Vision of the Institution

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

Mission of the Institution

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

Vision of Mechanical Engineering Department

To foster prosperity through technological development by means of education, innovation and collaborative research.

Mission of Mechanical Engineering Department

- To produce effective and responsible graduate and post-graduate engineers for global requirements by imparting quality education.
- To improve the Department's infrastructure to facilitate research productivity and success.
- To integrate teaching and research for preservation and effective application of knowledge and skills.
- To strengthen and expand collaboration and partnerships with industry and other organizations.
- To provide consultancy to the neighborhood and inculcate a spirit of entrepreneurship.
- To serve society through innovation and excellence in teaching and research.

Program Educational Objectives(PEOs)

PEO1: Graduates apply a deep working knowledge of technical fundamentals in areas such as Design, Thermal, Production, Industrial and related fields to address needs of the customer and society.

PEO2: Graduates pursue advanced education, Research and Development in Engineering, Technology and other professional careers.

PEO3: Perform themselves in a responsible, professional and ethical manner.

PEO4: Graduates participate as leaders in their fields of specialization and in activities that contribute to service and overall economic development of society.

Program Outcomes(POs) of Mechanical Engineering Department

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO's):

PSO1: Able to apply the knowledge learned as a part of the curriculum to provide solutions for problems related to Mechanical Engineering.

PS**O**2: Think innovatively, design and develop products with modern CAD/CAM tools and with optimized manufacturing processes.

II-Year II-Semester

S.No	Course Title	L	T	P	C
1	Instrumentation and Metrology	3	-	-	3
2	Fluid Mechanics and Hydraulic Machines	3	-	-	3
3	Mechanics of Solids	3	-	-	3
4	Applied Thermodynamics	3	-	-	3
5	Kinematics of Machinery	3	-	-	3
6	Instrumentation and Metrology Lab	-	-	3	1.5
7	Fluid Mechanics and Hydraulic Machines Lab	-	-	3	1.5
8	Mechanics of Solids Lab	-	-	3	1.5
9	Applied Thermodynamics Lab	-	-	3	1.5
10	Business English Communication Lab	-	-	3	1.5
11	Innovative Idea Project	-	-	3	1.5
	Total	15	-	18	24

Course Name	**INSTRUMENTATION AND METROLOGY**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	3	0	0	3

COURSE OBJECTIVES:

- To understand the measurement systems and its performance.
- To acquire knowledge about various measuring equipments.
- Design of part, tolerances and fits &Evaluation and inspection of surface Inspection of engineering parts and gears with various precision instruments roughness.
- Concept of interference of light and working of interferometers.
- The working of CMM and importance of X-ray computer tomography in non-destructive testing.

UNIT I

Measurement systems and performance: Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples, dynamic performance characteristics –classification and elimination of errors, calibration.

Measurement of Displacement: Transducers-Piezo electric, Inductive, capacitance, resistance transducers, Photo conductive cell, optical encoder

Measurement of Speed: Tachogenerator – Stroboscope

UNIT II

Measurement of Temperature: Bimetallic strip thermometer-Thermocouple - Resistance Thermometer – Thermistor – Optical Pyrometer

Measurement of Pressure: Bourdon pressure gauge– Diaphragm gauges – McLeod pressure gauge - Pirani thermal conductivity gauge – Ionization pressure gauge

Flow Measurement: Rotameter, Magnetic flow meter, Ultrasonic flow meter

UNIT III

Measurement of Acceleration and Vibration: Seismometer – Laser Doppler Vibrometer and Accelerometer

Stress Strain Measurements: Concept of Electrical resistance strain gauge- method of usage of resistance strain gauge for bending compressive and tensile strains –Strain gauge Rosettes.

Measurement of Force, Torque and Power: Hydraulic load cell, Strain gauge load cell, Strain gauge torsion meter, Hydraulic dynamometer, Eddy current dynamometer

UNIT IV

INTRODUCTION TO MEASUREMENTS-LINEAR, ANGULAR

Introduction, nominal size, tolerance, limits, deviations, fits -Unilateral and bilateral tolerance system, hole and shaft basis systems, slip gauges, dial indicators, micrometers, sine bar, bevel protractor, spirit levels, angle dekkor, limit gauges-Taylor's principle

UNIT V

FORM MEASUREMENT, OPTICAL & INTERFEROMETRY

Form measurement – Measurement of tooth thickness – gear tooth vernier - Tools maker's

microscope- autocollimators - Interference of light, Michelson's interferometer, NPL flatness interferometer, and NPL gauge interferometer. Comparators – mechanical & pneumatic

SURFACE ROUGHNESS MEASUREMENT: Surface roughness and surface waviness– Numerical assessment of surface finish- CLA, R.M.S. Rz, R10 values, Method of measurement of surface finish ,Talysurf, ISI symbols for indication of surface finish.

