Chhattisgarh Swami Vivekanand Technical University, Bhilai

SCHEME OF TEACHING AND EXAMINATION

BE (MECHANICAL ENGINEERING) III Semester

S. No.	Board of Study	Sub. Code	SUBJECT	PERIODS PER WEEK			SCHEME OF EXAM Theory/Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1.	Appl Mathematics	337351(14)	Mathematics-III	4	1	-	80	20	20	120	5
2.	Mech. Engg	337352(37)	Machine Drawing	4	1	-	80	20	20	120	5
3.	Mech. Engg	337353(37)	Material Science & Metallurgy	3	1	-	80	20	20	120	4
4	Mech. Engg	337354(37)	Mechanics of Solids-I	4	1	-	80	20	20	120	5
5	Mech. Engg	337355(37)	Engineering Thermodynamics	4	1	-	80	20	20	120	5
6	Mech. Engg	337356(37)	Mechanical Measurements & Metrology	3	1	-	80	20	20	120	4
7	Mech. Engg	337361(37)	Machine Drawing Lab	-	-	3	40	-	20	60	2
8	Mech. Engg	337362(37)	Material Testing Lab	-	-	2	40	-	20	60	1
9	Mech. Engg	337363(37)	Engineering Thermodynamics Lab	-	-	2	40	-	20	60	1
10	Mech. Engg	337364(37)	Mechanical Measurements & Metrology Lab	-	-	2	40	-	20	60	1
11	Humanities	337365(46)	Value Education	-	-	2	-	-	40	40	1
12			Library	-	-	1	-	-	-	-	-
			Total	**22**	**6**	**12**	**640**	**120**	**240**	**1000**	**34**

L: Lecture, T: Tutorial, P: Practical, ESE: End Semester Exam, CT: Class Test, TA: Teachers Assessment
Note: Duration of End Semester Examination all theory papers will be of Three Hours **except for Machine Drawing Paper (at Sl. No. 2) which is of four hours duration.**

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Mathematics - III**	Code:	**337351(14)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

1. To make the students understand that Fourier series analysis is a powerful method where the formulas are integrals and to have knowledge of expanding periodic functions that explore variety of applications of Fourier series.
2. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differentials equations.
3. To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in engineering.
4. To provide a sound background of complex analysis to perform a thorough investigation of major theorems of complex analysis and to apply these ideas to a wide range of problems that include the evaluation of both complex line integrals and real integrals.
5. To study about a quantity that may take any of a given range of values that can't be predicted exactly but can be described in terms of their probability

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 tn, 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, 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.

Text Books:

1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

Reference Books:

1. Advanced Engg.Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N.Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Grih Prakashan,Pune
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.

Course Outcome: After studying the contents of the syllabus in detail the students will be able to

1. define Fourier series including half range series, Harmonic analysis and variety of its applications.
2. define (mathematically) Unit step, Unit impulse, Laplace transforms, its properties, Inverse and applications to solve ordinary differential equations.
3. 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.
4. solve difficult problems using theorems of complex analysis and apply Residue theorem to evaluate real integrals.
5. understand discrete and continuous probability distribution and be able to find mean and standard deviation and use the Uniform distribution.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Machine Drawing**	Code:	**337352(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Four Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- 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.

UNIT- I **Machine Drawing Conventions**

a) 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.

b) Representation of geometrical and dimensional tolerance-Straightness, flatness, circularity, cylindricity, parallelism, perpendicularity, angularity, concentricity and coaxiality, symmetry, radial run out and axial run out. Representation of dimensional tolerance of hole, shaft and fits.

c) Representation of surface roughness and direction of lay of machining.

d) Representation of welded joints- representation of form, location and size of welds.

UNIT-II **a) Conversion of pictorial views into orthographic views-**First angle projection and third angle projection.

b) 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- III **a) Screwed Fasteners**

Drawing hexagonal nut and square nut, hexagonal headed bolt, square headed bolt and washer.

b) 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 (zigzag) lap joint, single riveted (single strap) butt joint, single riveted (double straps) butt joint.

