Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

B.Tech. (Mechanical Engineering)

Semester-III

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Four Years B.Tech. Programmme
Scheme of Teaching and Examination
B.Tech. Third Semester Mechanical Engineering
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the session: 2022-23)

S.N	Course Code	Course Title	Hours per week			Credit	Examination Scheme			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1.	BSCCP301T	Mathematics-III	3	1	-	4	**30**	**70**	**100**	**3**
2.	BENME302T	Machine Drawing	3	1	-	4	**30**	**70**	**100**	**3**
3.	BENME302P	Machine Drawing Lab	-	-	4	2	**15**	**35**	**50**	**-**
4.	BENME303T	Material Science & Engineering	3	1	-	4	**30**	**70**	**100**	**3**
5.	BENME304T	Mechanics of Solids-I	3	1	-	4	**30**	**70**	**100**	**3**
6.	BENME304P	Mechanics of solid-I Lab	-	-	4	2	**15**	**35**	**50**	**-**
7.	BENME305T	Engineering Thermodynamics	3	1	-	4	**30**	**70**	**100**	**3**
8.	BENME305P	Engineering Thermodynamics Lab	-	-	4	2	**15**	**35**	**50**	**-**
9.	BENME306T	Mechanical Measurements & Metrology	3	1	-	4	**30**	**70**	**100**	**3**
10	BENME306P	Mechanical Measurements & Metrology Lab	-	-	4	2	**15**	**35**	**50**	**-**
						32			**800**	

B.Tech. (Mechanical Engineering)
Semester-III
2022-23

Course Title	**MATHEMATICS -III**				
Course Code	**BSCCP301T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**MATHEMATICS – I & II**				
Course objectives	**This course will enable students-** • To have a knowledge of Fourier series and its applications. • To provide knowledge of Laplace transform of elementary functions including its properties • To under the complex variables and statics problem. • To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in engineering.				
Course Contents	**UNIT- I** **Fourier Series** Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half range series, Harmonic analysis. **UNIT-II** **Laplace Transform** Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t_n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations. **UNIT- III** **Partial Differential Equation** Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables. **UNIT-IV** **Complex Variables** Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, and Evaluation of real definite integrals.				

	UNIT-V **Statistics** Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.
Course outcomes	**At the end of this course students will be able to-** • Define Fourier series including half range series, Harmonic analysis and variety of its applications. • Form and solve by direct integration method Linear equation of first order including Homogeneous and Non-homogeneous Linear equations and also method of separation of variables. • Solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals. • Understand discrete and continuous probability distribution and be able to find mean and standard deviation.
Text Books	1. Higher Engineering Mathematics by Dr. B.S. Grewal– Khanna Publishers. 2. Advanced Engineering Mathematics by Erwin Kreyszig – John Wiley & Sons. 3. Advanced Engineering Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
Reference Books	1. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH. 2. Applied Mathematics by P.N.Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Grih Prakashan,Pune

Course Title	**MACHINE DRAWING**				
Course Code	**BENME302T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**ENGINEERING DRAWING**				
Course objectives	**This course will enable students-** • Understand the different steps in producing drawings according to bureau of Indian standards (B.I.S.) as per SP:46 (1988) • Understand the application of industry standards and techniques applied in Machine Drawing • Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional • Objects in two-dimensional views. • Apply auxiliary or sectional views to most practically represent engineered parts. • Assemble important parts used in major mechanical engineering applications.				
Course Contents	**UNIT-I** **Machine Drawing Conventions** Conventional representation of machine components-leaf spring, leaf spring with eyes, coil spring (tension and compression),disc spring, spiral spring, splined shaft, serrated shaft, square end of shaft, ball and roller bearing, spur gearing, bevel gearing ,worm and worm wheel, straight knurling, diamond knurling, internal and external thread, method of designating and dimensioning metric thread. **UNIT-II** **Geometrical Representation** Machine Drawing Conventions- Representation of geometrical and dimensional tolerance-Straightness, flatness, circularity, cylindricity, parallelism, perpendicularity, angularity, concentricity and coaxially, symmetry, radial run out and axial run out. Representation of dimensional tolerance of hole, shaft and fits. Representation of surface roughness and direction of lay of machining. Representation of welded joints- representation of form, location and size of welds. **UNIT-III** **Projection & Review** Conversion of pictorial views into orthographic views-First angle projection and third angle projection. Sectional view Introduction, cutting plane line, type of sectional views-full section, half section, partial or broken section, revolved section, removed section, offset section, sectioning conventions-spokes, web, rib,				

