SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

SCHEME OF TEACHING AND EXAMINATION

B. Tech. (Third Semester)

Mechanical Engineering

Sl. No.	Board of Studies (BOS)	Courses	Category	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
								Theory/Lab				
					L	T	P	ESE	CT	TA		
1	Mathematics	**Applied Mathematics III**	BSC	AM100301	2	1	-	100	20	30	150	3
2	Mech	**Strength of Material**	PCC	ME107301	2	1	-	100	20	30	150	3
3	Mech	**Material Science**	PCC	ME107302	3	-	-	100	20	30	150	3
4	Mech	**Measurement, Control and Sensing Tools**	PCC	ME107303	3	-	-	100	20	30	150	3
5	Mech	**Thermodynamics**	PCC	ME107304	3	-	-	100	20	30	150	3
6	Mech	**Machine Drawing and Computer Graphics Lab**	ESC	ME107391	-	-	2	25	-	25	50	1
7	Mech	**Material Testing Lab**	PCC	ME107392	-	-	2	25	-	25	50	1
8	Mech	**Measurement, Control and Sensing Tools Lab**	PCC	ME107393	-	-	2	25	-	25	50	1
9	Mech	**Mini Project – I**	PSI	ME107394	-	-	2	25	-	25	50	1
10	Mech	**Health Hygiene & Yoga**	HSMC	ME100395	-	-	2	-	-	25	25	1
11	IT	**Cyber Laws and Ethics**	NC	IT100396	-	-	-	-	-	25	25	-
Total					**13**	**2**	**10**	**600**	**100**	**300**	**1000**	**20**

Note:

(a)Abbreviations used:L-Lecture,T-Tutorial,P-Practical,ESE-EndSemesterExam,CT-ClassTest,TA-Teacher'sAssessment

(b)Thedurationofendsemesterexaminationofalltheorypaperswillbeofthreehours.

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

SCHEME OF TEACHING AND EXAMINATION

B. Tech. (Fourth Semester)

Mechanical Engineering

Sl. No.	Board of Studies (BOS)	Courses	Category	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
								Theory/Lab				
					L	T	P	ESE	CT	TA		
1	Mech	**Kinematics of Machines**	PCC	ME107401	3	1	-	100	20	30	150	4
2	Mech	**Manufacturing Processes**	PCC	ME107402	2	1	-	100	20	30	150	3
3	Mech	**Python**	PCC	ME107403	3	-	-	100	20	30	150	3
4	Mech	**Fluid Mechanics and Machines**	PCC	ME107404	3	-	-	100	20	30	150	3
5	Mech	**Operation Research**	PCC	ME107405	3	-	-	100	20	30	150	3
6	Mech	**Kinematics of Machines Lab**	ESC	ME107491	-	-	2	25	-	25	50	1
7	Mech	**Python Lab**	PCC	ME107492	-	-	2	25	-	25	50	1
8	Mech	**Fluid Mechanics and Machines Lab**	PCC	ME107493	-	-	2	25	-	25	50	1
9	Mech	**Mini Project – II**	PSI	ME107494	-	-	2	50	-	25	75	1
10	Chemistry	**Biology for Engineers**	NC	AC100495	-	-	-	-	-	25	25	-
Total					**14**	**2**	**08**	**625**	**100**	**275**	**1000**	**20**

Note:

(a)Abbreviations used:L-Lecture,T-Tutorial,P-Practical,ESE-EndSemesterExam,CT-ClassTest,TA-Teacher'sAssessment

(b)Thedurationofendsemesterexaminationofalltheorypaperswillbeofthreehours.

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code AM100301	Applied Mathematics - III	L = 3	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objective of this course is to familiarize the prospective engineers with techniques in calculus of multivariable and infinite series expansion of continuous function as well as some statistical treatment of discrete functions. More precisely, the objectives are: 1. To instigate a thorough knowledge of partial differentialequations which arise in mathematical descriptions of situationsin engineering 2. To develop the tool of Fourier series forlearning advanced Engineering Mathematics. 3. To provide knowledge of Laplace transform ofelementaryfunctions including its propertiesand applications to solveordinarydifferentialequations. 4. To originate a thorough study about randomquantities and theirdescription in terms of theirprobability. **5.** To introduce the tools of differentiation andintegration of functions of complex variable that is used in various techniquesdealingengineering problems.	**At the end of this course, the students are expected to be able to:** **CO1:** To have a thorough knowledge of PDE which arise in mathematical descriptions of situations in Engineering. **CO2:** To make the students understand that Fourier series analysis is powerful methods where the formulas are integrals and to have knowledge of expanding periodic functions that explore variety of applications of Fourier series. **CO3:** To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differentials equations. **CO4:** To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability **CO5:** 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 includes the evaluation of both complex line integrals and real integrals. .