UNIT-IV **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

Marks allotted to UNIT I to UNIT III is 16 each whereas for UNIT IV it is 32

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

Reference Books:

1. Machine Drawing, R.K.Dhawan,S,Chand,Delhi
2. Textbook of Machine Drawing, K.C. John,PHI,Delhi
3. Machine Drawing, N.Sidheswar,P. Kannaiah, &V.V.S. Sastry, TMH,Delhi
4. Machine Drawing With Autocad,, Pohit, Goutam & Ghosh, Goutam,Pearson,Delhi
5. Engineering Drawing Practice for School & Colleges, SP 46:1988, Bureau of Indian Standards

Course outcomes:

- After going through this course, the student shall 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.
- Skillfully use modern engineering tools and techniques such as CAD- CAM softwares for mechanical engineering design, analysis and application

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Material Science & Metallurgy**	Code:	**337353(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- 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.

UNIT I **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 behaviour of solids, Material properties – Elasticity, Plasticity, Ductility, Malleability, Brittleness, Toughness, Stiffness, Yield strength, Resilence, 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.

UNIT III **Phase Diagrams:** 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, hypoeutectoid, Peritectic and Peritectoid system. Allotrophy of iron and Fe-C diagram.

UNIT IV **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; Normalising, Hardening, Tempering- Austempering, Martempering, Surface hardening-Flame, Induction and Case hardening: Carbuising- Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-Nitriding.

UNIT V **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.

Text Books:

1. Material Science & Engg. – A first course – V. Raghavan – PHI(P) Ltd., Delhi, 2003
2. A Text Book of 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 Re3ed Hill – Affiliated East-West Press Pvt. Ltd., New Delhi, 2004

Course outcomes:

- 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.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Mechanics of Solids – I**	Code:	**337354(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- 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 in linear solids and structures
- To analyze; determinate and indeterminate axial members, torsional members and beams to determine axial forces, torque, shear forces, bending moments, slopes and deflection.
- 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.

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 **(A) 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.
(B) Bending of beams: Bending of beams with symmetric section, boundary conditions, pure bending, and bending equation problems of simple bending,
(C) Transverse shear stress

UNIT III **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 **(A) Torsion:** Deformation in circular shaft due to torsion, basic assumptions, torsion equations, stresses in elastic range, angular deflection, hollow & stepped circular shaft.
(B) Springs: Types of spring, Closed & Open Coil Helical Springs subjected to Axial Load, springs in parallel & series.

UNIT V **(A) 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.
(B) Combined Loading: Components subjected to bending, torsion & axial loads.

Text Books:

1. Elements of Strength of Material – Timoshenko & Young- EWP press
2. Strength of Materials – Dr. Sadhu Singh – Khanna publication

Reference Books:

1. Strength of Materials – R.K. Rajput – Dhanpat Rai & Sons
2. Mechanics of Material-Gere and Timoshenko CBS Publications
3. Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications
4. Strength of material – Ryder–ELBS
5. Introduction to Solid Mechanics – I.H.Shames–PHI
6. Engineering Mechanics of Solids – E.P. Popov – PHI

Course outcomes:

- 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 engineering in particular.
- Identify, analysis, and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Engineering Thermodynamics**	Code:	**337355(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- To provide a mature approach to the basic principle of classical thermodynamics and to apply it to system surroundings interactions; involving work and heat transfer with associated property changes.
- To Use classical thermodynamics principles to develop algebraic relationships among key physical parameters and variable based on analysis of a specified system
- Use references that provide tabulated physical data that are useful to mechanical engineers.
- Familiarity with construction and performance parameters of Boilers

UNIT I **a) 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.
b) Entropy: Clasius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes.

UNIT II **a) 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.
b) 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 **a) 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 van der Wall's principle.
b) Mixture of perfect gases: Mass Fraction, Mole fraction , Dalton's Law of additive pressure, Amagat-Leduc of additive volumes , Properties of mixture of ideal non reactive gases –gas constant, molecular weight, specific heat, internal energy, enthalpy and entropy.

UNIT IV **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:** 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.