	shaft, pipes, different types of holes, hatching or section lines, conventions of section lines for different metals and materials. **UNIT-IV** **Drawing Fasteners** Screwed Fasteners Drawing hexagonal nut and square nut, hexagonal headed bolt, square headed bolt and washer. Riveted Joint Form and properties of snap or cup head rivet, dimensions of rivet joint, Type of riveted joints, single riveted lap joint, double riveted (chain) lap joint ,double riveted (zig-zag) lap joint, single riveted (single strap) butt joint, single riveted (double straps) butt joint. **UNIT-V** **Types of Joint** Assembly Drawing Preparation of assembly drawing and bill of materials of following assemblies from its disassembled views: (i) Cotter joint- Sleeve & Cotter Joint, Spigot and Cotter joint (ii) Pin Joint or Knuckle joint (iii) Bearing-Bushed bearing, Plummer block (iv) Coupling-Flange coupling ,Flexible coupling (v) Pulley-Fast and loose pulley (vi) Valves-Steam stop valve, Blow-off cock, Lever safety valve.
Course outcomes	**At the end of this course students will be able to-** • Understand the drawings of mechanical components and their assemblies along with their utility for design and development of mechanical system. • Work effectively with engineering and science teams as well as with multidisciplinary designs. • Use modern engineering tools and techniques such as CAD/CAM software for mechanical engineering design, analysis and application.
Text Books	1. Machine Drawing, N.D. Bhatt, Charotar Book Stall, Anand 2. A Text Book of Machine Drawing, P.S.Gill, S.K.Kataria, Delhi. 3. Machine Drawing, R.K.Dhawan,S,Chand,Delhi. 4. Machine Drawing, K.C. John,PHI,Delhi.
Reference Books	1. Machine Drawing, N.Sidheswar,P. Kannaiah, &V.V.S. Sastry, TMH,Delhi. 2.Machine Drawing With Autocad,, Pohit, Goutam & Ghosh, Goutam,Pearson,Delhi.