Unit – 1 **CO1**

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; Equation of vibrating string (wave equation). **[8 Hrs]**

Unit – 2 **CO2**

Fourier Series- Euler's formula; Functions having point of discontinuity; Change of interval; Even and odd function; Half range series; Harmonic Analysis. **[7Hrs]**

Unit – 3 **CO3**

Laplace transform: Definition; Transform of elementary functions; Properties of Laplace transform; Inverse Laplace Transform (Method of partial fraction, Using properties and Convolution theorem); Transform of Unit step function and Periodic functions; Application to the solution of ordinary differential equations. **[7Hrs]**

			1.00	Applicable for AY 2020-21 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	

Unit – 4 **CO4**

Probability distributions: Random variable; Discrete and continuous probability distributions; Mathematical expectation; Mean, Variance and Moments; Moment generating functions; Probability distribution (Binomial, Poisson and Normal distributions). **[7Hrs]**

Unit – 5 **CO5**

Complex Analysis: Analytic functions; Cauchy-Riemann equations and its applications to flow problems; Complex integration; Cauchy theorem (without proof), Cauchy Integral formula (without proof); Expansion of complex functions (Taylor's and Laurent's series); Cauchy Residue theorem (without proof) and its application in evaluation of real definite integrals. **[7Hrs]**

Text Books:

S.No.	Title	Authors	Publisher
1)	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers
2)	Advanced Engineering Mathematics	H. K. Dass	S. Chand Publication
3)	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons
4)	Applied Engineering Mathematics	Madan Mohan Singh	BS Publications
5)	Linear Algebra: A Modern Introduction	D. Poole	Brooks/Cole

Reference Books:

S.No.	Title	Authors	Publisher
1)	Calculus and Analytic geometry	G. B. Thomas and R. L. Finney	Pearson, Reprint
2)	EngineeringMathematicsforfirstyear	T. Veerarajan	Tata McGraw Hill,New Delhi
3)	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw Hill New Delhi
4)	A text book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107301	Strength of Materials	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To impart the basic concepts of stress, strain and their variations under different types of loading. 2. To provide exposure to analyze beam, shaft and spring for bending moment, shear force, shear stress, slope and deflection under different loading and support conditions.	**At the end of this course, the students are expected to be able to:** **CO1:** Apply the concept of stress and strain to analyze various types of structures. **CO2:** Determine the distribution of shear force, bending moment and transverse shear stress along the loaded beam. **CO3:** Determine the deflections and slope of loaded flexural members. **CO4:** Analyze shaft and springs under torsional load. **CO5:** Analyze various structural elements subjected to combine stresses/combined loads.

Unit – 1 **CO1**

(a) Simple stress & strain: Elasticity, Hooke's law, factor of safety, stress-strain diagram for ductile andbrittle materials, Analysis of bar of varying sections, tapered bar, composite sections, bar of uniform strength, elongation of bar due to self-weight. Thermal stresses and strains in simple and composite bars.

(b) Elastic constants: Longitudinal strain, lateral strain, Poisson's ratio, volumetric strain, bulk modulus, relation between Young's modulus and bulk modulus, complementary shear stress, relation between modulus of elasticity and modulus of rigidity. **[7 Hrs]**

Unit – 2 **CO2**

(a) S.F. and B.M. diagrams of beams: Types of loads, types of beams, SF and BM diagram for cantilever, simply supported and overhanging beams, Point of contra-flexure, relation between load, SF and BM.

(b) Bending stresses in beams: Pure bending, neutral axis, moment of resistance, bending stresses in symmetric sections, section modulus, bending equation, bending stress distribution, problems.

(c) Shear stress in beams: Shear stress at a section, shear stress distribution for rectangular, circular, I-sections and T-sections. **[9 Hrs]**

Unit – 3 **CO3**

Deflection of transversally loaded beams: Relation between slope, deflection and radius of curvature, determination of slope and deflection by Double integration method, Macaulay's method, Moment Area Method in simply supported, cantilever and overhanging beams. **[7 Hrs]**

Unit – 4 **CO4**

(a) Torsion of shafts: Shear stress in circular shaft due to torsion, torque and power transmitted by solid, hollow & stepped circular shaft, polar modulus, strength of shafts and torsional rigidity, composite shaft, shafts in series, shafts in parallel, deflection of shafts fixed at both ends, combined bending and torsion.