UNIT VI

RECENT ADVANCEMENT AND DEVELOPMENT METROLOGY

Laser Metrology: Precision instrument based on laser – Principle – Application of Laser – Laser interferometer - Applications in linear measurement and angular measurement

Coordinate Measuring Machine (CMM) – construction- Applications of CMM - Inspection by computer aided- X-ray computed tomography (CT)–principle- Applications.

COURSE OUTCOMES:

1. Describe the working principle of strain gauges and possess knowledge about various measuring instruments.
2. Evaluate the performance of a measuring systems.
3. Understand the standards of length, angles and evaluation of surface finish with various comparators.
4. Understand the concept of interference by interferometers and Choose appropriate method for inspection of various gear elements and thread elements
5. Understand the principle and applications of laser in linear, angular measurements and dimensional metrology.

TEXT BOOKS:

1. D.S Kumar, Measurement Systems Applications & design, Metropolitan Book Co. (P) Ltd, 5th edition, 2015.
2. Mahajan, Engineering Metrology, DhanpatRai Publishers, 1st edition, 2012.
3. R.K.Jain, Engineering Metrology, Khanna Publishers, 1st edition, 2018.

REFERENCE BOOKS:

1. R.K. Jain, Mechanical and Industrial Measurements, Khanna Publishers, 1st edition, 1995.
2. I.C.Gupta, Engineering Metrology, DhanpatRai Publishers, 1st edition, 2018.
3. Connie Dotson, Dimensional Metrology, Cengage Learning, 1st edition, 2016.
4. Doeblin Earnest, Measurement systems Application and design , O. Adaptation, TMH, 6th edition, 2017.

Course Name	**FLUID MECHANICS AND HYDRAULIC MACHINES**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of physical properties and their significance.
- To distinguish different types of flows for better understanding of flow regimes
- To understand the concept of boundary layer phenomenon in different conditions and to Interpret the concepts of flow measurements and flow through pipes
- To understand the basic concepts of turbo machinery and to apply the impulse momentum and angular momentum principles to different types of vanes of turbo machinery.
- To understand the fundamental concepts of hydraulic turbines and their design
- To understand the fundamental concepts of pumps and their design

UNIT-I

FLUID STATICS: Units and dimensions, Properties of fluids- density, specific volume, specific gravity, viscosity, compressibility, surface tension, vapor pressure and their influence on fluid motion, Newton's law of viscosity, measurement of pressure- Piezometer, U-tube and differential manometers, Pascal's law, Hydrostatic law, Buoyancy and flotation: Meta center, stability of floating body, Submerged bodies, Calculation of meta center height.

UNIT-II

FLUID KINEMATICS: Stream line, path line and streak lines and stream tube, Classification of flows-steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational, compressible, incompressible, free vortex, forced vortex, Equation of continuity for one, two and three dimensional flows

FLUID DYNAMICS: Surface and body forces-Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

Measurements of flows: Pitot tube, Venturimeter, Orifice meter and Turbine flow meter.

UNIT-III

BOUNDARY LAYER CONCEPTS: Flow over a Flat Plate- Displacement Thickness, Momentum Thickness and Energy Thickness- Laminar and Turbulent boundary layers (No derivation) – boundary layer in transition - Laminar Sub-Layer- Boundary Layer Separation

CLOSED CONDUIT FLOW: Reynold's experiment- Darcy Weisbach equation, Moody's diagram, Minor losses in pipes, Pipes in series and pipes in parallel- total energy line-hydraulic gradient line-power transmission through pipelines

DIMENSIONAL ANALYSIS: Similitude, Modeling, Dimensionless numbers

UNIT-IV

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes- jet striking centrally and at tip- velocity diagrams at inlet and outlet- work done and efficiency-Angular momentum principle-flow over radial vanes

UNIT-V

HYDRAULIC TURBINES: Classification of turbines- Pelton wheel turbine, Francis turbine and Kaplan turbine-working principle, work done, efficiencies, Draft tube theory- functions and efficiency

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT-VI

CENTRIFUGAL PUMPS: Classification ,working - work done – manomertic head- losses and efficiencies-specific speed-pumps in series and parallel- performance characteristic curves, NPSH, cavitation.

