:</b> Nature of radiation, emissive power, absorption, transmission, reflection and emission of radiation, Planck's distribution law, radiation from real surfaces; radiation heat exchange between black and gray surfaces, shape factor, analogical electrical network, radiation shields. Boiling and condensation: Film wise and drop wise condensation; Nusselt theory for film wise condensation on a vertical plate and its modification for horizontal tubes; boiling heat transfer phenomenon, regimes of boiling, boiling correlations.	14
V	<b>Heat Exchangers:</b> Types- parallel flow, counter flow; evaporator and condensers, overall heat	14

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Programme: **Bachelor of Technology**

**Semester –V**


transfers coefficient, fouling factors, log-mean temperature difference (LMTD), method of heat exchanger analysis, effectiveness of heat exchanger, NTU method; Mass transfer: Fick's law, equi-molar diffusion, diffusion coefficient, analogy with heat transfer, diffusion of vapour in a stationary medium.	
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**Text Book/References Books/ Websites:**

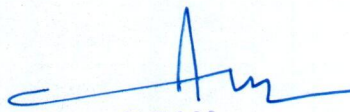
1. S.P. Sukhatme ; Heat Transfer; Tata McGraw Hill
2. J.P. Holman ; Heat Transfer; Tata McGraw Hill
3. K. Kannan ; Heat & Mass Transfer; Anuradha Agencies
4. Yunus A. Cengel ; Heat Transfer: A Practical Approach; McGraw Hill
5. Ghosh, Dastudhar ; Heat Transfer; Oxford University Press
6. D.S. Kumar ; Heat & Mass Transfer; S.K. Kataria & Sons.

**Suggested List of Laboratory Practical (Expandable):**

1. To determine Thermal Conductivity of given metal rod
2. To study the transfer phenomenon and compare the performance of heat pipe with two geometrical similar pipes of copper and stainless steels
3. To measure the Emissivity of the test surface in comparison to black surface
4. To determine Forced convention heat transfer coefficient for flow through the given horizontal tube
5. To visualized the pool boiling over the heater wire in different regions up to the critical heat flux point at which the wire melts
6. To calibrate a thermocouple and find the corresponding curve-fit correlation
7. To determine the Stefan Boltzmann constant of radiant heat transfer
8. To determine the natural convection heat transfer coefficient for the vertical tube exposed to atmospheric air
7. To determine the Temperature difference (LMTD) and overall co-efficient of given Heat Exchanger
8. To determine Free convection from extended surfaces

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBME-505	Dynamics of Machines	3	1	1						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Student should have general knowledge Mechanical engineering.
<b>Course Objectives</b>	The primary objective is to analyzing and predicting dynamics behavior of mechanical components.
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.</li> <li>2. To understand the principles in mechanisms used for speed control and stability control.</li> <li>3. To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.</li> <li>4. To study gyroscopic couple and its effects on objects in spinning motion.</li> <li>5. To learn the mechanical vibration as a specialized area in dynamics.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Dynamics of Engine Mechanisms:</b> Displacement, velocity and acceleration of piston; turning Moment on crankshaft, turning moment diagram, fluctuation of energy. Fly Wheels – Dimension of flywheel rims, Flywheels of punching presses.	14
II	<b>Governor Mechanisms:</b> Types of governor, characteristics of centrifugal governor, gravity and spring controlled centrifugal governor, hunting of centrifugal governor, inertia governor. Performance parameter: Sensitivity, stability, Isochronism, Governor effort and power controlling force diagram.	14
III	<b>Balancing:</b> Static and dynamic Balancing, Balancing of rotating masses – Balancing machines, Balancing of single cylinder engines – Balancing of multi cylinder engines – Balancing of V and radial engines, Balancing of linkages	14
IV	<b>Gyroscope:</b> angular velocity and angular acceleration, gyroscopic torque (couple) ; gyroscopic effect on naval ships & aeroplanes; stability of two and four wheel vehicles, rigid disc at an angle fixed to a rotating shaft. Types of brake, Types of dynamometers. Friction clutches	14
V	<b>Vibration:</b> Basic features of vibratory systems, Degrees of freedom – single degree of freedom, Free vibration, Equations of motion, Natural frequency; Types of Damping, Damped vibration; Torsional vibration of shaft, Critical speeds of shafts, two and three rotor torsional systems.	14

**Text Book/References Books/ Websites:**

1. R.S. Khurmi; A Textbook of Theory of Machine; S Chand
2. S S Rattan; Theory of machines; TMH
3. A G Ambekar; Mechanism and Machine Theory; PHI.
4. C S Sharma; Purohit K; Theory of Mechanism and Machines; PHI.

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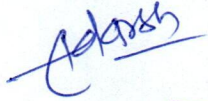
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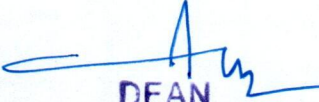
5. Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.
6. Ghosh and Mallick, theory of machine & mechanism.

**Suggested List of Laboratory Practical (Expandable):**

1. To perform experiment on Watt governor to prepare performance characteristic curves, and to find stability & sensitivity.
2. To perform experiment on Porter Governor to prepare performance characteristic curves, and to find stability & sensitivity.
3. To perform experiment on Hartnell Governor to prepare performance characteristic curves, and to find stability & sensitivity.
4. To perform static & dynamic balancing on static balancing machine apparatus.
5. The to determine the phase angle, position and mass to balance the effect of the centrifugal forces caused by rotating masses in a single plane.
6. To perform experiment on unbalanced system with rotating masses and adjust the radii of the two outer masses, calculate their mass and angular positions in order to achieve a balanced system.
7. To study of various types of dynamometers
8. To study of various types of brakes
9. To study gyroscopic effects through model.
10. To determine critical speed or whirling speed of a rotating shaft and to verify the value theoretically

  
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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-506	Computer-Aided Design and Manufacturing	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	-	1			Min: 40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Manufacturing Technology and Basic knowledge of computer.
<b>Course Objective</b>	To provide an overview of how computers are being used in design, development of manufacturing planning and manufacturing. To understand the need for integration of CAD and CAM.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic concepts of CAD and CAM.</li> <li>2. Cad standards and various modeling techniques.</li> <li>3. Principle and part programming of CNC for manufacturing industrial components.</li> <li>4. Importance of CAPP and CAQC in CAM.</li> <li>5. Use of current state-of-the-art rapid prototyping in CAD/CAM technology.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Fundamentals of CAD/ CAM, Application of computers for Design and Manufacturing, Benefits of CAD/ CAM – Computer peripherals for CAD/ CAM, Design workstation, Graphic terminal, CAD/ CAM software- definition of system software and application software, CAD/ CAM database and structure. Geometric Modeling: Wire frame modeling, wire frame entities, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.	14
II	<b>CAD Standards:</b> Standardization in Graphics, GKS, other graphics standards, Exchange of modelling data. Introduction to drafting system in AutoCAD, basic drafting, editing and dimensioning commands used in solid modelling and surface modelling. Solid modelling software's. <b>Finite element analysis:</b> Introduction, software, stiffness matrix.	14
III	<b>Manufacturing Aspects of Industrial Products:</b> Numerical control, CNC system, Hardware; part programming: advanced part programming methods, Computer aided part programming; APT, Post processor commands; CAM system, CNC tooling CNC, DNC and Adaptive Control Systems; Information requirement of manufacturing.	14
IV	<b>Group Technology:</b> Part families, Parts classification and coding., cellular manufacturing system. <b>Computer Aided Process Planning:</b> Difficulties in traditional process planning, CAPP: retrieval type and generative type, Computer aided manufacturing resource planning: Material requirement planning, Benefits of MRP, Enterprise resource planning, Capacity requirements planning, JIT <b>Computer Aided Quality Control:</b> Automated inspection- Off-line, On-line, contact, Non-contact; SQC, SPC, TQM, Six-Sigma, Integration of CAQC with CAD and CAM. Computer Integrated Manufacturing: CIM system, Benefits of CIM.	14

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Semester –V


V	<b>Rapid Proto Typing:</b> Need for rapid proto typing, Basic principles and advantages of RP, General features and classifications of different RP techniques with examples. 3D printing; Fused deposition modeling; Laminated object manufacturing; Selective laser sintering; Stereo lithography.	14
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**Text Book/References Books/ Websites:**


1. Alavala; CAD/CAM Concepts and Applications; PHI.
2. P. N. Rao; CAD/CAM Principles and Applications; Mc Graw Hill.
3. M P Groover; CAD/CAM; Pearson.
4. Radhakrishnan and Subramanian; CAD/CAM/CIM; New Age.
5. website: [www.nptel.ac.in](http://www.nptel.ac.in)

**Suggested List of Laboratory Practical (Expandable):**

1. Performing drawing, editing and dimensioning operation in CAD software.
2. Performing 3D operation- panning, zooming, clipping etc.
3. Performing simple assembly operations like- nut, bolt, coupling etc.
4. CNC Programming for turning operation.
5. Performing operation on trainer Lathe
6. Designing of Simple machine components in CAD software.
7. Study of CIM
8. Study of principle of 3D printing process

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)
CBTE-507	NCC-V	1	-	6						

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks:15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	(a) Understand the concept of Team and its functioning. (b) Hone Public speaking skills. (c) Understand the security set up and management of Border/Coastal areas. (d) Acquire knowledge about an Infantry Battalion organization and its weapons. (e) Acquire knowledge about Indo-Pak Wars fought in 1965 & 1971.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> 1. Participate in team building exercise and value team work. 2. Improve communication skills by public speaking activities. 3. Understand the security mechanism and management of Border/Coastal areas. 4. Get motivated to join armed forces.

Unit	Contents (Theory)	Marks Weightage
I	<b>Personality Development:</b> (i) Group Discussions –Team work. (ii) Public speaking.	07
II	<b>Border &amp; Coastal Areas:</b> Security Setup and Border/Coastal management in the area.	07
III	<b>Introduction to Infantry Battalion and its Equipment:</b> Organization of Infantry Battalion & its weapons.	07
IV	<b>Military History:</b> Study of Battles of Indo-Pak Wars 1965 & 1971.	14

# Note: For NCC-V, 05 credits will be allotted after successful completion of camp.

**Text Book/References Books/ Websites:**

1. Cadet's handbook, NCC Directorate, MP, CG.
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

**Suggested List of Laboratory Practical (Expandable):**

1. **Drill**
  - Ceremonial Drill.
  - Guard Mounting.
2. **Field Craft & Battle Craft**
  - Fire control orders.
  - Types of fire control orders.
  - Fire and Movement- when to use fire and movements tactics, Basic considerations, Appreciation of ground cover, Types of cover, Dead ground, Common Mistakes, Map and air photography, Selection of Fire position and fire control.
3. **Map Reading:** Google Maps & applications.
4. **Weapon Training:** Short Range firing

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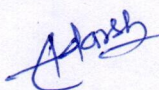
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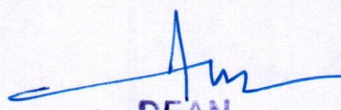
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5. **Social Service and Community Development:** Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc. as per the requirement and similar announced days- National and State level.
6. **Health & Hygiene:**
- Yoga- Introduction, Definition, Purpose, Benefits.
  - Asanas-Padamsana, Siddhasana, Gyan Mudra, Surya Namaskar, Shavasana, Vajrasana, Dhanurasana, Chakrasana, Sarvaangasana, Halasana etc.
7. **Obstacle Training:**
- Obstacle training – Intro, Safety measures, Benefits.
  - Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- Zag Balance, High Wall etc.

Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.

  
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Programme: Bachelor of Technology

Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-508	Accounting and Finance Management	2	-	-						

Duration of Theory (Externals): 2 Hours

Theory Internal- Max Marks: 15	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
Practical Internal Max Marks: Nil	Lab Performance/Attendance /Quiz - Max. Marks: Nil	


Pre-Requisite	Nil
Course Objective	The objective of this course is to familiarize the students with concepts and methods in accounting as a subject in Business Financial Management.
Course Outcomes	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand Basic accounting concepts.</li> <li>2. To know system of book banking.</li> <li>3. To understand depreciation methods.</li> <li>4. To understand the framework of balance sheet.</li> <li>5. To understand the Bank Reconciliation Statement.</li> </ol>


Unit	Contents (Theory)	Marks Weightage
I	<b>Accounting:</b> Meaning, scope & relationship with other functional areas, book keeping & accounting.	07
II	<b>Conceptual framework of accounting:</b> Accounting principles, accounting concepts, accounting conventions, systems of books keeping, double entry system of books keeping, journal (Numerical).	07
III	<b>Depreciation Accounting:</b> Concepts causes methods of providing depreciation different assets: Fixed installment method (Numerical), Diminishing balance method (Numerical), Annuity method (Numerical).	07
IV	<b>Final Accounts:</b> Manufacturing account, trading account, profit & loss account, balance sheet and adjustments (Numerical).	07
V	<b>Bank Reconciliation Statement:</b> Objective, Importance & Techniques	07

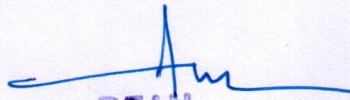
**Text Book/References Books/ Websites:**

1. Jain & Narang: Elements of Accounting.
2. S.N. Maheshwari: Fundamentals of Accounting.
3. Shukla, Grewal & Gupta: Advanced Account.