(b) Thin Pressure Vessel: Thin Pressure Vessels, Circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shellunder internal pressure

Thick Pressure Vessel: Introduction, Lames Theorem, Thick Pressure vessels subjected to internal pressure, External Pressure &both, compound cylinders. **[6 Hrs]**

Unit – 5 **CO5**

(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. **[7 Hrs]**

Text Books:

S.No.	Title	Authors	Publisher
1)	Elements of Strength of Material	Timoshenko & Young	EWP press
2)	Strength of Materials	Dr. Sadhu Singh	Khanna Publication
3)	Mechanics of Solids	Beer & Johnson	Tata McGraw Hill Publications

Reference Books:

S.No.	Title	Authors	Publisher
1)	Strength of Materials	R.K. Rajput	Dhanpat Rai & Sons
2)	Mechanics of Material	Gere and Timoshenko	CBS Publications
3)	Strength of Materials	R. Subramanian	Oxford University Press
4)	Strength of Material	Ryder	ELBS
5)	Introduction to Solid Mechanics	I. H. Shames	PHI

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107302	Material Science	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To impart knowledge about various kinds of Engineering Materials and their Engineering Applications. **2.** To impart an understanding of mechanical properties of materials and describe scientific reasons behind them. **3.** To impart an understanding of relating the knowledge of material science with various manufacturing processes like forming, casting etc. **4.** To impart knowledge of advantages of some important non-metals like ceramics and composites in various engineering applications.	**At the end of this course, the students are expected to be able to:** **CO1:** Explain crystal structure and Imperfection in crystal structure and define basic mechanical properties of materials & explain the theories of deformation. **CO2:** Understand the nature of dislocations and its role in the plastic deformation processes. Explain the processes of solidification of metals and effects of final grain size on mechanical properties of materials. **CO3:** Understand and interpret the phase diagrams which relates to the design and control of heat-treating processes. **CO4:** Get the knowledge about composition, properties and application of various ferrous alloys, non-ferrous metals and alloys. **CO5:** Explain mechanical and thermal properties of ceramics and various types of composites.

Unit – 1 **CO1**

The Structure of Crystalline Solids: Crystal Structures, Crystallographic Points, Directions and Planes, Crystalline and Non-Crystalline Materials.

Mechanical Properties of Material: Properties Related to Elastic Deformation (Stress-strain Behavior, An elasticity, Elastic Properties of Materials), Properties Related to Plastic Deformation (Tensile Properties, True Stress and Strain, Elastic Recovery after Plastic Deformation, Compressive, Shear and Torsional Deformations), Hardness, Toughness, Resilience etc, and Variability of Material Properties

Imperfections in Solids: Point Defects, Dislocations-Linear Defects, Interfacial Defects, Bulk or Volume Defects. **[8 Hrs]**

Unit – 2 **CO2**

Dislocations & Strengthening Mechanisms: Dislocations & Plastic Deformation (Basic Concepts, Characteristics of Dislocation, Slip Systems, Slip in Single Crystal, Plastic Deformation of Polycrystalline Material, Deformation by Twinning), Mechanisms of Strengthening in Metals (Grain-size reduction, Solid Solution Strengthening, Strain Hardening, Recovery, Recrystallization and Grain Growth).

Solidification of Metals and Alloys: Mechanism of solidification, nucleus formation and crystal growth, Homogeneous and Heterogeneous nucleation, grain boundaries, grain growth, effect of grain size on properties of metals. **[6 Hrs]**

Unit – 3 **CO3**

Phase Diagrams: Basic Concepts (Solubility Limit, Phases, Microstructure, Phase Equilibria), Unary Phase Diagrams, Binary Phase Diagrams Mechanical Properties of Isomorphous Alloys, Eutectic Systems, Development of Microstructure in Eutectic Alloys, Equilibrium Diagrams Having Intermediate Phases or Compounds, Eutectoid and Peritectic Reactions, Congruent Phase Transformations, Ceramic and Ternary Phase, Diagrams, The Gibbs Phase Rule, Iron-Carbon Phase diagram.