RECIPROCATING PUMPS: Main component parts and working - discharge and slip-Indicator diagrams

COURSE OUTCOMES:

At the end of course students will be able to:

- Understand the physical properties of fluids and its units.
- Understand the types of flows and flow regimes.
- Apply the knowledge of boundary layer to different conditions of flows in the fluid streams and determine minor and major head losses for viscous flows through pipes.
- Draw velocity diagrams for stationary, moving and inclined cases of flat and curved blades of turbo machinery.
- Select type of turbine to be best suitable for the purpose.
- Use proper types of pumps according to the requirement.

TEXT BOOKS:

1. P.N. Modi and S.M.Seth, Hydraulics, fluid mechanics and Hydraulic Machinery, Standard Book Company, 21st Edition, 2018.
2. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 10thEd 2018.

REFERENCE BOOKS:

1. Frank White, Fluid Mechanics, McGraw-Hill, 8th Ed, 2015.
2. S.Ramamrutham, Hydraulics Fluid Mechanics and Fluid Machines, DhanpatRai, 9thEdition, 2014.

Course Name	**MECHANICS OF SOLIDS**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	3	0	0	3

COURSE OBJECTIVES:

- To provide the basic concepts and principles of mechanics of solids.
- Understand the principles of Mechanics, Stress and Strain, principal stresses applied to solid structural members under different types of loads.
- To give an ability to calculate stresses and deformations of objects under bending, shear and torsion loadings.

UNIT I

Simple Stresses & Strains: Elasticity and plasticity–Types of stresses & strains – Hooke‘s law–stress–strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson‘s ratio & volumetric strain –Elastic module& the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Strain energy –Resilience–Gradual, sudden, impact and shock loadings.

UNIT II

Shear Force and Bending Moment: Definition of beam–Types of beams–Concept ofshear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT III

Flexural Stresses : Theory of simple bending–Assumptions–Derivation of bending equation: M/I = f/y =E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula–Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT IV

Principal Stresses and Strains: Introduction–Stresses on an inclined section of a bar under axial loading –compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr‘s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Introduction to Columns and Struts: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of

Euler’s Formula, Rankine’s Formula.

UNIT V

Torsion of Circular Shafts: Theory of pure torsion–Derivation of Torsion equations: $T/J=\tau/r = C\Theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

UNIT VI

Thin Cylinders: Thin seamless cylindrical shells–Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders– Thin spherical shells.

Thick Cylinders: Lame's equation – cylinders subjected to inside & outside pressures – compound cylinders.

COURSE OUTCOMES:

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

- Student will know the basic terms like stress, strain, thermal stress, principal stresses, Strain energy, poissons ratio…etc and how these parameters varying across the uniform and varying sections, composite bars, and relation between elastic constants.
- Students can draw the SF and BM diagrams for various beams at different loading conditions.
- Students will get concept of Theory of simple bending and will able to determine flexural stresses, shear stresses and section modulus of rectangular, circular, triangular, I, T angle sections.
- Students will able calculate stresses on inclined planes, principle stresses and importance of Mohr's circle in finding principle stresses.
- Students will able to calculate shear stress induced in circular shafts subjected to torsion. Also will know how shafts behave when subjected to combined bending and torsional moment.
- Students can differentiate between Thick cylinders and Thin cylinders. And also will identify when and how a cylinder fails subjected to internal and external pressures.

TEXT BOOKS:

1. Egor P .Popov, Engineering Mechanics of Solids, PHI, 2nd Edition, 2015.
2. R. K. Bansal, Strength of Materials (Mechanics of Solids), Laxmi Publication, 6thEdition, 2015.

REFERENCE BOOKS:

1. Stephen Timoshenko, Strength of Materials, CBS, 3rd Edition, 2002.
2. S.Ramamrutham, Strength of Materials,DhanapatRai,16th Edition, 2011
3. B.C.Punmia, Mechanics of Materials, Laxmi Publications, 10th Edition, 2019.
4. R.K Rajput, Strength of Materials, S. Chand, 7th Edition, 2018.
5. Strength of Materials, S.S.Rattan, 2nd Edition, Tata McGraw Hill, 2011.

Course Name	**APPLIED THERMODYNAMICS**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	3	0	0	3

COURSE OBJECTIVES:

- To study different types of IC engines, working &their performances.
- To learn about Alternate Fuels and Electric vehicles
- Understand the Rankine cycle, working of different boilers and their mountings & accessories.
- To learn about steam nozzles and condensers, and their performance.
- To analyze the performance of steam turbines.