<table>
<tr><td>Course Title</td><td colspan="5">MATERIAL SCIENCE & ENGINEERING</td></tr>
<tr><td>Course Code</td><td colspan="5">BENME303T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">BASIC KNOWLEDGE OF PHYSICS & CHEMISTRY</td></tr>
<tr><td>Course objectives</td><td colspan="5">This course will enable students-
To understand various mechanical properties of materials.
To understand how and why the properties of materials are controlled by its structure at the microscopic and macroscopic levels.
To understand how and why the structure and composition of a material may be controlled by processing.
To understand the inter-relationship between composition, structure and properties of engineering materials.
Get knowledge about different materials, their properties and application.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT– I
Introduction To Engineering Materials
Classification of engineering materials and their properties, Structure of Solid Materials-Classification, Amorphous and crystalline states Unit cells and crystal structure (BCC, FCC, and HCP) Allotropy, space lattice, coordination numbers, calculation of atomic number and APF different crystal structure. Solidification of Metals and Alloys: Mechanism of solidification, nucleus formation and crystal growth, Homogeneous and Heterogeneous nucleation, Metal ingot structure-dendritic and columnar grains, grain boundaries, grain growth, solidification process, effect of grain size on properties of metals.
UNIT – II
Mechanical Properties of Materials
Elastic and Plastic behavior of solids, Material properties – Elasticity, Plasticity, Ductility, Malleability, Brittleness, Toughness, Stiffness, Yield strength, Resilience, Hardness, Hardenability, fatigue, creep, and Tensile strength. Deformation of Metals: Elastic deformation: Elastic after effect, Plastic deformation: Deformation by Slip (shear deformation)- Critical Resolved Shear Stress, Deformation by twinning, Differences between slip and twinning. Dislocation theory-Edge dislocation, Screw dislocation. Imperfection in crystal structure: Point defects – Interstitial Defect, Frankel Defect and Schottky defect; Line defects- Edge dislocations, Screw dislocation; Surface defects – Tilt boundary, Twin boundary and Stacking fault; Volume defects. Strain hardening, Seasons cracking, Baushinger effect, Cold and Hot working processes, effect on properties like recovery, recrystallization, grain growth and grain size.</td></tr>
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	UNIT – III **Phase Diagram** Phase and phase equilibrium: solidification of pure metals and alloys, Gibb's phase rule, Hume-Rothery's rule, Types of Phase Equilibrium diagrams: Isomorphous-Lever rule, Monotectic, Eutectic-Hyper, hypoeutectic, Eutectoid- Hyper, hypo eutectoid, Peritectic and Peritectoid system. Allotropy of iron and Fe-C diagram. Metallography, preparation of specimen, selecting the specimen, grinding and polishing, Etching and etching reagents, The metallurgical microscope, use and care of microscope. Micro-examination, Sulphur printing. **UNIT – IV** **Heat Treatment** Heat Treatment of carbon and alloy steels: Introduction, purpose and advantages of heat treatment, defects due to faulty heat treatment, T-T-T curve and micro constituents in steel heat treatment processes like Annealing-stress relief, spheroidising, Process and Full annealing; Normalizing, Hardening, Tempering-Au tempering, Martempering, Surface hardening-Flame, Induction and Case hardening: Carburizing- Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-Nitriding **UNIT – V** **Engineering Materials** Engineering Materials Composition, Properties and Application of the following Engg. Materials - Ferrous Metals: Cast Iron & Steel, Cast Iron-Grey Cast Iron, White Cast Iron, Malleable Cast Iron, Nodular Cast Iron, Chilled CI, Alloy CI, Mechanite CI, **Steels**- Unalloyed steels or Plain carbon steels- Low, Medium, High carbon steels. Alloy steels- Stainless steel, Martensitic stainless steel, Ferritic stainless steel, High Speed Steel, Heat resisting alloys; spring steel. Non- Ferrous Metals & Alloys - Copper Alloys: Brasses – Muntz metal, Cartridge brass, Admiralty brass, Naval Brass, Bronzes – Gun Metal, Phospher Bronze, Aluminium Bronze, Copper-Nickels alloys. Bearing metals- Babbit, Copper lead alloys, Bronze bearing alloys. Light metal alloys: Aluminium alloys- Duralumin, Cast Aluminium alloys, Aluminium Silicon Alloys. Sintered Carbide.
Course outcomes	**At the end of this course students will be able to-** • Acquire knowledge and hands-on competence in applying the concepts of material science in the design and development of mechanical systems. • Demonstrate creativeness in designing new systems components and processes in the field of engineering. Identify, analysis, and solve mechanical engineering problems useful to the society.
Text Books	1. Material Science & Engg. – A first course – V. Raghavan – PHI(P) Ltd., Delhi, 2003 2. 2. Material Science & Science & Metallurgy, O.P. Khanna , Dhanpat Rai & Sons, New Delhi.

Reference Books	1. Elements of Material Science & Engg. – Van Vlack. – Addison – Wesley Longman, 6th Edn., New York 2. Physical Metallurgy – Clark & Varney, East West Edn., New Delhi 3. Engineering Physical Metallurgy – Lakhtin – CBS Publishers & Distributors 4. Materials Science – Narang – CBS Publishers & Distributors 5. Engineering Materials – Woulf Series. 6. Physical Metallurgy Principles – Robert E Reed Hill – Affiliated East-West Press Pvt. Ltd., New Delhi, 2004