**Suggested List of Laboratory Practical (Expandable): Nil**

  
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Semester –V

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-509	Mechanical Measurements and Metrology Lab	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min:20 (D Grade)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance – Max. Marks: 50	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	To find the fundamental knowledge about the role of basic measurement units and able to calibrate various measuring devices.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>To understand the basic measurement units and able to calibrate various measuring devices</li> <li>To express error and correction factors of various measuring devices</li> <li>To use measuring tools such as Sine Bar, Sine Center, Bevel Protractor, Tool Maker Microscope, Gear Tooth Micrometer, Optical Flats etc.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Mechanical Measurements:</b> Mechanical Engineering: Basic experimental laboratory measurements, such as measurement of strain, pressure, force, position, and temperature. <b>Metrology:</b> Measurements using Optical Projector / Toolmaker Microscope, Measurement of angle using Sine Center / Sine bar / bevel protractor, Measurement of alignment using Autocollimator / Roller set, Measurement of cutting tool forces using a) Lathe tool Dynamometer b) Drill tool Dynamometer, Measurement of Screw threads Parameters using Two wire or Three-wire method, Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator, Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer, Calibration of Micrometer using slip gauges and Measurement using Optical Flats.	50

**Text Book/References Books/ Websites:**

- I.C. Gupta; Engineering Metrology; Dhanpat Rai Publications, Delhi.
- R.K. Jain; Mechanical Measurements; Khanna Publishers, 1994
- Ernest O. Doebelin; Measurement Systems Applications and Design 5th Ed; McGraw Hill Book Co.

**Suggested List of Laboratory Practical (Expandable):**

- Calibration of vernier caliper & measurement of the given component .
- Power measurement using Rope brake dynamometer .
- Study of Linear Measuring Instruments .
- Measurement of Taper Angle Using Slips, Rollers & Sine bar.
- Tool Makers Microscope .
- Gear Measurement .
- Thread Measurement & Measurement of Surface Finish.
- Machine Tool Alignment Tests .
- Profile Projector .

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Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-510	Industrial Training	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (100)	Internal (Nil)	Total (100)
		-	-	1			(Nil)			Min: 40 (D Grade)

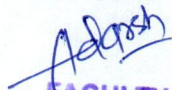
**Duration of Theory (Externals): -Nil**

<b>Theory Internal- Max Marks: -Nil</b>	Best of Two Mid Semester Test-Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fundamental Engineering concepts of concern discipline.
<b>Course Objective</b>	The objective of industrial training is to provide to students the feel of the actual working environment and to gain practical knowledge and skills, which in turn will motivate, develop and build their confidence.
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Participate in the projects in industries during his or her industrial training.</li> <li>2. Describe use of advanced tools and techniques encountered during industrial training and visit.</li> <li>3. Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.</li> <li>4. Develop awareness about general workplace behavior and build interpersonal and team skills.</li> <li>5. Prepare professional work reports and presentations..</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<p>The Course industrial training is to provide work experience, so that student's engineering knowledge is enhanced and employment prospects are improved. Industrial training of the students is essential to overcome the wide gap between the classroom learning and industrial environment.</p> <p>Industrial Training is a practical course, in which the students should undergo in reputed Private / Public Sector / Government organization / companies as industrial training of minimum <b>FOUR</b> weeks in the semester break <b>after IV semester</b> theory examinations.</p> <p><b>Training period:</b> Minimum of Four weeks or 30 (Thirty) Days.</p> <p><b>Evaluation:</b> Fifth semester</p> <p><b>Companies / Areas covered:</b> Any field related to concern branch / discipline of Engineering.</p> <p><b>Grading:</b> As per Scheme.</p> <p><b>Note:</b> The presentation is evaluated by your class incharge. Report must be submitted during power point presentation. A Viva voce comprising comprehensive questions based on your presentation and training undergone.</p> <p><b>Etiquettes:</b> Dress properly, behave well, portray good image as a university student, be punctual, observe work ethics, concern for safety, be professional.</p>	100

**Text Book/References Books/ Websites: Nil****Suggested List of Laboratory Experiments:- (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-511	Indian Constitution	-	-	-						

**Duration of Theory (Externals): Nil**


<b>Theory Internal- Max Marks: 50</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fluency in English
<b>Course Objective</b>	The objective of this Course is to outline the essential features of the Indian Constitution and to discuss important organs established by it.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>About the fundamental rights and duties</li> <li>About the institutional arrangement provided by the Constitution.(UG)</li> <li>About the institutional arrangement provided by the Constitution.(SG)</li> <li>About the local administration.</li> <li>About the working of election commission.</li> </ol>

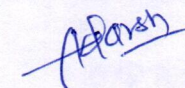
Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Constitution-meaning of the term; Indian Constitution: Sources and constitutional history; Features: Citizenship; Preamble; Fundamental Rights and Duties; Directive Principles of State Policy.	10
II	<b>Union Government and its Administration:</b> Structure of the Indian Union: Federalism; Centre- State relationship; President: Role; power and position; PM and Council of ministers; Cabinet and Central Secretariat; Lok Sabha; Rajya Sabha; Supreme Court of India.	10
III	<b>State Government and its Administration:</b> Governor: Role and Position; CM and Council of ministers; State Secretariat: Organization; Structure and Functions; High Courts.	10
IV	<b>Local Administration:</b> District's Administration head: Role and Importance; Municipalities: Introduction; Mayor and role of Elected Representative; CEO of Municipal Corporation; Pachayati raj: Introduction; PRI: Zila Pachayat; Elected officials and their roles; CEO Zila Pachayat: Position and role; Block level: Organizational Hierarchy (Different departments); Village level: Role of Elected and Appointed officials; Importance of grass root democracy.	10
V	<b>Election Commission:</b> Role and Functioning; Chief Election Commissioner and Election Commissioners; State Election Commission: Role and Functioning; Institute and Bodies for the welfare of SC/ST/OBC and women.	10

**Text Book/References Books/ Websites:**

1. Laxmikanth; Indian Polity.
2. Subhash Kashyap; Indian Administration.
3. D.D. Basu; Indian Constitution.
4. Avasti and Avasti; Indian Administration.

**Suggested List of Laboratory Practical (Expandable): Nil**
  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-6101	Artificial Intelligence and Expert Systems	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fundamental knowledge of Linear Algebra, Probability and Statistics.
<b>Course Objective</b>	The main objective of this course is to impart concepts of Artificial Intelligence and Expert System.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Understand about AI techniques for knowledge representation, planning and uncertainty.</li> <li>2. Develop knowledge of decision making and learning methods.</li> <li>3. Understand problem solving and demonstrate exploration methods.</li> <li>4. Present a problem oriented in depth knowledge of Artificial Intelligence.</li> <li>5. Adequate knowledge of expert systems and their applications.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Overview of AI:</b> Definition, Importance of AI, characteristics of AI, scope and future expectation of AI, Applications of AI, Overview of AI Technologies, AI Platforms.	14
II	<b>Learning and Natural Language Processing:</b> Learning in neural network, Learning Processes, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning. Predicate Logic: Representation simple facts in Logic, Representing instance, Computable functions and predicates, Resolution representing rule based systems: forward reasoning, conflict resolution, backward reasoning.	14
III	<b>Problem Solving:</b> State space search, Production systems, search space control, depth first, breadth-first search, heuristic search, hill climbing, best-first search, branch and bound. Problem reduction, Constraint satisfaction.	14
IV	<b>Handling Uncertainty and Learning:</b> Non-monotonic reasoning, probabilistic reasoning, use of certainty factors, fuzzy logic, Concept of learning, learning automation, genetic algorithm, learning by inductions, Bayesian Networks.	14
V	<b>Expert Systems:</b> Nature of Expert Systems, types of applications, relationship of Expert Systems to Artificial Intelligence and to Knowledge Based Systems. Expert System Architecture: Rule-Based Architecture, Nonproduction System Architectures, Dealing with Uncertainty, Knowledge Acquisition and Validation.	14

**Text Book/References Books/ Websites:**

1. Kevin Knight and Elaine Rich; Artificial Intelligence; TMH
2. Saroj Kaushik; Artificial Intelligence; Cengage Learning India
3. Peter Norvig and Stuart Russell; Artificial Intelligence: A Modern Approach; Prentice Hall.
4. I. Gupta and G. Nagpal; Artificial Intelligence and Expert Systems; Stylus Publishing.
5. C. S. Krishnamoorthy and S. Rajeev; Artificial Intelligence and Expert Systems for Engineers; CRC Press

**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
CBME-6102	Hybrid Vehicles	L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-						

**Duration of Theory (Externals): 3 Hours**

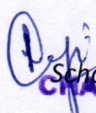
<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Basic knowledge of automobile and electrical engineering.
<b>Course Objective</b>	To let the student understand the working and principle of hybrid electrical vehicles.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Background and use of electric vehicles.</li> <li>2. To get prepared for latest technologies used in automotive sector.</li> <li>3. To introduce application of smart grid and electric vehicle for conversion, control and automation.</li> <li>4. Design and develop environmental friendly electrical Vehicle.</li> <li>5. The need and layout of charging stations.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Electric Vehicle:</b> History, components of electric vehicle, comparison with internal combustion engine: Technology, benefit and challenges. EV classification and their electrification levels, EV terminology. Hybrid and Electric Vehicles: configurations and ground vehicle applications, advantages and challenges in HEV design.	14
II	<b>Electric Vehicle Architecture Design:</b> Types of electric vehicle and components, electrical protection and system requirement, photovoltaic solar based EV design, battery electric vehicle (BEV), hybrid electric vehicle (HEV), plug-in hybrid vehicle (PHEV), fuel cell electric vehicle (FCEV), electrification level of EV, comparison of fuel vs electric and solar power, solar power operated electric vehicles.	14
III	<b>Energy Storage Solutions (ESS)</b> Cell Types (Lead Acid/Li/NiMH), Battery charging and discharging, cell Selection and sizing, Battery layout design, battery Pack Configuration, Battery selection criteria. <b>Battery Management System(BMS)/ Energy Management System (EMS):</b> Need of BMS, Rule based control and optimization based control, Software-based high level supervisory control, Mode of power, Behavior of motor, Advance Features.	14
IV	<b>Electric Drive and controller:</b> Types of Motors, selection and sizing of motor, RPM and torque calculation of motor, motor controllers, mechanical connection of motor, electrical connection of motor. <b>Control Unit:</b> Function of CU, development Process, software, hardware.	14
V	<b>Electric Vehicles charging station:</b> Type of charging station, selection and sizing of charging station, components of charging station, single line diagram of charging station. <b>Indian and Global Scenario:</b> Technology scenario, market scenario, policies and regulations, payback and commercial model, polices in India.	14

**Text Book/References Books/ Websites:**

1. Wei Liu; Introduction To Hybrid Vehicle System Modeling And Control; John Wiley & Sons, Inc., Publication.


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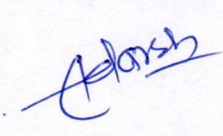
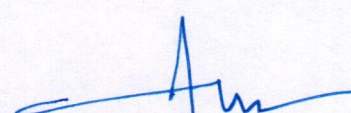
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2. Sandeep Dhameja; Electric Vehicle Battery Systems; Elsevier.
3. Tom Denton; Electric and Hybrid Vehicles; CRC Press.
4. Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives; Chris Mi, M. Abul Masrur; John Wiley & Sons Ltd.
5. Larminie, James, and John Lowry; Electric Vehicle Technology Explained; John Wiley and Sons.
6. Husain, I.; Electric and Hybrid Vehicles; Boca Raton, CRC Press.

**Suggested List of Laboratory Practical (Expandable): Nil**  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-6103	Automobile Engineering	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fundamental knowledge of mathematics such as Algebra and Trigonometry
<b>Course Objective</b>	To get firsthand knowledge in construction and working of automotive vehicles. Develop a strong base to understand future developments in the automobile industry.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>Students will understand the working principal of automobile parts.</li> <li>The student will be able to understand the environmental implications of automobile emissions.</li> <li>The use and design of correct steering mechanism.</li> <li>Working of the braking system.</li> <li>Basic knowledge of tyres and suspension system.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction of Automobile:</b> Classification of Automobiles, Vehicle Layout & Types, Body Construction - Types & Nomenclature of Car Body. Types of frames, testing of frames for bending & torsion. Introduction to Aerodynamic body Shapes. Driver's visibility and methods for improvement, safety aspects of vehicles. Vehicle aerodynamics, driver's cab design, body materials, location of engine, front wheel and rear wheel drive, four wheel drive. <b>Emission Standards:</b> Pollution Control, Indian Standards for Automotive Vehicles.	14
II	<b>Steering System:</b> Front axle beam, stub axle, front wheel assembly. Principles & types of wheel alignment, front wheel geometry viz. camber, Kingpin inclination, castor, toe-in and toe-out, condition for true rolling motion, centre point steering, directional stability of vehicles, steering gear, power steering, slip angle, cornering power, over steer & under steer, gyroscopic effect on steering gears. <b>Braking systems:</b> Disc brakes, mechanical, hydraulic & pneumatic power brake systems, performance, and air bleeding of hydraulic brakes. Self-Energizing brakes.	14
III	<b>Transmission System:</b> Function and types of clutches, single plate, multi-plate clutch, roller & spring clutch, clutch lining and bonding, double declutching. Types of gear Boxes, synchroniser, gear materials, determination of gear ratio for vehicles, gear box performance at different vehicle speed. Automatic transmission, Torque converters, Fluid coupling. Principle of hydrostatic drive, constant velocity universal joints, differential gear box, rear axle construction. Construction & Working of propeller shaft, Axle- type of rear axles, front axles & their applications.	14
IV	<b>Suspension Systems:</b> Necessity & classification of suspension system, working & construction of leaf spring, rigid axle suspension, introduction to air suspension, its construction & working, construction & working of telescopic shock absorbers. <b>Wheels &amp; Tyres:</b> Construction, working & comparison of radial, cross-ply, tube, tubeless tyre. Tyre specifications, factors affecting tyre life. wheel alignment	14