Development of Microstructure and Alteration of Mechanical Properties: Phase Transformations(Basic Concepts, The Kinetics of Phase Transformation, Metastable vs Equilibrium States)**,** Microstructural and Property Changes in Iron-Carbon Alloys(Isothermal Transformation Diagrams, Continuous-Cooling Transformation Diagrams, Mechanical Behavior of Iron–Carbon Alloys, Tempered Martensite).

Thermal Processing of Metals: Annealing - stress relief, spheroidising, Process and Full annealing; Normalising, Hardening, Tempering - Austempering, Martempering, Surface Hardening-Flame, Induction and Case hardening: Carburising-Pack and Gas carburizing, Nitriding, Cyaniding, Carbo-Nitriding. **[8 Hrs]**

Unit – 4 **CO4**

Ferrous Alloys: 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 and Alloys: Copper and Copper Alloys (Muntz metal, Cartridge brass, Admiralty brass, Naval Brass, Bronzes –Gun Metal, Phospher Bronze, Aluminum Bronze, Copper-Nickels alloys. Bearing metals- Babbit, Copper lead alloys, Bronze bearing alloys. Light metal alloy), Aluminum & Aluminum Alloys (Duralumin, Cast Aluminum alloys, Aluminum Silicon Alloys. Sintered Carbide). **[7 Hrs]**

Unit – 5 **CO5**

Ceramics: Ceramic Structures (Crystal Structures, Silicate Ceramics, Carbon, Imperfections in Ceramics), Mechanical Properties (Brittle Fracture of Ceramics, Stress–Strain Behavior, Mechanisms of Plastic Deformation, Influence of Porosity, Hardeness, Creep), Types and Application of Ceramics (Glasses, Glass–Ceramics, Clay Products, Refractories, Abrasives, Cements, Ceramic Biomaterials), Advanced Ceramics.

Composite Materials: Particle Reinforced Composites (Large-Particle Composites, Dispersion-Strengthened Composites), Fiber Reinforced Composites (Influence of Fiber Length Influence of Fiber Orientation and Concentration, The Fiber Phase, The Matrix Phase, Polymer-Matrix Composites, Metal-Matrix Composites, Ceramic-Matrix Composites, Carbon–Carbon Composites, Hybrid Composites), Structural Composites (Laminar Composites, Sandwich Panels, Nanocomposites). **[7 Hrs]**

Text Books:

S.No.	Title	Authors	Publisher
1)	Material Science &Engg	V. Raghavan	PHI(P) Ltd., Delhi
2)	A Text Book of Material Science & Science & Metallurgy	O.P. Khanna	Dhanpat Rai & Sons, New Delhi

Reference Books:

S.No.	Title	Authors	Publisher
1)	Elements of Material Science &Engg	Van Vlac– Addison, Wesley Longman	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)	Physical Metallurgy Principles	Robert E. – Re3ed Hill	Affiliated East-West Press Pvt. Ltd., New Delhi

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107303	Measurement, Control and Sensing Tools	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To understand the concepts in measurement and metrology. **2.** To be familiar with different sensors and transducers. **3.** To build suitable measurement technique. **4.** To have the confidence to apply automation solutions for given industrial applications. **5.** To demonstrate the ability to design and conduct experiments, interpret and analyse data, and report results. **6.** To expose the students to various sensors and transducers for measuring mechanical quantities.	**At the end of this course, the students are expected to be able to:** **CO1:** Acquire knowledge and hands-on competence in applying the concepts of measurement and metrology in the design and development of mechanical systems. **CO2:** Demonstrate creativeness in designing new systems components and processes in the field of engineering. **CO3:** Work effectively with engineering and science teams as well as with multidisciplinary designs. **CO4:** Skillfully use modern engineering tools and techniques. **CO5:** To develop concepts for mechanical engineering design, analysis and application.

Unit – 1 **CO1**

Generalized Measurement System: Introduction - Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, Units of measurement, Static and dynamic performance characteristics of measurement devices, Calibration, Concept of error, Sources of error, Statistical analysis of errors sensors and Transducers– Types of sensors, Type of transducers and their characteristics. **[7 Hrs]**

Unit – 2 **CO2**

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. **[7 Hrs]**

Unit – 3 **CO3**

Measurement of Flow: Obstruction meters, Variable head meters, Hot wire and magnetic meters, Ultrasonic flow meters. Vibration and noise measurement: Seismic instruments, Vibration pickups and decibel meters.