Course Title	**MECHANICS OF SOLIDS – I**

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2022-23

<table>
<tr><td>Course Code</td><td colspan="5">BENME304T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td>-</td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">BASIC MECHANICAL ENGINEERING</td></tr>
<tr><td>Course objectives</td><td colspan="5">This course will enable students-
To gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
To study engineering properties of materials, force-deformation and stress-strain relationship
To learn fundamental principles of equilibrium, compatibility, and force-deformation relationship, and principle of superposition.
To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces,
To determine stress, strain, and deformation of bars, beams and springs.
To be able to perform structural analysis by hand computations and design axial and torsional members.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT–I
Introduction
Basic of Stress & Strain, elastic constants, stress – strain diagram, Hooke’s law, Poisson’s ratio, shear stresses, stresses in the components subjected to multi-axial forces, thermal stresses, statically indeterminate systems.
UNIT–II
Bending of Beam
Beams: Introduction of Beams, Various type of Beams, Various type of Supports, Reactions at supports, Shear force and bending moment at any section of a beam, Methods for determination of S.F. and B.M. diagrams of beams (simply supported, overhang and cantilever) subjected to various loads, Relation between Shear Force and Bending Moment, Point of contra-flexure. Bending of beams: Bending of beams with symmetric section, boundary conditions, pure bending, and bending equation problems of simple bending, Transverse shear stress.
UNIT–III
Deflection Of Beam
Deflection of beam: Relation between slope deflection and radius of curvature, solution of beam deflection, problem by Macaulay’s method, Direct integration method, Moment Area Method, Conjugate Beam method.
UNIT–IV</td></tr>
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	Torsion Torsion: Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft. Springs: Types of spring, Closed & Open Coil Helical Springs subjected to Axial Load, springs in parallel & series. **UNIT–V** **Principle of Stress And Strain** Principal stresses and strain: Transformation of plane stresses, Principal stresses, Maximum shear stresses, Mohr's circle for plane stresses, Plain strain and its Mohr's circle representation, Principal strains, Maximum shear strain. Combined Loading: Components subjected to bending, torsion & axial loads.
Course outcomes	**At the end of this course students will be able to-** • Apply knowledge of mechanics of deformable body for understanding, formulating and solving engineering problems. • Acquire knowledge and hands-on competence in applying the concepts mechanics of solid in the design and development of mechanical systems. • Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical. • Identify, analysis, and solve mechanical engineering problems useful to the society. • Work effectively with engineering and science teams as well as with multidisciplinary designs
Text Books	1. Elements of Strength of Material – Timoshenko & Young- EWP press. 2. Strength of Materials – Dr. Sadhu Singh – Khanna publications. 3. Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons.
Reference Books	1. Mechanics of Material-Gere and Timoshenko CBS Publications. 2. Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications. 3. Introduction to Solid Mechanics – I.H.Shames–PHI.

Course Title	**ENGINEERING THERMODYNAMICS**

Course Code	**BENME305T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**FUNDAMENTAL OF MECHANICAL ENGINEERING & BASICS OF PHYSICS & CHEMISTRY**				
Course objectives	**This course will enable students-** • To provide a thorough education in the fundamentals of Mechanical engineering. • Understand the vectoral and scalar representation of forces and moments. • Describe static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. • Illustrate the laws of motion, kinematics of motion and their interrelationship. • Comprehend the effect of Friction on general plan motion.				
Course Contents	**UNIT-I** **Law Of Thermodynamics** Second law of thermodynamics: Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, PMM of Second kind, reversibility and irreversibility, causes of irreversibility, Carnot cycle, Carnot theorem, Absolute thermodynamic temperature scale. Entropy: clausius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes. **UNIT- II** **Available Energy** Availability and Irreversibility: Available energy, availability of a closed system, availability function of a closed system availability of steady flow system, availability function of open system, Helmholtz function, Gibbs functions, Irreversibility for closed and open system, Second law efficiency. Thermodynamic Relationships: Maxwell's equations, T-ds equations, difference in heat capacities, coefficient of Volume expansion and isothermal compressibility, adiabatic compressibility, ratio of specific heat, energy equations, Joule-Kelvin effect, Clausius-Clapeyran equation. **UNIT- III** **Gaseous States** Equation of state: Ideal gas equation of state, deviation of Real gas from ideal gas, van der waal's equation of state, correction for the intermolecular attractions,				