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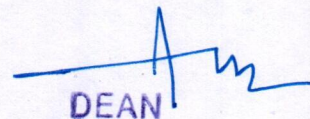
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V	<b>Electrical Systems:</b> Battery- working, construction & rating of battery. Ignition system- construction & working of electronic and CDI ignition system. Starting system- construction & working of starting motor. Charging system- construction & working of alternator. Wiring system-harnessing & colour codes, lighting system-head light, tail light, indicator light & their circuits. Windscreen wiper.	14
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**Text Book/References Books/ Websites:**

1. Kripal Singh; Automobile Engineering Vol-1; Standard Publishers and Distributors Pvt Ltd
2. Kripal Singh; Automobile Engineering Vol-2; Standard Publishers and Distributors Pvt Ltd
3. S K Gupta; A Textbook of Automobile Engineering; S. Chand
4. R. K. Rajput; A Textbook of Automobile Engineering; Laxmi Publications
5. William H. Crouse, Donald L Anglin; Automotive Mechanics; McGraw Hill Education India

**Suggested List of Laboratory Practical (Expandable): Nil**
  
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Programme: Bachelor of Technology

Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-6104	High-Performance Materials	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance /Attendance / Quiz- Max. Marks: Nil	

Pre-Requisite	Engineering Materials, Physical and Chemical Properties, Fe-C Equilibrium Diagram, Tensile Testing
Course Objective	To train students with strong skills in the areas of processes, implementation and optimization of properties of the latest generation of materials.
Course Outcomes	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. How high-performance materials help to solve challenges better than traditional materials.</li> <li>2. Material properties of high-performance materials in relation to specific needs.</li> <li>3. Identify industry-specific materials development (including safety and legislative aspects);</li> <li>4. Provide descriptions of materials development;</li> <li>5. Critically evaluate the likely future trends in industry-specific materials and processes.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Fundamentals of High-Performance Materials:</b> Definition of High Performance Materials, Classification and Types, Need, Properties, Advantages and Disadvantages, phase equilibria and phase transformations, multiphase materials, thermodynamic and kinetic aspects, structure on the nano, micro, meso and macro scales.	14
II	<b>Fundamental Aspects of Process Engineering:</b> Basic education in process engineering, Plasma for surface coating processes, joining methods, surface treatment and the application of coatings, surface interactions. <b>Materials Design:</b> compositional variation and processing to achieve required microstructures, and hence properties. <b>Materials Selection:</b> consideration of all material types, materials processing methods, and product costs.	14
III	<b>Development processes for bulk and layered ceramics:</b> Bulk processing, Development processes for bulk ceramics, Development processes for layered ceramics, Elements of a process simulation, layered and additive manufacturing techniques, 3D printing, creation of 'intelligent' products by incorporating sensors.	14
IV	<b>Degradation/durability of materials:</b> Effect of environment upon performance, corrosion, wear, and biodegradation. <b>Applications of complex materials' processes:</b> Multi-materials, Composite materials, Smart Materials, Materials with gradients of properties.	14
V	<b>Process diagnostics and control:</b> Diagnostic tools of processes, Methodological tools, methods of acquisition, Diagnostics of plasma processes, Quantification of environmental impacts.	14

**Text Book/References Books/ Websites:**

1. Tim Oberle, Process Techniques for Engineering High-Performance Materials; CRC Press
2. Stephen M. Rossnagel & William D. Westwood & Jerome J. Cuomo, Handbook of Plasma Processing Technology: Fundamental, Etching, Deposition and Surface Interactions.
3. Mahmoud M. Farag, Materials and Process Selection for Engineering Design, Taylor & Francis Inc.

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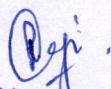
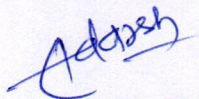
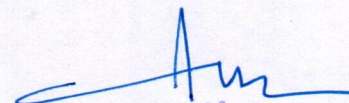
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4. Ian Gibson, David Rosen and Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing; Springer Science and Business Media.
5. William Smith and Javad Hashemi, Foundations of Materials Science and Engineering; McGraw-Hill Education.
6. Dale Seborg, Thomas F. Edgar, Duncan A. Mellichamp, Process Dynamics and Control; Wiley India Publishers.

**Suggested List of Laboratory Experiments (Expandable): Nil****CHAIRMAN****BOARD OF STUDIES (ENGINEERING)  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-602	Machine Component Design	3	1	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance / Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Engineering Mechanics, Strength of Materials, Theory of Machines, Thermodynamics and Heat Transfer, Vibrations, Fluid Mechanics, Metallurgy, Manufacturing Processes.
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. Develop an ability to apply knowledge of mechanics and materials to design a system/component to meet desired needs within realistic constraints using suitable design methodology.</li> <li>2. Use multiple standards and standardization techniques to apply the principle of design and validation.</li> </ol>
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Analyze machine components using theories of failure and Design machine parts against fatigue failures of components subjected to variable and cyclic loads.</li> <li>2. Design welded, riveted and bolted joints, cotter and knuckle joints.</li> <li>3. Design Shafts, Keys, couplings and different types of springs.</li> <li>4. Design Brakes and Clutches.</li> <li>5. Design concept of different types bearing.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Steady Stresses and Variable Stresses in Machine Members:</b> Introduction to the Machine Design Process, Factors influencing Machine Design, Materials selection, Direct, Bending And Torsional Stress Equation, Impact and Shock loading, Factor of Safety, Design Stress, Theories of Failures, Problems. <b>Stress Concentration, Causes and Remedies, Theoretical Stress Concentration Factor, Notch Sensitivity, Fatigue Stress Concentration Factor, Cyclic Loading, Endurance Limit, S-N Curve, Loading Factor, Size Factor, and Surface Factor, Design Consideration for Fatigue, Goodman and Soderberg Equation, Gerber Parabola, Design for Finite Life, Cumulative Fatigue Damage Factor, Problems.</b>	14
II	<b>Temporary and Permanent Joints:</b> Types of Riveted Joints, Failure of Riveted Joint, Strength of Rivet Joint, Efficiency of Riveted Joint, Design of Riveted Joint, Eccentrically Loaded Riveted Joint. Types of Welded Joints, Stresses for Welded Joints, Strength of Welded Joints, Eccentrically Loaded Joint, Welded Joint subjected to Bending Moment, Design Procedure, and Stress Relieving Techniques. Types of Screw Fastenings, Stresses in Screwed Fastening, Bolts of Uniform Strength, Design of a Nut, Bolted Joints under Eccentric Loading. Design of Knuckle Joint and Cotter Joint, Problems.	14
III	<b>Basic Elements Design:</b> Introduction of Shafts, Design of shaft under combined bending, twisting and Axial Loading; shock and Fatigue Factors, Design for Rigidity; Design of shaft subjected to static & dynamic load; Design of keys and shaft couplings, muff, flange, flexible etc. Design of helical compression and tension springs, leaf springs and torsion springs; fatigue loading of springs, surge in spring, Problems.	14



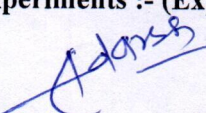
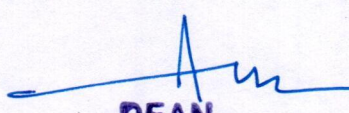
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Semester –VI

IV	<b>Brakes &amp; Clutches:</b> Design of brakes: Rope, band & block brake, Internal expanding brakes, Disk brakes, Materials for Friction Surface, Uniform Pressure and Uniform Wear Theories, Design of Friction Clutches: Disk, Plate Clutches, Cone & Centrifugal Clutches	14
V	<b>Journal Bearing:</b> Types of Lubrication, Viscosity, Hydrodynamic Theory, Design Factors, Temperature and Viscosity Considerations, Reynolds's Equation, Stable and unstable operation, Heat Dissipation and Thermal Equilibrium, Boundary Lubrication, Dimensionless Numbers, Design Of Journal Bearings, <b>Rolling-Element Bearings:</b> Types of Rolling Contact Bearing, Bearing Friction and power Loss, Bearing Life; Radial, Thrust & Axial Loads; Static & Dynamic Load Capacities; Selection of ball and roller bearings; lubrication and sealing, Problems.	14

**Note: Machine Design Data Book is permitted in the Exam Hall.****Text Book/References Books/ Websites:**

1. V.B.Bhandari; Design of Machine Elements; Tata Mc- Graw Hill.
2. R.K.Jain; Machine Design; Khanna Publication.
3. Abdulla Shariff; Hand Book of Properties of Engineering Materials & Design Data for
4. Machine Elements; Dhanpat Rai & Sons
5. P.C. Sharma and D.K. Aggarwal, A Text Book of Machine Design; S.K. Kataria & Sons.
6. Joseph Edward Shigley; Mechanical Engg. Design Mc-Graw Hill
7. Design Data Book by V.B. Bhandari.
8. Design Data Book by PSG Coimbtore.
9. Design Data Book by Mahadevan.

**Suggested List of Laboratory Experiments :- (Expandable): Nil**
  
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Subject Code	Subject Title	Credit			Theory			Practical		
CBME-603	Refrigeration and Air Conditioning	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Thermodynamics, Fluid Mechanics & Heat transfer phenomena.
<b>Course Objective</b>	Develop an ability to apply knowledge of heat transfer between system and surroundings to design a refrigerator. Understand about various air-conditioning methods
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Heat transfer between system and surrounding.</li> <li>2. Various refrigeration systems.</li> <li>3. Refrigerants and its types.</li> <li>4. Psychometric Chart.</li> <li>5. Thermodynamics of air conditioning.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Principles and methods of refrigeration, freezing; mixture cooling by gas reversible expansion, throttling, evaporation, Joule Thomson effect and reverse Carnot cycle; unit of refrigeration, coefficient of performance, vortex tube & thermoelectric refrigeration, adiabatic demagnetization; air refrigeration cycles- Joule's cycle Boot-strap cycle, reduced ambient cycle and regenerative cooling cycles.	14
II	<b>Vapour compression system:</b> Vapor compression cycle, p-h and t-s diagrams, deviations from theoretical cycle, sub-cooling and super heating, effects of condenser and evaporator pressure on cop; multi-pressure system: removal of flash gas, multiple expansion & compression with flash inter cooling; low temperature refrigeration: production of low temperatures, cascade system, dry ice, production of dry ice, air liquification system. Refrigeration Compressors,	14
III	<b>Vapour absorption system:</b> Theoretical and practical systems such as aqua-ammonia, Electrolux & other systems; Steam jet refrigeration: Principles and working, simple cycle of operation, description and working of simple system; refrigerants: nomenclature & classification, desirable properties, common refrigeration, comparative study, leak detection methods, environment friendly refrigerants and refrigerant mixtures, brine and its properties.	14
IV	<b>Psychrometric:</b> Calculation of psychometric properties of air by table and charts; psychrometric processes: sensible heating and cooling, evaporative cooling, cooling and dehumidification, heating and humidification, mixing of air stream, sensible heat factor; principle of air conditioning, requirements of comfort air conditioning, ventilation standards, infiltrated air load, fresh air load human comfort, effective temperature & chart, heat production & regulation of human body.	14
V	<b>Air conditioning loads:</b> calculation of summer & winter air conditioning load, bypass factor of coil, calculation of supply air rate & its condition, room sensible heat factor, grand sensible heat factor, effective sensible heat factor, dehumidified air quantity. Problems on cooling load calculation. Air distribution and ventilation systems.	14

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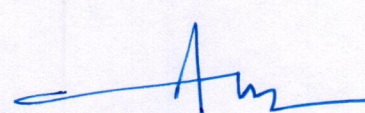


**PEOPLE'S UNIVERSITY, BHOPAL*****(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology****Semester –VI****Text Book/References Books/ Websites:**

1. C.P Arora.; Refrigeration and Air Conditioning; TMH
2. S N Sapali; Refrigeration and Air Conditioning; PHI
3. Manohar Prasad; Refrigeration and Air Conditioning; New Age Pub
4. Ameen; Refrigeration and Air Conditioning; PHI
5. Pita ; Air conditioning Principles and systems: an energy approach; PHI
6. W.F Stoecker, Jones J; Refrigeration and Air conditioning; TMH.
7. RC Jordan and GB Priester Refrigeration and Air Conditioning, PHI USA

**Suggested List of Laboratory Experiments (Expandable):**

1. Study of vapor compression refrigeration system.
2. Study of Ice Plant.
3. Study and working of cold storage
4. Study Trane Air Condition (Package Type).
5. Study of Electrolux Refrigeration.
6. Study one tone Thermax refrigeration unit.
7. Study of Water cooler.
8. Experimentation on Vapor compression Air Conditioning test rig.
9. Study of Leak Detectors (Halide Torch).
10. Study and working of Gas charging Rig.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –VI**

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-604	Industrial Engineering and Operations Research	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min:20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	General study of management and safety management.
<b>Course Objective</b>	To find the fundamental knowledge about the role of mechatronics in automation and analysis of the various types of computational elements and controllers.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Ability to understand about industrial engineering and Value Engineering</li> <li>2. To understand about work study, method study and work measurement</li> <li>3. To understand about development of operations research necessity and scope of Industry</li> <li>4. To understand about the transportation problems and assignment problems.</li> <li>5. Ability to understand how to represent the network.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Industrial Engineering:</b> Definition, development, Object, Contribution & function of Industrial Engineering, Management Ergonomics, Objectives and need for maintenance, Types of maintenance, Condition based maintenance system, Equipment Replacement Policy: Reasons, Deterioration, Obsolescence, Depreciation, Methods for depreciation calculation, Value Engineering: Definition, Objectives, Application & Techniques.	14
II	<b>Work Study:</b> Introduction and definition of Work-study, Productivity and work study, Prerequisites of conducting a work study. <b>Method Study:</b> Introduction, definition, procedure, recording techniques, Flow Process Charts, Critical examination by questioning technique, man-machine chart, Motion economy principles, Micro motion study –Therbligs. <b>Work Measurement:</b> Definition, Objectives, Techniques of Work measurement, Selection & timing the job, Rating, Allowances, Normal and standard time determination, Work sampling.	14
III	<b>Operations Research:</b> Introduction and Development of Operations Research, Necessity and scope of Industry, Decision making, OR models, applications, Difficulties and Limitation of OR, Linear Programming maximization and minimization of function with or without Constraints, Formulation of a linear programming problem, Graphical method and Simplex method, Big M method, Degeneracy, Application of Linear Programming in Mechanical Engineering.	14
IV	<b>Transportation Problems:</b> Mathematical formulation, Stepping Stone Method, Modified Distribution Method, Vogel's Approximation Method, Solution of balanced and unbalanced transportation problems and case of Degeneracy. <b>Assignment Problems:</b> Mathematical formulation of assignment problems, Solution of assignment problems, Travelling salesman problems, Air crew Assignment problems.	14
V	<b>Network Analysis:</b> CPM/PERT, Network Representation, Techniques for drawing network, Resource smoothing and levelling, Project cost, Optimum project duration, Project crashing, Updating, Time estimation in PERT.	14

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**PEOPLE'S UNIVERSITY, BHOPAL*****(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology****Semester –VI****Text Book/References Books/ Websites:**

1. Martand Telsang; Industrial Engineering and Production Management; S Chand & Company.
2. Philip E Hicks; Industrial Engineering & Management: A new perspective; Mcgraw Hill.
3. N.J. Manek; Comprehensive Industrial Engineering; Laxmi Publication (P) Ltd.
4. S. Dalela, Mansoor Ali; Industrial Engineering and Management Systems; Standard Publishing.
5. Hira & Gupta; Operation Research; S. Chand & Co.
6. O.P. Khanna; Industrial Engineering & management; Khanna Publication.