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. **[8 Hrs]**

Unit – 4 **CO4**

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. Principle and use of interferometry. Comparators, screw threads Measurement, Measurement of Gears tooth. Coordinate measuring machine (CMM)- need construction, types and application**[7 Hrs]**

Unit – 5 **CO5**

Sensors and Transducers

Displacement Measurement: Transducers for displacement, displacement measurement, potentiometer, LVDT, Capacitance Types, Digital Transducers (optical encoder), Nozzle Flapper Transducer

Strain Measurement: Theory of Strain Gauges, gauge factor, temperature Compensation, Bridge circuit, orientation of strain gauges for force and torque, Strain gauge-based load cells and torque sensors

Measurement of Angular Velocity: Tachometers, Tachogenerators, Digital tachometers and Stroboscopic Methods.

Acceleration Measurement: Theory of accelerometer and vibrometers, practical accelerometers, strain gauge based and piezoelectric accelerometers**[7 Hrs]**

Text Books:

S.No.	Title	Authors	Publisher
1)	Measurement Systems: Applications and Design	EO Doebelin	5th Edition,McGraw Hill

Reference Books:

S.No.	Title	Authors	Publisher
1)	Mechanical Engineering Measurements	A K Sawhney	Dhanpat Rai& Sons, New Delhi
2)	Instrumentation & Mechanical Measurements	A K Thayal	Galgotia Publications
3)	Principles of Measurement Systems	John P. Bentley	Pearson Education, 4th Edition, 2005

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107304	Thermodynamics	L = 2	T = 1	P = 0	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To introduce students to basic concepts and first laws of thermodynamics. **2.** To impart knowledge of concepts of second law of thermodynamics and entropy. **3.** To introduce students to energy and related concepts. **4.** To study about properties of real gases and mixture of ideal non-reactive gases. **5.** To provide an understanding of properties of pure substances.	**At the end of this course, the students are expected to be able to:** **CO1:** Apply basic concepts and first law of thermodynamics to analyze thermodynamics system. **CO2:** Apply the concepts of second law of thermodynamics and entropy to analyze thermodynamics system. **CO3:** Apply the concepts of energy to solve related problems. **CO4:** Explain the equations of state and thermodynamic properties of real gases and calculate properties of mixture of ideal non- reactive gases. **CO5:** Analyze processes involving pure substances.

Unit – 1 **CO1**

(a) Introduction to Engineering Thermodynamics: Thermodynamic System, properties, process, cycle, thermodynamic equilibrium, Quasi-static Process, Zeroth Law of thermodynamics. Exact& Inexact differentials. Work- Displacement work, flow work, free expansion, work done in various quasi-static process, work as a path function. Heat transfer-sensible heat, latent heat, heat as a path function.

(b) First Law of thermodynamics: Joule's experiment, internal energy as property of system, first law applied to various quasi-static process, PMMI, Limitations of the First Law, control volume, Steady flow energy equation, Applications of SFEE. **[8 Hrs]**

Unit – 2 **CO2**

(a) Second law of thermodynamics: ThermalReservoir,HeatEngine, cyclicHeat engine, Kelvin-Planck statement and Clausius Statements and their Equivalence, Refrigerator and Heat pump, COP, PMMII, reversibility and irreversibility, causes of irreversibility, Carnot cycle, reversed heat engine, Carnot theorem, corollaries of Carnot theorem, Absolute thermodynamic temperature scale.

(**b) Entropy:** Clausius theorem, the property of entropy, the inequality of Clausius, Entropy principle and its applications, Entropy change during different thermodynamic processes, entropy generation in closed system and open system, first and second law combined. **[8 Hrs]**

Unit – 3 **CO3**

Exergy: Available energy, availability and availability function of a closed system, availability and availability function of an open system, dead state, Helmholtz function, Gibbs functions, Irreversibility and Gouy-StodolaTheorem, Second law efficiency. **[6 Hrs]**

Unit – 4 **CO3**

Steam Generators: Types of Boilers, Classification of boiler and working.