	correction for finite size of molecules, evaluation of constants a and b, virial expansions, limitations of the van der Wall's equation, Reduced coordinates, compressibility factor, the law of corresponding states as per vander Wall's principle. Mixture of perfect gases: Mass Fraction, Mole fraction, Dalton's Law of additive pressure, Properties of mixture of ideal non reactive gases –gas constant, molecular weight, specific heat, internal energy, enthalpy and entropy. **UNIT- IV** **Pure Substances** Properties of Pure substances: Thermodynamic properties of pure substances in solid, liquid and vapour phases, Phase Transformations, dryness fraction, Triple point, critical state, p-v, p-T, T-s, h-s diagrams, P-V-T surfaces,– Properties and processes in ideal vapour, use of steam tables and Mollier's diagram in determination of steam properties, energy interaction and entropy calculations. **UNIT- V** **Boilers** Boilers: Classification of boiler, difference between water tube and fire tube boiler, construction and working of Cochran fire tube boiler, construction and working of Babcock Wilcox water tube boiler, High pressure boiler- advantages, construction and working of Lamont boiler, function of various boiler mounting and accessories, Draught-definition and classification. Performance of Boiler: Evaporation rate, equivalent evaporation, factor of evaporation, Boiler efficiency, Boiler trial, heat balance sheet of boiler.
Course outcomes	**At the end of this course students will be able to-** • Apply knowledge of classical thermodynamics for formulating and solving engineering problems. • Acquire knowledge and hands-on competence in applying the concepts of thermal sciences in the design and development of mechanical systems. • Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering. • To continue the study of the applied thermodynamics.
Text Books	1. Thermodynamics- An Engineering Approach – Cengal & Boles – McGraw Hill. 2. Engineering Thermodynamics – P.K. Nag – TMH Publishers. 3. Fundamental of engineering thermodynamics- R.Yadav ,CPH, Allahabad. 4. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons. 5. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag,Wiley,Delhi.

Reference Books	1. Engineering Thermodynamics-M.Achuthan –PHI- New Delhi. 2. Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age, Delhi.

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Course Title	**MECHANICAL MEASUREMENT & METROLOGY**				
Course Code	**BENME306T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**	**-**	**4**	
Prerequisites	**BASIC KNOWLEDGE OF PHYSICS & MATHEMATICS**				
Course Objectives	**This course will enable students-** • To understand the concepts in measurement and metrology. • To be familiar with different sensors and transducers. • To build suitable measurement technique. • To have the confidence to apply automation solutions for given industrial applications. • To demonstrate the ability to design and conduct experiments, interpret and analyze data, and report results. • To familiar with various standards and calibration methods used in industry.				
Course Contents	**UNIT- I** **Measurement System** Generalized Measurement System: Introduction - Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, static and dynamic performance characteristics of measurement devices, calibration, error- concept and sources, statistical analysis of errors sensors and Transducers. Types of sensors, type of transducers and their characteristics. **UNIT–II** **Measurement Of Pressure & Temperature** Measurement of pressure: pressure standard, bourdon tubes, Diaphragm and bellows, Measurement of very low pressure –Mcleod gauge and Pirani gauge. Measurement of Strain, Type of strain gauges and their working, temperature compensation. Strain rosettes. Measurement of temperature by thermometers, bimetallic, thermocouples, thermistors and pyrometers-total radiation and optical pyrometer. **UNIT – III** **Measurement of Flow** Variable head meters, hot wire and magnetic meters, ultrasonic flow meters. Vibration measurement: Seismic instruments, vibration pickups. Data acquisition system: Introduction to data acquisition systems, single and multi-channel systems, microprocessors and PC based data acquisition systems. Input – output devices signal transmission and Processing. Devices and systems				

	UNIT – IV **Metrology** Metrology: Standards of measurement. Linear and angular measurement devices and systems limit gauges, gauge blocks. Measurement of geometric forms like straightness, flatness, roundness and circularity, surface texture measurement, principles and application of optical projectors, tool makers, microscope, autocollimators etc. **UNIT – V** **Interferometry** Principle and use of interferometry. Comparators, screw threads Measurement, Measurement of Gears tooth. Coordinate measuring machine (CMM) - need construction, types and application.
Course Outcomes	**At the end of this course students will be able to-** • Acquire knowledge and hands-on competence in applying the concepts of measurement and metrology in the design and development of mechanical systems. • Demonstrate creativeness in designing new systems components and processes in the field of engineering. • Work effectively with engineering and science teams as well as with multidisciplinary designs. • Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application.
Text Books	1. Mechanical Measurements – G. Beckwith Thomas G. – Pearson Education. 2. Mechanical Measurements and Control – D.S. Kumar – S.K. Kataria & Sons. 3. Metrology and quality control- A.M. Badadhe Technical Publication Pune. 4. Measurement Systems, Application Design – E.O. Deoblein - McGraw Hill.
Reference Books	1. Engineering Metrology – K.J. Hume - MacDonald and Company. 2. Engineering Metrology – I.C. Gupta - Dhanpat Rai & Sons.