**Suggested List of Laboratory Practical (Expandable):**

1. Stop watch time study.
2. Performance rating exercise.
3. Graphic tools for method study.
4. Work sampling
5. To draw two handed process chart for Bolt, Washer & Nut assembly.
6. To draw the multiple activity chart (or) man machine chart.
7. Physical fitness testing of individuals.
8. Manual Material Handling (MMH).
9. To study principles of motion study Apparatus: Pins Pin Board Trays Theory.
10. To solve different Problems by graphical and analytical methods contained in the syllabus.  
Different programming software may be used.

  
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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –VI**

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-605	Control Systems Engineering	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		2	-	1			Min: 40 (D Grade)			Min:20 (D Grade)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Student should have general knowledge about the Linear Algebra and Calculus, Laplace, Fourier transform, and Differential equations etc.
<b>Course Objectives</b>	The primary objective is to introduce some of the components mainly used different ways of system representations such as Transfer function representation, time domain analysis, frequency domain analysis, various controllers, etc
<b>Course Outcome</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand the principles in mechanisms used for control system</li> <li>2. To understand the Knowledge about the basic techniques to make any system stable.</li> <li>3. To understand the analyze system response and evaluate error dynamics in time domain.</li> <li>4. To understand the various case study of system and techniques involved in proportional integral</li> <li>5. To understand the different components of system</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Systems:</b> Continuous/Discrete, Time-invariant/Time-varying, Linear/Nonlinear, Open loop/Closed loop, Effects of negative feedback, Transfer Functions – (example: R-L-C series circuit or equivalent), Order and type of transfer functions, Block diagram representation of systems (example: D.C. motor or equivalent), Block diagram algebra	14
II	<b>Signal Flow Graph:</b> Time and frequency domain specifications, Transient Analysis of standard first and second order systems with unity feedback, Transient and steady state errors – definitions, Error constants.	14
III	<b>Stability:</b> Routh Hurwitz Criteria and Nyquist stability criterion, Relative stability: Significance of Gain margin and phase margin, Construction of Root locus, Bode plots and Polar plots, Minimum/Non-minimum phase systems, Transportation lag, Pade approximation.	14
IV	<b>Case Studies:</b> Effect of P, PI, PD and PID control, Effects of Lead and lag compensation time domain and frequency domain analysis, Effect of tachogenerator feedback.	14
V	<b>Control System Components:</b> Potentiometers, Synchros, Tachogenerators, A.C. and D.C. Servomotors, Gyroscope.	14

**Text Book/References Books/ Websites:**

1. M. Gopal, Control Systems Principles and Design, Second Edition, Tata McGraw Hill 2002
2. Benjamin C. Kuo, Automatic Control Systems, 7th Edition, Prentice Hall of India, 1995.
3. Naresh K. Sinha, Control Systems, CBS college Publishing, 1986.

**Suggested List of Laboratory Practical (Expandable):**

1. Introduction to MATLAB Computing Control Software.
2. Defining Systems in Transfer Function form.

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- (a) Plot step response of a given Transfer Function and system in state-space. Take different values of damping ratio and natural undamped frequency. (b) Plot ramp response.
3. For a given 2nd order system plot step response and obtain time response specification.
4. To design 1st order R-C circuits and observe its response with the following inputs and trace the curve.  
(a) Step (b) Ramp (c) Impulse
5. To design 2nd order electrical network and study its transient response for step input and following cases.  
(a) Undamped system.  
(b) Under damped system.  
(c) Over damped System.  
(d) Critically damped system.
6. To Study the frequency response of following compensating Networks, plot the graph and find out corner frequencies.  
(a) Lag Network (b) Lead Network (c) Lag-lead Network.
7. To draw characteristics of A.C servomotor.
8. To perform experiment on Potentiometer error detector.
9. Check for the stability of a given closed loop system.
10. Plot bode plot for a 2nd order system and find GM and PM.

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-606	Human Resource Management	2	-	-						

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks: 15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	The objective of the course is to acquaint students with the techniques and principles to manage human resource of an organization.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To understand the basis concept of HRM.</li> <li>2. To learn the techniques for the acquisition of Human Resource.</li> <li>3. To understand the concept of training and development.</li> <li>4. To understand the factors responsible for performance appraisal.</li> <li>5. Human Resource Maintenance.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Human Resource Management: Definition, Nature and Scope of Human Resources Management, Functions Role Competencies of HR Manager, HR Policies, HRM vs HRD. Emerging Challenges of Human Resource Management.	07
II	<b>Acquisition of Human Resource:</b> Human Resource Planning-Definition, Objective, Significance, Process of Human Resources Planning, Factor influencing HRP job analysis-job description and job specialization; Recruitment-process, Methods, Sources, Selection-Concept and process; Test and interview; placement and induction & Orientation.	07
III	<b>Training and Development:</b> Concept and Importance; Identifying Training and Development Needs; Training Programmes, Types of Training , Evaluating Training Effectiveness; Training Process Outsourcing; Management Development; Career Development, Managing employee well being and concept of work life balance and quality of work life.	07
IV	<b>Performance Appraisal:</b> Nature, objectives and importance; Techniques and systems of performance appraisal; performance appraisal forms potential appraisal and employee counseling; well being and concept of work life balance and quality of work life.	07
V	<b>Maintenance:</b> Employee health and safety; employee welfare; social security; Employer-Employee relations-an over view; concept of redeployment, redundancy, attrition, VRS, downsizing, layoffs and retrenchment, ethics and HRM.	07

**Text Book/References Books/ Websites:**

1. Bohlendar and Snell; Principal of Human Resource Management; Cengage Learning.
2. Neeru Kapoor; Human Resource Management, Dhanpat Rai & Co.; Delhi.
3. Robert L. Mathis and John H. Jackson; Human Resource Management; PHI Learning.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Semester –VI

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-607	NCC-VI	L	T	P	End Sem (35)	Internal (15)	Total (50)	End Sem (35)	Internal (15)	Total (50)
		2	-	1			Min: 20 (D Grade)			Min: 20 (D Grade)

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks:15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: 15</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. Get acquainted about counselling process its need and importance.</li> <li>2. Know about SSB procedure and different tasks and tests.</li> <li>3. Know about the conduction during the interview.</li> <li>4. Understand the security challenges &amp; role of cadets in Border Areas.</li> <li>5. Know about the modes of entry in Armed forces, CAPF &amp; police.</li> <li>6. Understand the life history &amp; leadership qualities of great generals.</li> <li>7. Learn about 1999 Kargil war.</li> <li>8. Acquire the knowledge about various wars and their heroes.</li> <li>9. Know about various components of communication process.</li> </ol>
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Get motivated to join Armed forces, police &amp; CAPF.</li> <li>2. Write their CV effective and appealing.</li> <li>3. Face SSB interview effectively in their future.</li> <li>4. Understand individual responsibilities &amp; role in meetings the security challenges on Border/Coastal areas.</li> <li>5. Imbibe the feeling of patriotism.</li> <li>6. Communicate more effectively.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Personality Development:</b> <ol style="list-style-type: none"> <li>(i) Career Counselling.</li> <li>(ii) SSB Procedure.</li> <li>(iii) Interview Skills</li> </ol>	07
II	<b>Border &amp; Coastal Areas:</b> Security Challenges & Role of cadets in Border management.	07
III	<b>Armed Forces :</b> Modes of Entry into Army, Police and CAPF.	07
IV	<b>Military History :</b> <ol style="list-style-type: none"> <li>(i) Biographies of Renowned Generals.</li> <li>(ii) War Heroes : Param Veer Chakra Awardees.</li> <li>(iii) Study of Battles of Kargil.</li> <li>(iv) War Movies.</li> </ol>	07
V	<b>Communication:</b> Introduction to Communication & Latest Trends.	07

**Text Book/References Books/ Websites:**

1. Cadet's handbook, NCC Directorate, MP, CG

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Semester –VI

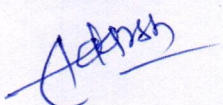
2. Supplementary cadet's handbook, NCC Directorate, MP, CG.

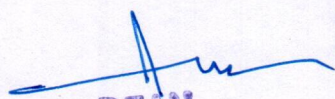
**Suggested List of Laboratory Practical (Expandable):**

1. Drill
  - Ceremonial Drill.
  - Guard of Honour.
2. Weapon Training (WT): Short Range firing.
3. Map Reading (MR): Google maps and Applications.
4. Field Craft & Battle Craft (FCBC): Knots, Lashing and Stretchers.
5. Social Service and Community Development (SSCD) : Cadets will participate in various activities throughout the semester e.g., Blood donation Camp, Swachhata Abhiyan, Constitution Day, Jan Jeevan Hariyali Abhiyan, Beti Bachao Beti Padhao etc as per the requirement and similar announced days-National and State level.
6. Introduction of Infantry Weapons & Equipment (INF): Characteristics of 5.56MM INSAS Rifle, Ammunition, Fire Power, Stripping, Assembling & Cleaning Practice.
7. Communication (COM)
  - Basic Radio Telephony (RT) Procedure.
  - Introduction, Advantages, Disadvantages, Need for standard procedures.

Note: Examination of this NCC course will be conduct as per NCC head quarter norms in consultation with office of COE, PU.

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (35)	Internal (15)	Total (50) Min: 20 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-608	Company and Compensation Law	2	-	-						

**Duration of Theory (Externals): 2 Hours**

<b>Theory Internal- Max Marks: 15</b>	Best of Two Mid Semester Test – Max Marks: 10	Assignment/Quiz/Attendance - Max. Marks: 05
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fluency in English.
<b>Course Objective</b>	The objective of this course is to teach students about the origin, management and winding up of companies. Students will also learn about social security legislations.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic concepts of company law.</li> <li>2. Memorandum of Association and Articles of Association.</li> <li>3. Conduct meeting and its documentations.</li> <li>4. Basic concepts of compensation law.</li> <li>5. Social Welfare Legislations.</li> </ol>

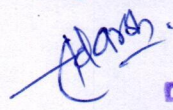
Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Characteristics of a company; lifting of corporate veil; types of companies including one person company, small company; formation of company –promoters, their legal position, pre-incorporation contract and provisional contracts; online registration of a company.	07
II	<b>Documents and Shares:</b> Memorandum of association, articles of association, prospectus, shelf and red herring prospectus, misstatement in prospectus; issue, allotment and forfeiture of share, Debentures, transmission of shares, buyback; issue of bonus shares.	07
III	<b>Management and Meetings:</b> Classification of directors, women directors, independent director, small shareholder's director; disqualifications, director identity number (DIN); appointment; legal positions, powers and duties; removal of directors; key managerial personnel, meetings of shareholders and board; types of meeting, convening and conduct of meetings, postal ballot, meeting through video conferencing, e-voting.	07
IV	<b>Compensation Law:</b> Employees State Insurance Act, 1948; Minimum Wages Act, 1948; Employees' Compensation Act, 1923.	07
V	<b>New Developments in Compensation Law:</b> Code on Social Security 2020: History, Significance and Important Provisions.	07

**Text Book/References Books/ Websites:**

1. K.L Malik ; Industrial Laws and Labour Laws; Eastern Book Company; Lucknow.
2. J.P. Sharma, J.P.; An Easy Approach to Company and Compensation Laws; Ane Books Pvt Ltd; New Delhi.
3. S.C. Srivastava ; Industrial Relations & Labour Laws; Vikas Publishing House (P) Ltd.
4. Companies Act and Corporate Laws, Bharat Law House Pvt Ltd, New Delhi.
5. Company Law Digest, Bharat Law House Pvt Ltd, New Delhi.