Properties of Pure substances: Thermodynamic properties of pure substances in solid, liquid and vapor 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 vapor, use of steam tables and Mollier diagram in determination of steam properties, energy interaction and Entropy calculations, measurement of steam quality. **[7 Hrs]**

Unit – 5 **CO3**

Cycles: Gas power cycles: Otto, Diesel, limited pressure cycle. Comparison

Vapour Power Cycle: Rankine cycle, ideal Rankine cycles, reheat cycle, regenerative cycle. Refrigerationcycle, reverseCarnot cycle.**[7 Hrs]**

Text Books:

S.No.	Title	Authors	Publisher
1)	Thermodynamics - An Engineering Approach	Cengal& Boles	McGraw Hill
2)	Engineering Thermodynamics	P.K. Nag	TMH

Reference Books:

S.No.	Title	Authors	Publisher
1)	Fundamental of engineering thermodynamics	R.Yadav	CPH
2)	Thermal Science & Engineering	D.S. Kumar	S.K. Kataria& Sons
3)	Fundamental of Thermodynamics	Claus Borgnakke, Richard E. Sonntag	Wiley
4)	An Introduction to Thermodynamics	Y.V.C. Rao	University Press
5)	Engineering Thermodynamics	M. Achuthan	PHI
6)	Thermodynamics & Thermal Engineering	J. SelwinRajadurai	New Age

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107391	Machine Drawing and Computer Graphics Lab	L = 0	T = 0	P = 4	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	40	--	20	60	

COURSE OBJECTIVES	COURSE OUTCOMES
Mendel drafting is now being replaced by a highly accurate and efficient computer aided drafting so it is essential for an engineer to be proficient in utilizing these modern engineering tools. The objective of this course is to teach the basic command and tools necessary to create and manipulate geometric models using CAD software systems with an aim to in CU late employability skills and prepare that candidate for new highly competitive working area.	**At the end of this course, the students are expected to be able to:** **CO1:** Describe the basic concept of drafting software and able to create drawing using software tools. **CO2:** Understand the importance of the linking functional and visualization aspects in the preparation of the part drawings. **CO3:** Modify the geometry dimensions the views and create drawing using layers commands. **CO4:** Convert orthographic view into isometric view and vice-versa using drafting software. **CO5:** Preparation of the part or assembly drawings as per the conventions.

List of Experiments

At least 10 experiments are to be performed by each students

1. General introduction of GUI
2. Setting up the drawing environment: Drawing aids units, setting grid, setting limits, functional key objective snap.
3. Using co-ordinate system Cartesian, polar coordinates (Absolute and relative coordinates direct distance entry methods).
4. Drawing object-Use of various draw tools with illustrative exercise.
5. Modifying objects uses of various modify tools with illustrate exercise.
6. Creating texts and tables.
7. Basic dimensioning, Geometric dimensioning and tolerance.
8. Adding constraints to sketches.
9. Advanced options for making complicated drawing – 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.

Course Delivery:-

The Course will be delivered through lectures in lab and Demonstration and CAD practice. This Lab can be performed using ANY ONE of following software's:

1. Solid edge
2. CATIA
3. CREO
4. Solid Works
5. INVENTOR

Any equivalent or open source software's

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107392	Material Testing Lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	40	--	20	60	

COURSE OBJECTIVES	COURSE OUTCOMES
This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials, and to develop report writing proficiency	**At the end of this course, the students are expected to be able to:** **CO1:** Analyze mechanical properties of various engineering materials under a specific type of load in universal testing machine. **CO2:** Analyze mechanical properties of engineering Materials under impact loading. **CO3:** Analyze mechanical properties of specimen under torsion (Torsion Testing Machine, Spring Testing Machine). **CO4:** Determine hardness of given material. **CO5:**Analyze mechanical properties of specimen under Fatigue, deep drawing and buckling load.

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

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME107393	Measurement Control and Sensing Tools Lab	L = 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	40	--	20	60	

COURSE OBJECTIVES	COURSE OUTCOMES
1. To expose students to real world measurement equipment. 2. To learn operation of various measurement equipment. 3. To expose students to real world metrology equipment. 4. To learn operation of various measurement equipment. 5. To provide students with the necessary skills for calibration and testing of different gauges and instruments.	On successful completion of the course, the student will be able to: 1. Identify different mechanical measurement and metrological instruments. 2. Describe the working of different mechanical measurement and metrological instruments. 3. Conduct experiments, observe, interpret data and report results of pressure, displacement, temperature, flow rate, angle, torque and strain measurement instruments. 4. Conduct experiments, observe, interpret data and report results of heights, lengths, diameter, various angles, accuracies in electrical and optical comparator, surface flatnessand contour etc using various types of metrological instruments. 5. Calibrate Vernier calipers, micrometer, height gauge, depth micrometer using slip gauge.