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Course Title	**MACHINE DRAWING LAB**				
Course Code	**BENME302P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	**ENGINEERING DRAWNING**				
Course objectives	**This course will enable students-** • Understand the different steps in producing drawings according to bureau of Indian standards (B.I.S.) as per SP:46 (1988) • Understand the application of industry standards and techniques applied in Machine Drawing.				
Course Contents	**LIST OF EXPERIMENTS** 1. Study of Conventional representation 2. Study of Sectional views 3. Study of Dimensioning 4. Study of Working drawings 5. Study of Machine elements 6. Study of Keys and cotter joints 7. Study of Riveted joints 8. Study of Couplings 9. Study of Bearings 10. Assembly drawings- 11. Connecting rod and eccentric 12. Screw jack 13. Machine vice and tailstock				
Course outcomes	**At the end of this course students will be able to-** • Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. • Explore new areas of research in both drawing and design fields of science and technology.				
Equipment/ Machines used	**Equipment/Machines/Instruments/Tools/Software Required:** 1. Software Required – Drafting Software (CAD/CAM, SOLID EDGE)				

B.Tech. (Mechanical Engineering)
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2022-23

Course Title	**MECHANICS OF SOLID –I LAB**				
Course Code	**BENME304P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	**MATERIAL SCIENCE & ENGINEERING**				
Course objectives	**This course will enable students-** • Study & practice about material testing lab & gain knowledge about machine. • To perform the practical & study the properties and find the value of materials.				
Course Contents	**LIST OF EXPERIMENTS** 1. To study the Universal Testing Machine. 2. To perform the Tensile Test of Mild Steel on U.T.M and To Draw Stress–Strain Curve. 3. To determine strength of wood on U.T.M (i) Along the Grain (ii) Across the Grain. 4. To determine shear strength of Mild Steel on U.T.M. 5. To observe Flexural Behavior of Timber specimen and to determine it's strength under transverse loading on U.T.M. 6. To study the Impact Testing Machine and test specimen of Izod and Charpy. 7. To determine Izod and Charpy Value of the given mild steel specimen. 8. To study the Fatigue Testing Machine and to discuss the procedure to find out endurance limit of given material. 9. To study the Spring Testing Machine. 10. To determine G for the material of open and closed Coiled Helical Spring Subjected to Axial Load by spring Testing machine. 11. To study the Torsion Testing Machine 12. To determine ultimate shear stress and modulus of rigidity under Torsion. 13. To study the Cupping Test Machine and to determine Ericson value of Mild Steel sheet. 14. To study the Rockwell Hardness Testing Machine and to determine the Rockwell Hardness of the given material. 15. To study the Brinell Hardness Machine and to determine the Brinell hardness of the given material.				

Course outcomes	**At the end of this course students will be able to-** • After end of practical performance, we are able to know mechanical properties and fracture point. • Analysis and discussion of material properties.
Equipment/ Machine Used	**Equipment/Machines/Instruments/Tools/Software Required:** 1. Universal Testing Machine 2. Impact Testing Machine 3. Fatigue Testing Machine 4. Spring Testing Machine 5. Torsion Testing Machine 6. Cupping Testing Machine 7. Rockwell Hardness Testing Machine 8. Brinell Hardness Machine 9. Vickers Hardness Machine 10.Column Testing Machine

Course Title	**ENGINNERING THERMODYNAMICS LAB**				
Course Code	**BENME305P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	**BASIC OF THERMODYNAMICS**				
Course objectives	**This course will enable students-** • Identify, analysis, and solve mechanical engineering problems useful to the society. • Work effectively with engineering and science teams as well as with multidisciplinary designs.				

	• Skillfully use modern engineering tools and techniques for mechanical engineering design, analysis and application
Course Contents	**LIST OF EXPERIMENTS** 1. To study the rise in temperature of liquid due to external work. 2. Effect of reduction in temperature in a steam pressure vessel. 3. To study the expansion process using throttling devices. 4. To study the effect of mixing of two/three fluid streams having different flow rates and temperatures. 5. To study the different thermodynamic working fluid e.g. air, steam. 6. To study Mountings & Accessories of a Boiler. 7. To study the Cochran Boiler and it's Accessories and Mountings. 8. To study the Lancashire and it's Accessories and Mountings. 9. To study the Babcock Wilcox and it's Accessories and Mountings. 10. To study a Simple Steam Engine. 11. To study a Compound Steam Engine. 12. Performance and testing of surface steam condenser. 13. Performance and testing of steam jet condenser. 14. Study of Steam Turbines 15. Study of Reciprocating Compressor
Course outcomes	**At the end of this course students will be able to-** • Able to understand the working principle of plants & industries. • Taking knowledge about boiler accessories and mounting.
Equipment/ Machine Used	**Equipment/Machines/Instruments/Tools/Software Required:** 1. Insulated agitated vessel. 2. Steam pressure vessel with arrangement for external cooling. 3. Compressed air tank with expansion device. 4. Arrangement of mixing of two/three fluid streams. 5. Boiler mountings 6. Boiler accessories 7. Cochran boiler 8. Lancashire boiler 9. Babcock and Wilcox boiler 10. Simple steam turbine