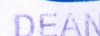
**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
CBME-609	Mechanical Engineering Software Lab-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total Nil	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1						Min: 20 (D Grade)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Basic knowledge of Computer.
<b>Course Objective</b>	To introduce the concepts of Mathematical Modeling of Engineering Problems using FEA and to appreciate the use of FEA methodology to a wide range of Engineering Problems.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To use the ANSYS package to solve basic engineering analysis problems using FEA techniques.</li> <li>2. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.</li> </ol>

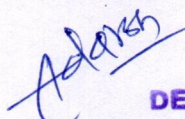
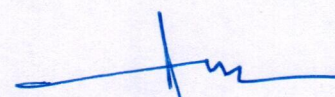
Unit	Contents (Theory)	Marks Weightage
I	<b>Finite Element Analysis Software:-</b> ANSYS workbench overview, mechanical overview, starting mechanical, working with units, Basic analysis procedure, Solid Modeling, Meshing, Material Properties, Boundary Conditions, Solvers, Graphical User Interface, Static Structural Analysis, Modal Analysis, Thermal Analysis, Contact Recognition.	50

**Text Book/References Books/ Websites:**

1. <https://www.pdfdrive.com/ansys-mechanical-apdl-structural-analysis-guidepdf-e12262220.html>
2. <https://www.ansys.com/en-in/academic/learning-resources>
3. <https://www.ansys.com/help>

**Suggested List of Laboratory Experiments (Expandable):-**

Experiments to be performed based on the topics contained in the syllabus.


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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (100)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBTE-610	Universal Human Ethics	2	1	-						

**Duration of Theory (External): Nil**

<b>Theory Internal- Max Marks: 100</b>	Best of Two Mid Semester Test – Max Marks: -50	Assignment/Quiz/Attendance - Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance / Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.</li> <li>To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.</li> <li>To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.</li> </ol>
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>To start exploring themselves: get comfortable with each other and with the teacher; they start appreciating the need and relevance for the course.</li> <li>Their desires and are able to see that all physical facility they are required for a limited time in a limited quantity.</li> <li>The natural acceptance and see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship.</li> <li>Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them, feel confident that they can understand the whole existence; nothing is a mystery in this existence.</li> <li>Grasp the right utilization of their knowledge in their streams of Technology/Engineering to ensure mutual fulfillment.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction to Value Education:</b> Understanding Value Education, Self-exploration as the Process for Value Education ,Sharing about Oneself ,Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility ; Exploring Human Consciousness , Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations ,Exploring Natural Acceptance.	20
II	<b>Harmony in the Human Being :</b> Understanding Human being as the Co-existence of the Self and the Body ,Distinguishing between the Needs of the Self and the Body ,Exploring the difference of Needs of Self and Body ,The Body as an Instrument of the Self, Understanding Harmony in the Self , Exploring Sources of Imagination in the , Harmony of the Self with the Body , Programme to ensure self-regulation and Health.	20
III	<b>Harmony in the Family and Society :</b> Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, Exploring the Feeling of Trust, 'Respect' – as the Right Evaluation , Exploring the Feeling of Respect , Understanding Harmony in the Society, Vision for the Universal Human Order , Exploring Systems to fulfill Human Goal.	20

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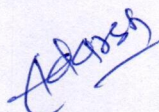
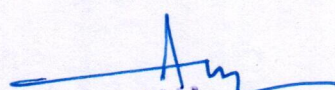


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IV	<b>Harmony in the Nature/Existence:</b> Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Exploring the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence, Exploring Co-existence in Existence.	20
V	<b>Implications of the Holistic Understanding – a Look at Professional Ethics:</b> Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct , Exploring Ethical Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Exploring Humanistic Models in Education, Holistic Technologies, Production Systems and Management Models Typical Case Studies, Strategies for Transition towards Value-based Life and Profession, Exploring Steps of Transition towards Universal Human Order.	20

**Text Book/References Books/ Websites:**

1. R.R Gaur; R Sangal; G P Bagaria; A foundation course in Human Values and professional Ethics; Excel books; New Delhi.
2. B L Bajpai; Indian Ethos and Modern Management; New Royal Book Co.
3. A.N. Tripathy; Human Values; New Age International Publishers.
4. Value Education websites, <http://uhv.ac.in>.

**Suggested List of Laboratory Practical (Expandable): Nil**
  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-7101	Maintenance Engineering	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Nil Max. Marks: Nil	

<b>Pre-Requisite</b>	Student should have a basic knowledge of industries and basic idea about machines.
<b>Course Objective</b>	To find the fundamental knowledge about the maintenance strategies and the replacement planning & maintenance.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Basic definitions of maintenance terms.</li> <li>2. Different kinds of Maintenance required and their procedures.</li> <li>3. Replacement and anticipation of failures.</li> <li>4. Different kinds of Safety procedures followed in industries and occupational diseases</li> <li>5. Criteria to choose different maintenance techniques or maintenance management.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> 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.	14
II	<b>Maintenance Management:</b> Types of Maintenance Strategies, Planned and Unplanned Maintenance, Breakdown, Preventive & Predictive Maintenance, Comparison, Advantages & Disadvantages, Computer Aided Maintenance, Maintenance Scheduling, Spare Part Management, Inventory Control, Organization of Maintenance Department.	14
III	<b>Tribology in Maintenance:</b> 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.	14
IV	<b>Machine Health Monitoring:</b> 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.	14
V	<b>Reliability, Availability &amp; Maintainability (RAM) Analysis:</b> Introduction to RAM Failure Mechanism, Failure Data Analysis, Failure Distribution, Reliability of Repairable and Non-Repairable Systems, Improvement in Reliability, Reliability Testing.	14

**Text Book/References Books/ Websites:**

1. Dr. A. K Gupta; Reliability Maintenance and Safety Engineering; Laxmi publication.
2. Dr Subhash Chandra, S K kataria; Maintenance Engineering and Management; Dhanpat Publication.
3. David S Gloss & Miriam Gayle Wardle; Introduction to Safety Engineering; TMH.
4. Mishra and Pathak; Maintenance Engineering and 164 Management; PHI.

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBME-7102	Combustion and Emission in IC Engines	3	-	-	(70)	(30)	(100) Min: 40 (D Grade)	(Nil)	(Nil)	(Nil)

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Fundamental knowledge IC engines and automobiles.
<b>Course Objective</b>	To have the understanding of combustion in various engines. To get familiar with emission standard used across the globe.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The phenomenon of combustion in IC engines.</li> <li>2. The mechanics of flame generation inside the engines.</li> <li>3. The various pollution standards used.</li> <li>4. The mechanism and overall working and various engines.</li> <li>5.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Engine Construction and Operation:</b> Construction and working principle of SI, CI engines and gas turbines, Major engine components. Four stroke and two stroke engines, Otto cycle, Diesel cycle, assumptions in fuel air cycle analysis, composition of cylinder gases. Construction and working principle of SI, CI engines and gas turbines, major engine components, four stroke and two stroke engines	14
II	<b>Basic Requirements of Engine Fuels:</b> Chemical structure of petroleum, Heat value of fuels, rating of SI Engine fuels, rating of CI engine fuels, combustion equation for hydrocarbon fuels, properties and ratings of petrol and diesel fuels, fuel supply systems of SI and CI engines, Non-conventional fuels for IC engines; LPG, CNG, Methanol, Ethanol, Non-edible vegetable oils, Hydrogen. Construction and working of carburetor, inlet and exhaust valve timings, fuel feed and fuel injection pumps, petrol injection, electronic Fuel Injection systems (EFI), multi-point fuel injection system (MPFI).	14
III	<b>Ignition Systems:</b> Stages of combustion in engines, flame wave propagation and factors affecting it. Knocking and pre-ignition, factors affecting knocking and control of knocking. Detonations and factors affecting it, its disadvantages. Combustion chamber requirements, turbo charging and super charging.	14
IV	<b>Engine Performance:</b> Performance parameters. Measurements of speed, air flow, fuel consumption, engine power, BHP, IP, BSFC, fuel consumption, air consumption, engine heat balance sheet, mechanical efficiency, engine efficiencies, testing of engines.	14
V	<b>Emission of IC Engine:</b> Emission from SI engine, effect of engine maintenance on exhaust emission control of SI engine, diesel emission, diesel smoke and control, diesel and control comparison of gasoline and diesel emission. Measurement and calculation for of emission constituents, emission standards.	14

**Text Book/References Books/ Websites:**

1. V. Ganesan; Internal Combustion Engines; McGraw Hill Education.

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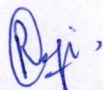
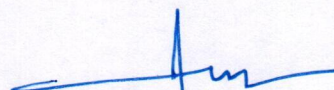
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2. Kripal Singh; Automobile Engineering Vol-1 and Vol 2; Standard Publishers and Distributors Pvt Ltd.
3. R.P. Mathur, M.L. & Sharma; Internal Combustion Engines; Dhanpat Rai Publications.

Suggested List of Laboratory Practical (Expandable): Nil

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(Applicable for Admitted from Academic Session 2021-22 onwards)

Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem	Internal	Total	End Sem	Internal	Total
CBME-7103	Finite Element Method	3	-	-	(70)	(30)	(100) Min: 40 (D Grade)	(Nil)	(Nil)	(Nil)

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

Pre-Requisite	Engineering Mathematics, Heat and Mass Transfer, Strength of Materials, Fluid Mechanics.
Course Objective	To learn basic principles of finite element analysis procedure and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.
Course Outcomes	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>1. Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.</li> <li>2. Develop element characteristic equation and generation of global equation.</li> <li>3. Formulate and solve Axi-symmetric and heat transfer problems.</li> <li>4. Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, problems.</li> <li>5. Apply suitable boundary conditions to a global equation for axi-symmetric and dynamic problems.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<p><b>Introduction to Finite Element Method:</b> General steps of the finite element method. Engineering applications of finite element method. Advantages of the Finite Element Method.</p> <p><b>Boundary conditions:</b> Homogeneous and non-homogeneous for structural, Potential energy method, Rayleigh Ritz method, Galerkin's method, Displacement method of finite element formulation. Convergence criteria, Discretisation process.</p> <p><b>Types of elements:</b> 1D, 2D and 3D, Node numbering, Location of nodes.</p> <p><b>Strain-</b> displacement relations, Stress-strain relations, Plain stress and Plain strain conditions, temperature effects.</p>	14
II	<p><b>Introduction to the stiffness (Displacement) method:</b> Introduction, Derivation of stiffness matrix, Derivation of stiffness matrix for a spring element, One-Dimensional Elements-Analysis of Bars and Trusses, Constant strain triangle.</p> <p><b>Numerical integration:</b> Gaussian quadrature one point, two point formulae, 2D integrals. Force terms: Body force, traction force and point loads, Numerical Problems: Solution for displacement, stress and strain in 1D straight bar, stepped bars and tapered bars using elimination approach and penalty approach.</p>	14
III	<p><b>Beams and Shafts:</b> Boundary conditions, Load vector, Hermite shape functions, Beam stiffness matrix based on Euler-Bernoulli beam theory, Examples on cantilever beams, propped cantilever beams, Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load.</p> <p><b>Torsion of Shafts:</b> Finite element formulation of shafts, determination of stress and twists in circular shafts.</p>	14
IV	<p><b>Heat Transfer:</b> Basic equations of heat transfer: Energy balance equation, Rate equation: conduction, convection, radiation, 1D finite element formulation using vibration method, Problems with temperature gradient and heat fluxes, heat transfer in composite sections, straight</p>	14

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Programme: **Bachelor of Technology**

Semester –VII

	fins. <b>Fluid Flow:</b> Flow through a porous medium, Flow through pipes of uniform and stepped sections, Flow through hydraulic net works.	
V	<b>Axi-symmetric Solid Elements:</b> Derivation of stiffness matrix of axisymmetric bodies with triangular elements, Numerical solution of axisymmetric triangular element(s) subjected to surface forces, point loads, angular velocity, pressure vessels. <b>Dynamic Considerations:</b> Formulation for point mass and distributed masses, Consistent element mass matrix of one dimensional bar element, truss element, axisymmetric triangular element, quadrilateral element, Evaluation of Eigen values and Eigen vectors, Applications to bars, and stepped bars.	<b>14</b>

**Text Book/References Books/ Websites:**

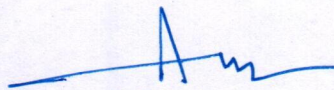
1. J. N. Reddy, An introduction to the Finite Element Method, 3rd edition, McGraw-Hill.
2. K. J. Bathe, Finite Element Procedures in Engineering Analysis, 2nd edition (reprint), Prentice-Hall.
3. T. J. R. Hughes, The Finite Element Method, Prentice-Hall.
4. O. C. Zienkiewicz and R. L. Taylor, The Finite Element Method, 7th edition, Butterworth-Heinemann.
5. Ashok Chandrupatla, and Belegundu, Introduction to Finite Elements in Engineering, Pearson.