Text Books:

1. Thermodynamics- An Engineering Approach – Cengal & Boles – McGraw Hill
2. Engineering Thermodynamics – P.K. Nag – TMH Publishers

Reference Books:

1. Fundamental of engineering thermodynamics- R.Yadav ,CPH, Allahabad
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons
3. Fundamental of Thermodynamic- Claus Borgnakke, Richard E. Sonntag,Wiley,Delhi
4. An Introduction to Thermodynamics-Y.V.C.Rao University Prass, Hyderabad
5. Engineering Thermodynamics-M.Achuthan –PHI- New Delhi
6. Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age, Delhi
7. Thermodynamics – C.P. Arora – TMH Pub.
8. Thermodynamics – S.C. Gupta – Pearson Education

Course outcomes:

- 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 in particular.
- 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.
- To continue the study of the applied thermodynamics.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Mechanical Measurement & Metrology**	Code:	**337356(37)**
Total Theory Periods:	**40**	Total Tutorial Periods:	**10**
Class Tests:	**Two (Minimum)**	Assignments:	**Two (Minimum)**
ESE Duration:	**Three Hours**	**Maximum Marks: 80**	**Minimum Marks: 28**

Course Objectives:

- 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.

UNIT I **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:** 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 pyrometry.

UNIT III **Measurement of flow:** Variable head meters, hot wire and magnetic meters, ultrasonic flow meters.
Vibration measurement : Seismic instruments, vibration pick ups.
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:** 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 **Metrology:** Principle and use of interferometry. Comparators, screw threads Measurement, Measurement of Gears tooth. Coordinate measuring machine (CMM)- need construction, types 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

Reference Books:

1. Metrology and quality control- A.M. Badadhe Technical Publication Pune
2. Measurement Systems, Application Design – E.O. Deoblein - McGraw Hill
3. Engineering Metrology – K.J. Hume - MacDonald and Company
4. Engineering Metrology – I.C. Gupta - Dhanpat Rai & Sons
5. Mechanical & Industrial Measurements – R.K. Jain – Khanna Publishers

Course outcomes:

- 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.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Machine Drawing Laboratory**	Code:	**337361(37)**
Total Lab Periods:	**36**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

1. General introduction of GUI
2. Setting up the drawing environment: Drawing aids, setting drawing units, setting grid, setting limits, function keys, object snap.
3. Using co-ordinate system-Cartesian coordinate, polar coordinate (Absolute and relative co-ordinate, direct distance entry methods).
4. Drawing Object-Use of various draw tools with illustrative exercise.
5. Modifying Objects- Use of various modify tools with illustrative exercise.
6. Creating texts and tables
7. Basic dimensioning, Geometric dimensioning and tolerancing
8. Adding constraints to sketches
9. Advance options for making complicated drawings –Layers, Blocks, View port.
10. Exercise problems on conversion of pictorial view to orthographic view
11. Exercise problems on conversion of pictorial view to orthographic sectional view
12. Assembly drawing of machine components.

Equipment/Machines/Instruments/Tools/Software Required:

1. P-IV, 2.6 G. Hz., 128/256 MB SDRAM, 40 GB HDD, 1.44 MB FDD, 14” Colour Monitor, 52 X CD RW, Laser Scroll Mouse
2. Software Required – Drafting Software

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Materials Testing Laboratory**	Code:	**337362(37)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

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 modulus of rigidity 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 Erichsen 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.
16. To study the Vickers Hardness Machine and to conduct a hardness test on the machine.
17. To study Column testing machine and to conduct Buckling Test of column.

Equipment/Machines/Instruments/Tools/Software Required:

- Universal Testing Machine
- Impact Testing Machine
- Fatigue Testing Machine
- Spring Testing Machine
- Torsion Testing Machine
- Cupping Testing Machine
- Rockwell Hardness Testing Machine
- Brinell Hardness Machine
- Vickers Hardness Machine
- Column Testing Machine

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Engineering Thermodynamics Laboratory**	Code:	**337363(37)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

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

Equipment/Machines/Instruments/Tools/Software Required:

- Insulated agitated vessel.
- Steam pressure vessel with arrangement for external cooling.
- Compressed air tank with expansion device.
- Arrangement of mixing of two/three fluid streams.
- Boiler mountings
- Boiler accessories
- Cochran boiler
- Lancashire boiler
- Babcock and Wilcox boiler
- Simple steam turbine
- Compound steam turbine
- Surface steam condenser
- Jet steam condenser
- Steam turbine
- Reciprocating air compressor

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Mechanical measurement & Metrology Laboratory**	Code:	**337364(37)**
Total Lab Periods:	**24**	Batch Size:	**30**
Maximum Marks:	**40**	Minimum Marks:	**20**

List of Experiments: *(At least Ten experiments are to be performed by each student)*

(Minimum Seven experiments to be performed from the following group)

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 Thermister
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 Themocouple

(Minimum Three experiments to be performed from the following group)

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.

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)

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program:	**Bachelor of Engineering**		
Branch:	**Mechanical Engineering**	Semester:	**III**
Subject:	**Value Education**	Code:	**337365(46)**
No. Of Periods:	**2 Periods/Week**	Total Tutorial Periods:	**NIL**
Maximum Marks:	**40**	**Minimum Marks:**	**24**

Course Objectives:

1. This course is designed to provide the importance of education with why, what & how.
2. To impart students with an understanding of fundamental humanitarian viewpoint and its outcomes.
3. To provide the knowledge about whole existence and its impact on values.
4. To bring the awareness about life long exercise so that they can fulfill their responsibility towards themselves, the family, the society, the planet.

UNIT- I **Aim of Education and Necessity for Value Education:** Education in values/wisdom/etc and education in traits/technologies/etc as the two fundamental strands of education; Answer to the frequently asked questions such as "Why to do studies", "What studies to do in overall", "How to do studies in a proper way", "How to think systematically and talk systematically"

UNIT-II **Humanitarian Viewpoint and Basic Human Objective:** Meaning and concept of happiness, Need for a fundamental viewpoint to judge things in all cases of human concerns, Proposal of the natural path of humanitarian coexistentialism; Consciousness development and its expression; Fundamental want of sustainable happiness in human being; Understanding the distinct activities and needs of self (I) and body in human being; Fundamental goal of human being; Sustainable-solution in individual (At the place of delusion); Sustainable-prosperity in family (At the place of poverty); Sustainable-cooperation in society (At the place of competition); Sustainable-coexistence in planet (At the place of struggle)

UNIT- III **Elements of Holistic and Systematic Perspective:** Need for study of fundamental information categories to develop holistic perspective; Particular-time actions and general-time laws; Need for fundamental information sequence to develop systematic perspective, Some examples for systematic study sequence

UNIT-IV **Elements of Society-friendly and Environment-friendly Goals:** Elements of Knowledge of whole existence; Elements of Knowledge of human being; Elements of fundamental Values and Wisdom; Value spectrum with reference to general relationships and particular relationships of the objects in nature; Elements of History and Contemporarity used to set current goals; Elements of Sciences and Techniques to formulate methods to achieve goals; Elements of Motoricity and Mattericity to make actions to execute the methods

UNIT-V **Lifelong Exercise for All-round Sustainability:** Collecting information for sustainability issues; Motivating people towards sustainable life-style; Ability to identify and develop appropriate technologies and management patterns for society-friendly and environment-friendly systems for production /protection/ utilization/ experimentation ; Ability to establish and execute the fundamental five-fold system in order to ensure sustainable peace-and-prosperity worldwide.

Text Books:

Value Education for Consciousness Development by Dr P B Deshmukh, Radha K Iyer, and Deepak K Kaushik (2nd Edition, 2012, ISBN: 978-81-924034-0-3)

Reference Books:

1. International Research Handbook on Values Education and Student Wellbeing by Terence Lovat, Ron Toomey, Neville Clement (Eds.), Springer 2010, ISBN: 978-90481-86747
2. Values Education and Lifelong Learning: Principles, Policies, Programmes by David N Aspin and Judith D Chapman (Eds.); Springer 2007, ISBN: 978-1-4020-6183-7
3. Fundamentals of Ethics for Scientists and Engineers by E G Seebaur and Robert L Berry, 2000, Oxford University Press