	11. Compound steam turbine 12. Surface steam condenser 13. Jet steam condenser 14. Steam turbine 15. Reciprocating air compressor

Course Title	**MECHANICAL MEASUREMENT AND METROLOGY LAB**				
Course Code	**BENME306P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	

Prerequisites	**BASIC KNOWLEDGE OF PHYSICS AND CHEMESTRY**
Course objectives	**This course will enable students-** • The basic working knowledge required for the production of various engineering products. • Explains the construction, function, use. • Application of different working tools, equipment, machines as well as the technique of manufacturing a product from its raw material.
Course Contents	**LIST OF EXPERIMENTS** **Mechanical Measurements** 1. To Measure Pressure Using Bourdon Pressure Gauge. 2. To Calibrate Pressure Gauge Using Dead Weight Pressure Gauge Tester. 3. To Measure Displacement Using LVDT 4. To Measure Temperature Using Thermistor 5. To Measure Flow Rate Using Rotameter. 6. To Measure Angle Using Angular Sensor. 7. To Measure Torque Using Torque Transducer 8. To Measure Pressure Using Pressure Transducer. 9. To Measure Strain Using Strain Cantilever Beam. 10. To Measure Temperature Using RTD. 11. To Measure Temperature Using Thermo Couple. 12. To perform the following experiments using Data Acquisition System 13. To measure Temperature by Thermocouple **METROLOGY** 1. Measurements of lengths, heights, diameter by Vernier Calipers, Vernier Height Gauge, 2. Micrometers. 3. Measurement of various angles using Bevel Protractor, Sine Bar & Combination Set. 4. Determining the accuracy of Electrical and Optical Comparator. 5. Determine the Surface Flatness and Contour using Interferometer. 6. Determine the Effective Diameter of screw threads by using Two wire & Three wire methods. 7. Measurement of Gear Elements using Profile Projector and image analyzer. 8. Measurement of Tool Angles of a Single Point Cutting Tool by using Tool Makers Microscope.

	9. Calibration of Vernier Caliper, Micrometer, Height Gauge, Depth Micrometer using Slip Gauges
Course outcomes	**At the end of this course students will be able to-** • Work on any measurement prepares some useful product. • Actual measurement of job. • Prepare a job related to for Work and metal cutting measuring the dimension of job. • Temperature measurement and deformation measurement of job.
Equipment/ Machine Used	LIST OF EQUIPMENTS/MACHINES REQUIRED

MEASUREMENT		METROLOGY	
1	Data Acquisition System	1	Vernier Calipers
2	Software compatible with DAS	2	Vernier Height Gauge
3	Displacement Measurement Tutor Using (LVDT)	3	Depth Micrometers
4	Pressure Measurement Tutor Using Pressure Transducer	4	Set of slip Gauges
5	Strain Measurement Tutor Using Strain Cantilever Beam	5	Interferometer
6	Torque Measurement Tutor Using Torque Transducer	6	Tool Makers Microscope
7	Temperature Measurement Tutor Using RTD Sensor	7	Profile Projector
8	Temperature Measurement Tutor Using Thermocouple	8	Bevel Protector
9	Temperature Measurement Tutor Using Thermister	9	Sine Bar
10	Angular Measurement Tutor Using Angular Sensor	10	Combination Set
11	Rotameter Trainer Module	11	Optical & Electrical Comparator
12	Dead Weight pressure Gauge Tester	12	Optical Flats
13	Bourdon Gauge Trainer	13	Surface Plates
14	Image Analyzer	14	Dial Indicators
		15	Snap and Ring Gauges (GO and NO-GO type)