**Suggested List of Laboratory Practical (Expandable): Nil**
  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-7104	Neural Network and Fuzzy System	3	-	-						

**Duration of Theory (Externals): 3 Hours**

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/Attendance /Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Understanding of statistics, mathematics, and machine learning concepts.
<b>Course Objective</b>	The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals,
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Understand the context of neural networks and deep learning.</li> <li>2. To explain basic knowledge of the neural networks for pattern classification and association.</li> <li>3. Evaluate deep learning neural network architecture and other approaches.</li> <li>4. Comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic.</li> <li>5. Adequate knowledge of Fuzzy fundamentals and their applications.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Neuro Computing and Neuroscience:</b> Historical notes: human brain, neuron model, knowledge representation, AI and NN. Learning process: Supervised and Unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	14
II	<b>Data Processing:</b> Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	14
III	<b>Multilayered Network Architecture:</b> Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP, recurrent network and temporal feed-forward network,	14
IV	<b>Fundamentals Of Fuzzy Logic:</b> Basic concepts, fuzzy set theory, basic concept fuzzy sets, complements, union, intersection, combination of operation, general aggregation operations, fuzzy relations, fuzzy relational equations, fuzzy set and systems.	14
V	<b>Applications:</b> Neural Network Applications: Process identification, control, fault diagnosis and load forecasting. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.	14

**Text Book/References Books/ Websites:**

1. David Kriesel; A Brief Introduction to Neural Networks.
2. Simon Hyken; Neural Networks: A Comprehensive Study; Macmillan College Publishing, Inc.
3. Bart Kosko; Neural network and Fuzzy System; Prentice Hall.
4. J.Klin and T.AFolger; Fuzzy Sets; Prentice Hall.
5. Valluru Rao and HyRao; C++ Neural network and Fuzzy Logic; BPB and Publication.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-7201	Mechatronics	3	-	-						

Duration of Theory (Externals): 3 Hours

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Nil Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	To find the fundamental knowledge about the role of mechatronics in automation and analysis of the various types of computational elements and controllers.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Ability to understand the Knowledge of Mechatronics, need and applications.</li> <li>2. Understand the importance of sensors in Mechatronics.</li> <li>3. Understand the various Control elements and Actuators</li> <li>4. Ability to understand the various types of computational elements and controllers.</li> <li>5. Understand the role of interfacing of different hard wares in industry.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Introduction to Mechatronics, need and applications, elements of Mechatronics systems, role of Mechatronics in automation, manufacturing and product development.	14
II	<b>Sensors and Feedback Devices:</b> Importance of sensors in Mechatronics, Static and Dynamic characteristics of sensors, errors and output impedance of sensors, transducers for measurement of displacement, strain, position, velocity, noise, flow, pressure, temperature, humidity, vibration, liquid level, vision sensors.	14
III	<b>Control Elements and Actuators:</b> On/off push buttons, control relays, thermal over load relays, contactors, selector switches, solid state switches. Mechanical actuators – types of motion, gear trains, belt and chain drives, screw rods. Electrical actuators, solenoids, DC drives and AC variable frequency drives, AC and DC motors, servomotors, stepper motors, linear motors. Hydraulic and Pneumatic controls, functional diagram - control valves, cylinders and hydro motors.	14
IV	<b>Computational Elements and Controllers:</b> Basic concepts of control systems – open loop, closed loop, semi closed loop control system, block and functional diagrams controllers for robotics and CNC, linear and rotary encoders, timers, counters, microprocessors and microcontrollers: introduction, programming and applications, introduction to PLC, simple programs for process control application based on relay ladder logic-Supervisory Control and Data Acquisition Systems (SCADA) and Human Machine Interface (HMI).	14
V	<b>Interfacing Systems:</b> Introduction to interfacing of different hard wares in industry, need for networks in industrial plants, hierarchy and structure of networking, RS 232 based network, Ethernet, TCP/IP, MAP/TOP; Application of Mechatronics Systems: Introduction to factory automation and integration, design of simple Mechatronics systems, Case studies based on the application of Mechatronics in manufacturing, autotronics, bionics and avionics.	14

Text Book/References Books/ Websites:

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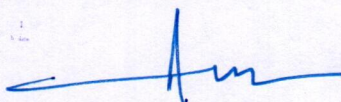
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1. W. Bolton, Mechatronics, Pearson publications (ISBN 978- 81-3176253-3)
2. Devdas Shett, Richard A. Kolk, Mechatronics System Design, Brooks/Cole, Thomson learning
3. John Watton, Fundamentals of Fluid power and control, Cambridge university press Andrejz M.Pawlak, Sensor and Actuators in Mechatronics Design, Taylor and Francis

Suggested List of Laboratory Practical (Expandable): Nil

  
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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-7202	Non- Traditional Machining Techniques	3	-	-						

**Duration of Theory (Externals): 3 Hours**

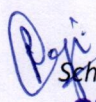
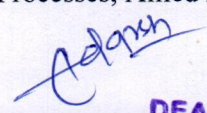
<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance /Attendance / Quiz - Max. Marks: Nil	

<b>Pre-Requisite</b>	Manufacturing Techniques and Production Process.
<b>Course Objective</b>	To learn various concepts related to modern machining processes, their applications and process selection.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. To implement the mechanical energy based unconventional machining process.</li> <li>2. To implement the thermal and electrical energy based unconventional machining process.</li> <li>3. To implement the chemical and electro-chemical energy based unconventional machining process.</li> <li>4. To implement the Advanced Nano Finishing Processes in unconventional machining process.</li> <li>5. To recognize the need of industries' current necessity and environment related issue.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction and Mechanical Energy Based Processes:</b> Unconventional machining Process – Need, classification, Working Principles, equipment used, Process parameters ,MRR- Applications merits, demerits and applications of Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining.	14
II	<b>Thermal and Electrical Energy Based Processes:</b> Electric Discharge Machining – Wire cut EDM – Working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing — Applications. Working Principles, equipment used, Process parameters ,MRR- Applications merits, demerits and applications of Laser Beam machining and drilling, plasma, Arc machining and Electron Beam Machining.	14
III	<b>Chemical And Electro-Chemical Energy Based Processes:</b> Chemical machining and Electro-Chemical machining (CHM and ECM) - Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipments- Surface Roughness and MRR Electrical circuit-Process Parameters- ECG and ECH - Applications.	14
IV	<b>Advanced Nano Finishing Processes :</b> Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.	14
V	<b>Recent Trends In Non-Traditional Machining Processes:</b> Recent Developments In Non-Traditional Machining Processes, Their Working Principles, Equipments, Effect Of Process Parameters, Applications, Advantages And Limitations. Comparison Of Non-Traditional Machining Processes.	14

**Text Book/References Books/ Websites:**

1. V.K. Jain ; Advanced Machining Processes; Allied Publishers


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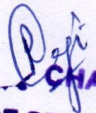
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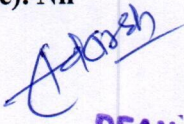


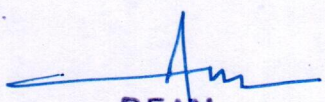
**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –VII**

2. P. C. Pandey, H. S. Shan; Modern Machining Processes; Mc Graw Hill.
3. Singh M.K; Unconventional Manufacturing Processes; New Age Publishers
4. J.A. McGeough; Advanced Methods of Machining; Springer International.
5. Benedict G.F.; Non-Traditional Manufacturing Processes ; CRC Press

**Suggested List of Laboratory Experiments :- (Expandable): Nil**

  
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Programme: **Bachelor of Technology**

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100)  Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total  (Nil)
CBME-7203	Additive Manufacturing Technology	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance /Attendance / Quiz - Max. Marks: Nil	

Pre-Requisite	Manufacturing Processes, Engineering Materials
Course Objective	<ol style="list-style-type: none"> <li>To provide comprehensive knowledge of the wide range of additive manufacturing processes, capabilities and materials</li> <li>To understand the software tools and techniques used for additive manufacturing.</li> <li>To create physical objects that facilitates product development/prototyping requirements.</li> </ol>
Course Outcomes	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>Demonstrate appropriate level of understanding on principles of additive manufacturing processes.</li> <li>Choose appropriate materials for additive manufacturing processes</li> <li>Apply suitable CAD tools and CAD interface for additive manufacturing process</li> <li>Develop physical prototypes by identifying suitable process with optimum process parameters</li> <li>Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction to Additive Manufacturing (AM):</b> General overview Introduction to reverse engineering Traditional manufacturing vis AM Computer aided design (CAD) and manufacturing (CAM) and AM Different AM processes and relevant process physics AM process chain Application level: Direct processes - Rapid Prototyping, Rapid Tooling. Rapid Manufacturing; Indirect Processes - Indirect Prototyping. Indirect Tooling, Indirect Manufacturing.	14
II	<b>Materials Science for AM:</b> Discussion on different materials used Use of multiple materials, multifunctional and graded materials in AM Role of solidification rate Evolution of non-equilibrium structure property relationship Grain structure and microstructure.	14
III	<b>AM Technologies:</b> Powder-based AM processes involving sintering and melting (selective laser sintering, shaping, and electron beam melting. involvement). Printing processes (droplet based 3D Solid-based AM processes - extrusion based fused deposition modeling object Stereo lithography Micro- and nano-additive.	14
IV	<b>Mathematical Models for AM:</b> Transport phenomena models: temperature, fluid flow and composition, buoyancy driven tension driven free surface flow pool) Case studies: Numerical Modeling of AM process, Powder bed melting based process, Droplet based printing process Residual stress, part fabrication time, cost, optimal orientation and optimal Defect in AM and role of transport.	14
V	<b>Process Selection, Planning, Control for AM:</b> Selection of AM technologies using decision methods AM process plan, Monitoring and control of defects, transformation.	14

Text Book/References Books/ Websites:

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
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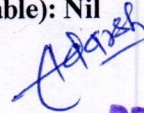


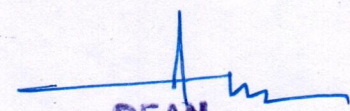
**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –VII**

1. Ian Gibson, David W. Rosen, Brent Stucker; Additive manufacturing technologies: rapid prototyping to direct digital manufacturing; Springer, 2010.
2. C.K. Chua, K.F. Leong and C.S. Lim; Rapid prototyping: principles and applications; 3rd Edition, World Scientific, 2010.
3. D.T. Pham and S.S. Dimov; Rapid Manufacturing; Springer.
4. Paul F. Jacobs; Rapid Prototyping and Manufacturing; ASME
5. Frank W. Liou; Rapid Prototyping and Engineering Applications: A Toolbox for Prototype Development; CRC Press, Taylor and Francis Group, 2007.
6. Andreas Gebhardt; Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing; Hanser Publishers, 2011.
7. Zhiqiang Fan and Frank Liou; Numerical modeling of the additive manufacturing (AM) processes of titanium alloy; InTech, 2012.

Suggested List of Laboratory Experiments :- (Expandable): Nil

  
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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-7204	Tool Die Engineering	3	-	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance- Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance/Quiz/Attendance - Max Marks: Nil	

Pre-Requisite	Manufacturing Processes, Press Working, Metal Forming, Moulding and Bending.
Course Objective	The prime objective of this course is to impart practical exposure on various machine tools, fixtures, dies and special purpose tools and die making.
Course Outcome	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>About tools and die material, their types and applications.</li> <li>About various tools their function, forces and their wear pattern and tool life.</li> <li>About various type of presses and press operation.</li> <li>About the dies and their application.</li> <li>About different jig, fixtures and their importance.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Tools, type of tools, tool materials and application, special purpose tools. Designing consideration of tool, making processes, testing of tools. Introduction to dies, function and objective of die making, die material, different types and application.	14
II	<b>Introduction to Machine Tools:</b> single point cutting tool, - Cutting tool geometry, nomenclature and tool signature, Cutting force- merchant circle, types of chips, Tool wear- Types of wear, Tool life, Cutting tool materials- types, compositions, properties and applications. Tool holders for turning, milling and CNC machines, Tool selection for CNC machines.	14
III	<b>Press Tools:</b> Introduction, classification of press, flywheel consideration, component of press, selection of press. Press operations, cutting, piercing, blanking, punching, bending, curling, drawing, extrusion.	14
IV	<b>Introduction to Dies:</b> component of die assembly, classification of dies, shear action in die cutting operations, design of cutting dies, clearance between die and punch. Design consideration of die elements, die blocks design, punch design, Stripper design.	14
V	<b>Jigs and Fixtures:</b> Introduction, elements of jigs and fixtures, jig, fixture, general design principle, location of the components, principle of location, jig body, type of jigs, type of fixtures, locating devices.	14

**Text Book/References Books/ Websites:**

1. P.N. Rao ; Manufacturing Technology (Vol. – I & II) ; Tata McGraw Hill, New Delhi.
2. P.C. Sharma; A Text Book of Production Technology (Manufacturing Processes); S. Chand and Company Ltd., New Delhi.
3. R.K. Jain; Production Technology; Khanna Publishers, New Delhi.
4. O.P. Khanna; A Text Book of Production Technology (Vol. I & II); Dhanpat Rai & Sons.