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

1. Measurement of Pressure Using Bourdon PressureGauge.
2. Calibration of Pressure Gauge Using Dead Weight Pressure Gauge Tester.
3. Measurement of Displacement UsingLVDT.
4. Measurement of Temperature UsingThermistor.
5. Measurement of Flow Rate Using Rotameter.
6. Measurement of Angle Using Angular Sensor.
7. Measurement of Torque Using Torque Transducer.
8. Measurement of Pressure Using PressureTransducer.
9. Measurement of Strain Using Strain CantileverBeam.
10. Measurement of Temperature UsingRTD.
11. Measurement of Temperature Using Thermocouple.
12. Measurement of Temperature byThermocouple.
13. Experimentation using Data AcquisitionSystem.

Minimum Three experiments to be performed from the following group

1. Characteristics of (Resistive and Thermoemf) temperature sensor
2. Characteristics of Piezoelectric measurement system
3. Measurement of displacement using LVDT
4. Characteristics of Hall effect sensor
5. Measurement of strain using strain gauges
6. Measurement of torque using Strain gauges
7. Measurement using proximity sensors
8. Characteristics of capacitive measurement systems
9. Loading effects of Potentiometer
10. Design of Opto-coupler using photoelectric transducers
11. Characteristics of Micro pressure and Micro accelerometer sensing device
12. Study of speed measuring devices and Gyroscope

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code ME100395	**Health, Hygiene and Yoga**	**L = 0**	**T = 0**	**P = 2**	**Credits = 1**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	---	--	25	25	---

COURSE OBJECTIVES	COURSE OUTCOMES
▪ To provide understanding and significance of good health ▪ To provide insight into the hygiene aspect and quality of lifestyle ▪ To study the concepts of various medicinal therapy ▪ To practice different types of yogasan, pranayama and meditation ▪ To provide knowledge about common diseases and its cure through yogasan and pranayama ▪ To inculcate the significance of social and communal health welfare	On successful completion of the course, the student will be able to: ▪ Demonstrate a better understanding about mental and physical health for human life ▪ Understand the correlation of mental and physical health with hygiene and yoga ▪ Demonstrate the understanding about the health hazards resulting due to improper lifestyle ▪ Display understanding about eminent yogis and primary texts on yoga ▪ Apply different techniques of yoga and pranayama to counter various lifestyle issues ▪ Understand the value of health, hygiene and yoga for society welfare

UNIT – I

(A) Health:

- **Concept of Health – Physical and Mental Health and Wellbeing**
- **Meaning and definition of Health according to WHO and Ayurveda Charaksamhita**
- **Primary Health Care – Food, Nutrition and Cleanliness**
- **Human Psychology and Health Consciousness**

(B) Hygiene:

- **Meaning, definition and importance of Hygiene in life**
- **Types of Hygiene and general rules for Hygiene and Cleanliness**
- **Ayurveda: Ayurveda, Vata, Pitta and Cough**

UNIT – II

(A) Medicinal Cure:

- **Introduction and basic concepts of common streams of medicinal cure**
- **Introductory knowledge about modes of operation of Alopathy, Ayurveda, Homoeopathy, Bio-chemic, Unani, Siddha, Acupressure, Acupuncture and Naturopathy**
- **Introduction of Anatomy and Physiology concerned**

(B) Occupational Health:

- **Diseases and their occupational relevance, risk factors for deficiency diseases**
- **Drugs, Tobacco, Alcohol and Food intoxication: chemical agents, side effects and control measures**
- **Stress, anxiety, depression and emotional imbalance – causes and prevention**

(C) Modern Silent Killers:

- **High blood pressure, diabetes and cancer – causes and cure**
- **Common health problems due to stomach disorders such as indigestion, acidity, etc.**

UNIT – III

(A) Yogasans:

- **Meaning, concept and importance of Yoga for healthy life**
- **Yogasans and its mode of operation, Prone and Supine Posture**
- **Common Yogasans such as Bhujangasan, Halasan, Padmaasan, Sarvangasan, Shavasan, Surya Namaskar, Utshep Mudra, Vajrasan, Jal-Neti, etc.**
- **Asans for Brain: Shirshpadasan, Shashankasan**
- **Asans for Eye Sight: Tratak, Neti-Kriya**

(B) Yogis and Yogic Texts:

- **Ashtang yoga from Patanjali Yoga Sutra**
- **Somantic and Psychosomatic from YogVashishth**
- **BhagwadGeeta**
- **Basic knowledge of Shat Darshan**

UNIT – IV

(A) Pranayama:

- **Definition, concept and types of Pranayama**
- **NadiShodhan, AnulomVilom, Bhastrika, Bhramari, Shitakari, etc.**
- **Usefulness of Pranayama for students**
- **Introduction to Kumbhak**

(B) Meditation:

- **Basic concept of Meditation**
- **Concentration of mind: Dhyan**
- **Concentration on breath; Japa, Ajapajap, Internal Silence**
- **Concentration on point of light, Concentration on feeling, Concentration on figure**
- **Visualization in mental sky**

UNIT – V

Social Awareness and Community Health:

- **NSS / NCC activities for society and nation**
- **Health and family welfare**
- **Nutrition and welfare programmes for childs, elders and divyangs**
- **Blood Donation and health check-up campaign**
- **Green environment campaign - Plantation**
- **Co-management of HIV and TB diseases**
- **Gender Equity and National Integrity**
- **Natural calamities and Disaster Management**
- **Road safety awareness, Swachhataa awareness, etc.**

Text Books:	*Reference Books:*
1. *Health, Hygiene & Yoga; Dr P. B. Deshmukh; Gyan Book Private Ltd. New Delhi.* 2. *Health, Hygiene and Yoga; Dr. Manju Shukla; Gyan Bharti Publications, New Delhi.*	1. *Yogic MateriaMedica.* 2. *Asan, Pranayama Mudrabandha; Swami SatyanandaSaraswati; Yoga Publication Trust, Munger (Bihar).* 3. *Fundamentals of Yogic Practices - A Complete Guide on Yoga; Shrikant, R. Kushwah, Y. Kushwah; Khel Sahitya Kendra, Delhi.*

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SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

B.Tech (Mechanical Engineering) -Third Semester

Subject Code IT100396	CYBER LAWS & ETHICS	L	T	P	Credits = 0
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	-	-	25	25	--

Course Objectives	Course Outcomes
1. To explore brief idea about the CYBER LAWS. 2. To get the basic idea about IT ACT. 3. Awareness about ecommerce and related cyber laws. 4. Awareness regarding Trademarks, Copyrights and Patents. 5. Awareness regarding Cyber Ethics.	**After the completion of course, student will be** **CO 1**. Understand Cyber laws **CO 2**. Understand IT Act. **CO 3**. Describe Information Technology act and Related Legislation. **CO 4**. Demonstrate Electronic business and legal issues. **CO 5**. Interpret Cyber Ethics.

UNIT – I: Introduction to Cyber law: CO 1

Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, CyberspaceWeb space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT – II: Information Technology Act: CO 2

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT – III: Cyber law and Related Legislation: CO 3

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code.

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B.Tech (Mechanical Engineering) -Third Semester

Subject Code (IT100396)	**CYBER LAWS & ETHICS**	**L**	**T**	**P**	**Credits = 0**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	-	**-**	**25**	**25**	**--**

UNIT – IV: Electronic Business and legal issues:CO 4

Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

UNIT-V: Cyber Ethics:CO 5

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics

Text Books:

S. No.	**Title**	**Authors**	**Publisher**
1)	Cyber Laws: Intellectual property & E Commerce, Security	Kumar K	dominant Publisher
2)	Cyber Ethics 4.0, Christoph Stuckelberger	Pavan Duggal	Globethic
3)	Information Security policy & Implementation Issues	NIIT	PHI
4)	Computers, Internet and New Technology Laws	Karnika Seth	Lexis Nexis Butterworths Wadhwa Nagpur

Reference Books:

S. No.	**Title**	**Authors**	**Publisher**
1)	Legal Dimensions of Cyber Space	Verma S, K, Mittal Raman	Indian Law Institute, New Delhi
2)	Cyber Law	JonthanRosenoer	Springer, New York, (1997)
3)	The Information Technology Act 2005	A Handbook	OUP Sudhir Naib,, New York, (2011)
4)	Information Technology Act, 2000	S. R. Bhansali	University Book House Pvt. Ltd., Jaipur (2003)
5)	Cyber Crimes and Law Enforcement	Vasu Deva	Commonwealth Publishers, New Delhi, (2003)

			1.00	Applicable for AY 2020-21 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	