**Suggested List of Laboratory Experiments (Expandable): Nil**

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-703	Energy Sources and Audit	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (Nil)	Internal (Nil)	Total (Nil)
		3	-	-			Min: 40 (D Grade)			

Duration of Theory (Externals): 3 Hours

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. To harness the environment friendly RE sources and to enhance their contribution to the Socio-economic development.</li> <li>2. To meet and supplement rural energy needs through sustainable RE projects</li> <li>3. To acquire the knowledge of modern energy conversion technologies and audit.</li> </ol>
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>1. The energy industry; energy regulation and management agencies; and in the academic and R&amp;D institutions.</li> <li>2. Various energy resources, technologies and management fundamentals, and capable in addressing the present and potential future energy problems.</li> <li>3. Specialized knowledge for the sustainable energy management.</li> <li>4. Integrate various options and assess the business and policy environment regarding energy conservation and energy auditing.</li> <li>5. Strategic and policy recommendations on energy conservation and energy auditing.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Energy Resources:</b> Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles. The multidisciplinary nature of environmental studies Definition, scope and importance, Need for public awareness.	14
II	<b>Ecosystems :</b> Concept of an ecosystem · Structure and function of an ecosystem · Producers, consumers and decomposers · Energy flow in the Ecosystem · Ecological succession · Food chains, food webs and ecological pyramids · Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest Ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)	14
III	<b>Bio Fuels: Edible, Petro Crops</b> – Analysis of Indian non edible oil sources – Example of biodiesel crop Jatropha curcas, Tree description Jatropha curcas for rural development, environmental protection , Bio ethanol , production from conventional as well as unconventional sources. , Bio diesel ,Technology for production of bio diesel , Transesterification , Process , Usage of Methanol, Glycerine ,Storage and Characterization of biodiesel – Biodiesel engine development modification ,Environmental and health effects of biodiesel , R&D in biodiesel ,disposal of cake ,value addition of byproducts	14
IV	<b>Environmental Pollution Definition</b> -Causes, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear pollution ·Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides	14

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V	<b>Energy Management &amp; Audit:</b> Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit	14
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**Text Book/References Books/ Websites:**

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn.
2. B.H. Khan: Non Conventional Energy Source-Tata Mc Graw-Hill, New Delhi.
3. J.W. Twidell & A.D. Weir: Renewable Energy Sources- The University Press.
4. S.P. Sukhatme: Solar Energy – Tata Mc Graw-Hill, New Delhi.
5. H.P. Grag & J. Prakash: Solar Energy Fundamental and Applications – Tata Mc Graw-Hill.
6. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publication.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (35)	Internal (15)	Total (50) Min:20 (D Grade)
CBME-704	Quality Control and Reliability	3	-	1						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
Practical Internal Max Marks: 15	Lab Performance/ Quiz/Attendance - Max. Marks: 15	

Pre-Requisite	General study of industrial engineering and management.
Course Objective	To enhance the product quality and reduce risks, gain production efficiencies, and customer loyalty.
Course Outcomes	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. The concept of industrial engineering.</li> <li>2. To understand about different control charts.</li> <li>3. To understand the concept of optimum sampling process.</li> <li>4. To understand the engineering knowledge and specialist techniques to prevent or to reduce the frequency of failures. .</li> <li>5. Ability to identify and correct the causes of failures that do occur despite the efforts to prevent them.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction and Process Control for Variables:</b> Introduction of quality and quality control, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost-Variation in process- factors - process capability - process capability studies and simple problems -Theory of control charts for variables - X chart, R chart and s chart, TQM, JIT.	14
II	<b>Process Control for Attributes:</b> Control chart for attributes -control chart for proportion or fraction defectives - p chart and np chart - control chart for defects - C and U charts, State of control and process out of control identification in charts.	14
III	<b>Acceptance Sampling:</b> Lot by lot sampling - types - probability of acceptance in single, double, multiple sampling techniques-O.C. curves - producer's Risk and consumer's Risk. AQL, LTPD, AOQL concepts-standard sampling plans for AQL and LTPD- uses of standard sampling plans.	14
IV	<b>Contemporary Trends:</b> Concurrent Engineering, Lean Manufacturing, Agile Manufacturing, World Class Manufacturing, Cost of Quality (COQ) system, Bench Marking, Business Process Reengineering, Six Sigma: Basic Concept, Principle, Methodology and applications.	14
V	<b>Reliability Concept:</b> Reliability engineering fundamentals; Failure data analysis; Failure rate; mortality curve; series, parallel and mixed configuration - simple problems.; Mean time to failure (MTTF); Mean time between failure, (MTBF) and mean time to repair (MTTR); Reliability in terms of Hazard rate and failure density, Optimization in reliability - Product design - Product analysis - Product development - Product life cycles.	14

**Text Book/References Books/ Websites:**

1. Martand Telsang; Industrial Engineering and Production Management; S Chand & Company.
2. Philip E Hicks; Industrial Engineering & Management: A new perspective; Mcgraw Hill.

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Programme: **Bachelor of Technology**

Semester –VII

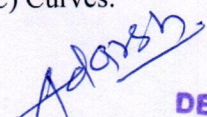
3. N.J. Manek; Comprehensive Industrial Engineering; Laxmi Publication (P) Ltd.
4. M.Younus et al, Quality Control & Reliability, Dhanpat Rai Publication.
5. O.P. Khanna; Industrial Engineering & management; Khanna Publication.

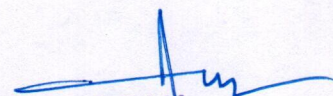
**Suggested List of Laboratory Practical (Expandable):**

1. To Study the Process Control Chart.
2. To Study the Six Sigma Concept.
3. To Study the control charts for Attributes.
4. To Study the concept of Standard Sampling Plan.
5. To Study Operating Characteristics (OC) Curves.
6. To Study Life Testing Reliability.
7. To Study Product Life Cycle.
8. Case study.

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Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-705	Robotics and Industrial Automation	L	T	P	End Sem (70)	Internal (30)	Total (100)	End Sem (35)	Internal (15)	Total (50)
		3	1	1			Min: 40 (D Grade)			Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

<b>Theory Internal- Max Marks: 30</b>	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance - Max. Marks: 10
<b>Practical Internal Max Marks: 15</b>	Lab Performance /Attendance / Quiz - Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>1. To develop the student's knowledge in various robot structures and their workspace.</li> <li>2. To develop student's skills in performing singularity issues, spatial transformations associated with rigid body motions and robot systems.</li> </ol>
<b>Course Outcomes</b>	<p><b>Student will be able to learn:</b></p> <ol style="list-style-type: none"> <li>1. Students will demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics.</li> <li>2. Students will demonstrate an ability to apply spatial transformation to obtain forward kinematics equation of robot manipulators.</li> <li>3. Students will understand the techniques and applications of Automation and Robotics Programming</li> <li>4. They will learn to design and implement robotic systems and apply what they learned to a career in the Automation and Robotics field</li> <li>5. Improves the understanding of students in manufacturing automation and design optimization.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction:</b> Need and importance, basic concepts, structure and classification of industrial robots, terminology of robot motion, configuration, anatomy, specifications of robot system, applications. End Effectors and Drive systems: Drive systems for robots, salient features and comparison, different types of end effectors, design, and applications.	14
II	<b>Sensors:</b> Classifications, features, characteristics, types, piezoelectric, linear position, displacement, proximity, tactile, vision, voice, optical, range, sensors, encoders, image processing & object recognitions, types of Robot Programming method, programming concepts and types of programming languages, applications. <b>Safety and Economy of Robots:</b> Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots.	14
III	<b>Automation:</b> Introduction, Types, Levels, Advantages, Limitations, Strategies, Future of Industrial Automation, Design Process, Product Life Cycle; Design For Manufacturing, And Concurrent Engineering; Product Design in Conventional And CIM Environment; Terms i.e.. CAD, CAE, CAM, CAP, CAPP, CATD, MRP And CAQ.	14
IV	<b>Group Technology:</b> Definition, Principle, Advantages, Limitations, Applications Of Group Technology, Cellular Manufacturing System, Part Family, Automated Guided Vehicle, Automated Storage And Retrieval System, Digital Manufacturing, Reverse Engineering.	14
V	<b>Modern Production Technology:</b> Introduction, Definition, Principle, Advantages, Limitations, Applications of Flexible Manufacturing System, Lean Productions and design for six-sigma, Agile Production, Artificial Intelligence, Intelligent Machine Tool, Smart Machines and Expert System For Manufacturing, Virtual Manufacturing, Green Manufacturing, Rapid Prototype.	14

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**PEOPLE'S UNIVERSITY, BHOPAL**  
**(Applicable for Admitted from Academic Session 2021-22 onwards)**

Programme: **Bachelor of Technology**


Semester –VII

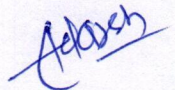
**Text Book/References Books/ Websites:**

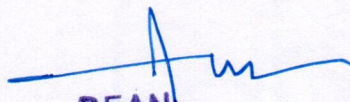
1. K. Shimon; Handbook of Industrial Robots; John Wiley & Sons.
2. R. K. Mittal, Nagrath; Robotics and Control; TMH
3. Bhupendra Gupta, Raji N.Mishra; Veerendra Kumar, Industrial Robotics, Dhanpat Rai, New Delhi
4. R.K. Jain, Production Technology, Khanna Publishers.

**Suggested List of Laboratory Experiments :- (Expandable):**

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors.
4. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
5. Study and report on Different Automated Machinery
6. To gather information about Flexible manufacturing system concept in detail and also understand the importance of sequencing.
7. To introduce the concepts of Lean and Agile manufacturing systems, which is one of the tools for cost reduction and profitability?

  
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**PEOPLE'S UNIVERSITY, BHOPAL**  
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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (70)	Internal (30)	Total (100) Min: 40 (D Grade)	End Sem (Nil)	Internal (Nil)	Total (Nil)
CBME-706	Machine Design	3	1	-						

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 20	Assignment/Quiz/Attendance – Max. Marks: 10
Practical Internal Max Marks: Nil	Lab Performance /Attendance / Quiz - Max. Marks: Nil	

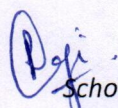
Pre-Requisite	Engineering Mechanics, Strength of Materials, Theory of Machines, Thermodynamics and Heat Transfer, Vibrations, Fluid Mechanics, Metallurgy, Manufacturing Processes.
Course Objective	1. Develop an ability to apply knowledge of mechanics and materials to design mechanical components to meet desired needs within realistic constraints using suitable design process. 2. Use multiple standards and standardization techniques to apply the principle of design and validation.
Course Outcomes	<b>Student will be able to learn:</b> 1. Design processes and various design consideration. 2. Design Belt Drives, Rope and Chain. 3. Design different types of Gears. 4. Design various IC engine components. 5. Concept of Optimization and Optimization Techniques in design.

Unit	Contents (Theory)	Marks Weightage
I	<b>Design Philosophy:</b> Problem identification- problem statement, specifications, constraints, Economic & financial feasibility, societal & environmental feasibility, Selection of Fits and tolerances, Selection of Materials, Ergonomics and value engineering considerations in design, Role of processing in design, Design considerations for casting and machining.	14
II	<b>Belts:</b> Selection of belt, Condition for Transmission of max, Design of belt drives, Flat & V-belt drives, design of rope drives, design of chain drives, Numerical.	14
III	<b>Gears:</b> Force analysis of gear tooth, modes of failure, beam strength, Lewis equation, form factor, formative gear and virtual number of teeth; Gear materials; Surface strength and wear of teeth; strength against wear; Design of straight tooth spur and Helical Gears. Bevel Gears: Application of bevel, formative gear and virtual number of teeth; Force analysis; Lewis equation for bevel gears; Strength against wear; Design of bevel gear. Numerical.	14
IV	<b>Design of I.C. Engine Components:</b> General design considerations in I C engines; design of cylinder; design of piston and piston-rings; design of connecting rod; design of crankshaft. Numerical.	14
V	<b>Optimization:</b> Basic concept of optimization, classification of optimization, optimization techniques, engineering applications of optimization. <b>Classical optimization techniques:</b> Constrained-unconstrained optimization, single-variable optimization, multivariable optimization, solution by direct search method, solution by Lagrange-multipliers method. Numerical.	14

Note: Machine Design Data Book is permitted in the Exam Hall.

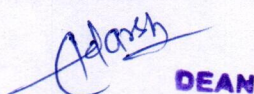
Text Book/References Books/ Websites:

- V.B.Bhandari; Design of Machine Elements; Tata Mc- Graw Hill..



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Department: Mechanical Engineering

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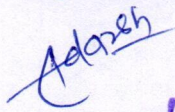


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2. R.K.Jain; Machine Design; Khanna Publication.
3. Abdulla Shariff; Hand Book of Properties of Engineering Materials & Design Data for
4. Machine Elements; Dhanpat Rai & Sons
5. P.C. Sharma and D.K. Aggarwal, A Text Book of Machine Design; S.K. Kataria & Sons.
6. Joseph Edward Shigley; Mechanical Engg. Design Mc-Graw Hill
7. Design Data Book by V.B. Bhandari.
8. Design Data Book by PSG Coimbtore.
9. Design Data Book by Mahadevan.

Suggested List of Laboratory Experiments :- (Expandable): Nil

  
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**PEOPLE'S UNIVERSITY, BHOPAL****(Applicable for Admitted from Academic Session 2021-22 onwards)**Programme: **Bachelor of Technology****Semester –VII**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBME-707	Innovative Project Lab	-	-	1						

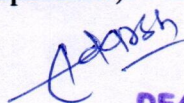
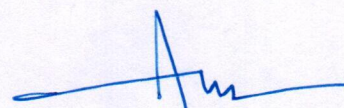
**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	Fundamental Engineering concepts of concern discipline.
<b>Course Objective</b>	This course sets in motion an exploration of the fundamental approaches that underpin the making and development of an innovation. It draws on ideas and practices such as - interdisciplinary, creativity, collaboration and entrepreneurship to identify problems and opportunities that give rise to innovation.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Carry out independent and/or collaborative research in the planning and scoping of a creative industry project that seeks to present an innovative outcome.</li> <li>2. Identify, analyze &amp; define the problem.</li> <li>3. Generate alternative solutions to the problem identified.</li> <li>4. Compare &amp; select feasible solutions from alternatives generated.</li> <li>5. To work effectively in a team.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<p>Students shall be encouraged to form groups (Maximum 5) to do a Project on technical topic of concern branch. The student should prepare a working system or some design or understanding of a complex system (on minor level ) that he/she has selected for his/her innovative project work using system analysis tools and submit the same in the form of a write-up i.e. detail project report.</p> <p>The student should maintain proper documentation of different stages of project such as concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable.</p> <p>Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of their project.</p>	50

**Text Book/References Books/ Websites: Nil****Suggested List of Laboratory Practical (Expandable): Nil**

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Programme: Bachelor of Technology

Semester –VII

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-708	Introduction to MATLAB	-	-	1						

Duration of Theory (Externals): Nil

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	

<b>Pre-Requisite</b>	C Programming, Basics of Engineering Mathematics, Basic computer literacy is expected.
<b>Course Objective</b>	<ol style="list-style-type: none"> <li>To Impart the Knowledge to the students with MATLAB software to enhances programming knowledge in Research and Development.</li> <li>To introduce students the use of a high-level programming language, MATLAB for scientific problem solving with engineering applications.</li> </ol>
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>Understand the basics of MATLAB.</li> <li>Break a complex task up into smaller, simpler tasks.</li> <li>To prepare programmes under Case Study (Any two Modules).</li> <li>Tabulate results and analyze.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<ol style="list-style-type: none"> <li><b>Introduction-</b> Starting MATLAB, Using MATLAB as a calculator, Creating MATLAB variables, Making corrections, Miscellaneous commands</li> <li><b>Mathematical functions-</b> Creating simple plots, Adding titles, axis labels, and annotations, multiple data sets in one plot, Matrix generation, entering a vector, Matrix indexing.</li> <li><b>Array operations and Linear equations-</b> Array arithmetic operations, Matrix inverse, Matrix functions.</li> <li><b>Introduction to programming in MATLAB -</b> M-File Scripts, Script side-effects, Anatomy of a M-File function, Input and output arguments, Input to a script file, Output commands.</li> <li><b>Debugging M-files -</b> Debugging process, Preparing for debugging, Setting breakpoints, Running with breakpoints.</li> </ol>	50

**Text Book/References Books/ Websites:**

- <http://www.matlabtutorials.com/mathforum/>
- <http://www.mathworks.in/matlabcentral/>
- MATLAB Manuals and Handbooks

**Suggested List of Laboratory Practical (Expandable):**

- Study of introduction to MATLAB.
- Find the factorial of 5 using MATLAB command.
- Generate the following row vector  $b=[1, 2, 3, 4, 5, \dots, 9, 10]$ , then transpose it to column vector.
- Write a programme to Solve the following system  $x+y=1$   $x-y+z=0$   $x+y+z=2$
- Write a programme, let  $x=[2 \ -3 \ 5; 0 \ 11 \ 0]$ , then a) find elements in x that are greater than 2 b) find the number of nonzero elements in x.
- Plot Sinc function, where  $\text{Sinc}(x) = \sin(x) / x$ , and  $-2\pi \leq x \leq 2\pi$
- Study of M file, Script file and function file in MATLAB with suitable examples.
- Two case studies related to your respective disciplines.

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**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*Programme: **Bachelor of Technology****Semester –VII**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (50)	Total (50)	End Sem (Nil)	Internal (Nil)	Total
CBTE-709	Psychology	1	-	-			Min: 20 (D Grade)			(Nil)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: 50</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: 50
<b>Practical Internal Max Marks: Nil</b>	Lab Performance/ Quiz/Attendance - Max. Marks: Nil	


<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	This course makes the students able to understand and deal with personal and professional aspects of life. They become able to deal with common psychological problems encountered in an engineer's life. Their ability to deal with societal aspects of behavior is enhanced. By application of knowledge their quality of personal living and job is maximized.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> <ol style="list-style-type: none"> <li>1. Be able to understand and deal with personal and organization phenomenon.</li> <li>2. Be able to deal with common psychological aspects related to an Engineer's life.</li> <li>3. Be able to understand the impact of social environment on individuals, groups and communities.</li> <li>4. Be able to utilize the knowledge of Sociology and to improve the quality of living of self and social relationship at large.</li> </ol>

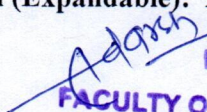
Unit	Contents (Theory)	Marks Weightage
I	<b>Psychology:</b> Introduction Definition and Scope of Psychology; Psychology as a science, Personality: Definition, types of personality, Measurement of Personality. Perception, Motivation and Learning.	10
II	<b>Application of Psychology:</b> Stress-management, Well-being; Self-development: Application of Psychology in building memory and creativity.	10
III	<b>Sociology:</b> Introduction, Importance of Sociology for Engineers, Sociology: Definition and nature; Origin of Society, Social Processes: – Competition, Cooperation Conflict, Accommodation and Assimilation, Social groups – Types and Characteristics; Social Institutions: Marriage: and Family; Religion: Functions and dysfunctions of religion.	10
IV	<b>Social concerns Social Stratification:</b> Nature and types, Prejudices, Social Mobility. Social Changes: – Urbanization, Westernization, and Pluralism. Social Disorganization, Social Problems: – Deviance, Delinquent behavior amongst youth, Crime, Prostitution, Gender injustice, Child Abuse, Terrorism. Social Movements.	10
V	<b>Cognitive Psychology.</b> An introduction to human mental processes, problem solving, pattern recognition, imagery, memory retention, language comprehension <b>Attention &amp; Perception:</b> Definition, types of attention, perception.	10

**Text Book/References Books/ Websites:**

1. Eastwood and Atwater; Psychology for living: Adjustment, growth and behavior today; Prentice Hall.
2. Meena Hariharan and Radhanath Rath, Coping with life stress. Sage Publications, ;
3. Shankar Rao; C .N, Sociology; S.Chand & Co Ltd.
4. S. K. Mangal; General Psychology; Sterling Publishers Pvt. Ltd.
5. Baron A. Robert; Psychology; Prentice Hall of India.

**Suggested List of Laboratory Practical (Expandable): Nil**

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Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-710	Massive Open Online Courses (MOOCs)-II	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (Nil)	Internal (50)	Total (50)
		-	-	1			(Nil)			Min: 20 (D Grade)

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/ Quiz/Attendance - Max. Marks: 50	


<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	MOOCs build on the engagement of learners who self-organize their participation according to learning goals, prior knowledge and skills, and common interests. Objective of this course is to improve the technical skills of students and its gives an opportunity to explore themselves beyond class room teaching.
<b>Course Outcomes</b>	<b>Student will be able to learn:</b> New interesting courses of their own curiosity and improve their knowledge and skills. MOOCs give an opportunity to connect openly on a global scale, with global learners. The ability to experiment with pedagogical methods on a vast scale.

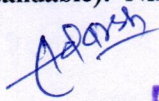
Unit	Contents (Theory)	Marks Weightage
I	<p>Massive Open Online Courses (MOOCs) are online courses that allow participants free access and unrestricted participation in any course of their choice. Besides the conventional modes of teaching such as lectures, videos and reading material, MOOCs also provide a platform for interactive forums.</p> <p>After the VI semester End Sem Examination, all students are instructed to register themselves in a minimum IV (Four weeks) MOOC/NPTEL/SWAYAM Certification course in their Engineering discipline.</p> <p>Students must appear in the certification examination conducted by NPTEL/ SWAYAM and submit it to their respective assigned faculty before the end of the semester. A student should give an effective PowerPoint presentation of chosen course in the class scientific seminars and receive feedback from each other. This effort will help them to communicate their ideas more clearly.</p> <p>The final evaluation of this course will base on a PowerPoint Presentation and Certification during the academic session by the assigned faculty.</p>	50

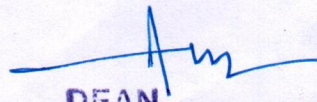
**Text Book/References Books/ Websites:**

1. <https://swayam.gov.in/>
2. <http://nptel.ac.in>
3. <https://onlinecourses-archive.nptel.ac.in>

**Suggested List of Laboratory Practical (Expandable): Nil**

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 Department: Mechanical Engineering



**PEOPLE'S UNIVERSITY, BHOPAL*****(Applicable for Admitted from Academic Session 2021-22 onwards)***Programme: **Bachelor of Technology****Semester –VII**

Subject Code	Subject Title	Credit			Theory			Practical		
CBTE-711	Professional Ethics and Proficiency	L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (35)	Internal (15)	Total (50)
		-	-	1						Min: 20 (D Grade)

**Duration of Theory (Externals): -Nil**

<b>Theory Internal- Max Marks: -Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance Max. Marks: Nil
<b>Practical Internal Max Marks: 15</b>	Lab performance/Quiz/Attendance: Max. Marks: 15	

<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	To enable the students to imbibe and internalize the values and ethical behaviour in personal and professional live.
<b>Course Outcome</b>	<b>Student will be able to:</b> <ol style="list-style-type: none"> <li>1. Understand the core values that shape the ethical behaviour of a professional.</li> <li>2. Learn the need for professional ethics, codes of ethics and roles.</li> <li>3. Discuss the ethical issues related to engineering.</li> <li>4. Realize the responsibilities and rights of an engineer in the society.</li> <li>5. Apply the knowledge of human values and social values to contemporary ethical values and global issues.</li> </ol>

Unit	Contents (Theory)	Marks Weightage
I	<b>Introduction to Professional ethics.</b> Basic concepts, Governing ethics , Personal and Professional ethics, Ethical Dilemmas, Life Skills, Emotional intelligence, Thoughts of Ethics, Value education, Dimension of ethics, Professional associations, Professional risks, Professional accountabilities, Professional success, Ethics and profession .	50
II	<b>Communications:</b> Communication and personality development covering, Psychological aspects of communication, cognition as a part of communication;; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution.	
III	<b>Career Oriental Communication covering, Resume and Bio-data:</b> Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process.	
IV	<b>Presentation Skills:</b> Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports. Advanced Techniques in Technical Communication covering, Interview through telephone/video-conferencing;	
V	<b>Global Ethical Issues.</b> Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisor -Moral leadership.	

**Text Book/References Books/ Websites:**

1. M. Govindarajan, S .Natarajan and V. S. Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi, 2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi, 2006.

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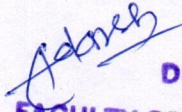
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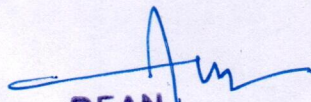
3. Mike W Martin and Roland Schinzinger, Ethics in Engineering, 4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi, 2014.
4. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
5. <http://www.slideword.org/slidestag.aspx/human-values-and-Professional-ethics>.

**Suggested List of Laboratory Practical (Expandable): Nil**

Students should prepare and submit hard and soft copy of their report to assigned faculty before End Semester Examination.

  
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Programme: **Bachelor of Technology**

**Semester –VII**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	End Sem (Nil)	Internal (Nil)	Total (Nil)	End Sem (Nil)	Internal (50)	Total (50) Min: 20 (D Grade)
CBTE-712	GD/Seminar	-	-	1						

**Duration of Theory (Externals): Nil**

<b>Theory Internal- Max Marks: Nil</b>	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
<b>Practical Internal Max Marks: 50</b>	Lab Performance/Attendance /Quiz - Max. Marks: 50	

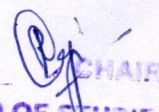
<b>Pre-Requisite</b>	Nil
<b>Course Objective</b>	To enable the students perform as a team player and also emerge as a leader in the group.
<b>Course Outcomes</b>	<b>Student will be able to:</b> <ol style="list-style-type: none"> <li>1. Understand nature, importance and characteristics of group discussion.</li> <li>2. Familiarise himself/herself with the different types of group discussions.</li> <li>3. Learn to identify areas of evaluation in selection group discussions.</li> <li>4. Chalk out strategies for making individual contributions in group discussion.</li> <li>5. Learn the method of in-depth study in a specialized area and prepare and present the report of the same.</li> </ol>

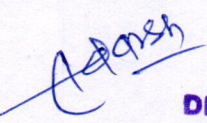
Unit	Contents (Theory)	Marks Weightage
I	<b>Group Discussion:</b> <ul style="list-style-type: none"> <li>• Nature, importance and characteristics of group discussions.</li> <li>• Selection Group Discussions</li> <li>• Group Discussion Strategies</li> <li>• Techniques for Individual Contribution</li> <li>• Group Interaction Strategies</li> </ul>	50
	<b>Seminar:</b> <ul style="list-style-type: none"> <li>• In depth study in a specialized area by doing literature survey, understanding different aspects of the problem and arriving at a status report in that area.</li> <li>• Learn investigation methodologies, study relevant research papers, correlate work of various authors/researchers critically, study concepts, techniques, prevailing results etc., analyze it and present a seminar report.</li> </ul>	

**Text Book/References Books/ Websites: Nil**

**Suggested List of Laboratory Practical (Expandable):**

Students should prepare and submit hard and soft copy of their report to assigned faculty before End Semester Examination.

  
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 Department: Mechanical Engineering



**PEOPLE'S UNIVERSITY, BHOPAL***(Applicable for Admitted from Academic Session 2021-22 onwards)*

Programme: Bachelor of Technology

Semester –VIII

Subject Code	Subject Title	Credit			Theory			Practical		
CBME-801	Project Internship and Viva- Voce	L	T	P	End Sem (Nil)	Internal (Nil)	Total	End Sem (300)	Internal (200)	Total (500)
		-	-	10			(Nil)			Min: 200 (D Grade)

Duration of Theory (Externals): Nil


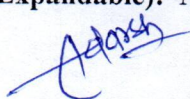
Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: Nil	Assignment/Quiz/Attendance - Max. Marks: Nil
Practical Internal Max Marks: 200	Lab Performance/Attendance /Quiz - Max. Marks: 200	

Pre-Requisite	Must have practical knowledge of respective program.
Course Objective	The course aimed to expose technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job. Exposure to the current technological developments relevant to the subject area of training.
Course Outcomes	<b>Student will be able to learn:</b> 1. After completion of this semester long course the student trained in his specialized area of operation. 2. Will be able to critically think, observe and communicate. 3. Will acquire the work experience through advance learning (in terms of depth, complexity and engagement) in an industrial environment. 4. Will be able to apply, extend and test the knowledge gained from class room experience to understand and mitigate complex issues and address real industry challenges. 5. Will be able to assimilate technical and administrative or managerial skills from his interactions with a variety of individuals, systems and practices.

Unit	Contents (Theory)	Marks Weightage
I	The purpose of the Internship Program is to provide each student practical experience in a standard work environment. The students must undergo industrial training/internship for a minimum period of 120 days during the 8 <sup>th</sup> semester in any of the reputed Govt. or private industry/ Government-sponsored Research & Development Organization/ reputed academic institution/foreign universities. The student will give a seminar with help of power point presentation based on his/her internship report before an departmental expert committee constituted by the concerned department as per norms of the institute and submit a report in hard copy to the department in prescribed format from college. The evaluation will be based on the following criteria:  <ul style="list-style-type: none"> <li>Internal departmental presentation to check knowledge &amp; experience of Project Internship.</li> <li>External Viva-Voce to evaluate Project Internship work done by student.</li> </ul>	500

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Practical (Expandable): Nil


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