UNIT I

Introduction: Introduction to IC engines, Working principles of 4-Stroke and 2-Stroke Spark Ignition and Compression Ignition Engines, Differences between 2-s and 4-s cycle engines, Differences between SI and CI engines, effect of operating variables, comparison of air standard and actual cycles, effect of time loss, heat loss and exhaust loss in Petrol and Diesel engines.

Engine Testing and Performance: Introduction, Parameters of performance-measurement of cylinder pressure, Measurement of Fuel consumption, Air intake, Brake power, Determination of Frictional power and Indicated power, Performance tests, Heat Balance sheet.

UNIT II

Combustion in SI and CI Engines: Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, Fuels for SI and CI engine, important qualities of IC engine fuels, rating of fuelsStages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine.

UNIT III

Alternate Fuels: Need for Alternate fuels, Desirable Characteristics of good Alternate Fuel,

Bio-diesels: Base materials used for production of Bio Diesel (Karanji oil, Neemoil, Sunflower oil, Soyabeen oil, Musturd oil, Palm oil, Jatropha seeds, Algae). Preparation of Bio-Diesel. Properties Diesel blended with vegetable oil, and difference in performance of Engine.

Alternate Vehicles: Electrical vehicles: History of EVs, EV system, components of EV-DC and AC electric machines: Introduction and basic structure-Electric vehicle drive train-advantages and limitations, Permanent magnet and switched reluctance motors.

UNIT IV

Basic Concepts: Rankine cycle -Schematic layout, Thermodynamic Analysis, Methods to improve cycle performance; Regeneration and Reheating.

Boilers: Classification–Working principle of critical boiler with sketches – Mountings and Accessories – Boiler horse power, – Draught, classification – Height of chimney for given

draught and discharge, condition for maximum discharge, efficiency of chimney.

UNIT V

Steam Nozzles : Function of nozzle, applications and types, Flow through nozzles, thermodynamic analysis –velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape- Super saturated flow and its effects, degree of super saturation and degree of under cooling - Wilson line.

UNIT VI

Steam Turbines: Classification–Impulse, reaction turbine; Mechanical details–Velocity diagram–effect of friction – power developed, axial thrust, blade efficiency – condition for maximum efficiency. De-Laval Turbine - its features. Compounding of steam turbines.combined velocity diagram for a impulse turbine.

Steam Condensers: Requirements of steam condensing plant–Classification of condensers–working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects.

COURSE OUTCOMES:

After completing this course, the students will able to

1. Understand the types of IC engines, working and their performance.
2. Understand the combustion process in IC Engines.
3. Understand the different Alternate Fuels and the working of Electrical vehicles
4. Analyze Rankine cycle and the importance of steam boilers in power plants.
5. Understand the various types of steam nozzles and their performance.
6. Analyze the performance of steam turbines.

TEXT BOOK:

1. V Ganesan, Internal Combustion Engines, McGraw-Hill, 4th Ed, 2017.
2. R.K. Rajput, Applied Thermodynamics, Lakshmi Publications, 2nd Ed, 2016.
3. MehrdadEhsani, YaminGio, Ali Emadi, Modern Electric, Hybrid Electric, and Fuel CellVehicles, Fundamentals, Theory, and Design, Standards media, 2nd Edition, 2009.

REFERENCE BOOKS:

1. Mahesh M. Rathore, Thermal Engineering, McGraw-Hill, 1st Edition, 2010.
2. PK Nag, Engineering Thermodynamics, TMH, 6th Edition, 2017.
3. Seth Leitman and Bob Brant, Build your own electric vehicle, McGraw Hill Co., 2nd Edition, 2009.
4. R. Yadav, Thermodynamics and Heat Engines, Central Book Depot, 1stEdition, 2003.

Course Name	**KINEMATICS OF MACHINERY**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	3	0	0	3

COURSE OBJECTIVES:

- Understand mechanisms for motion transmission.
- To analyze Steering gear mechanisms and to understand the working principles in power drives.
- Understand the principles in analyzing the assembly with respect to the displacement, velocity and acceleration at any point in a link of a mechanism.
- Able to design cams and followers and understand the relative motion between them.
- To understand the basic concepts, terminologies and kinematics of gears and gear trains.

UNIT I

Mechanisms: Elements or Links–Classification–Rigid Link, flexible and fluid link–Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

Machines: Mechanism and machines–classification of machines–kinematic chain–inversion of mechanism– inversions of quadric cycle, chain – single and double slider crank chains.

UNIT II

StraightLline Motion Mechanisms: Exact and approximate copiers and generated types– Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Steering Mechanism: Conditions for correct steering– Davis Steering gear, Ackerman's steering gear –velocity ratio.

Hooke's Joint: Single and double Hooke's joint –Universal coupling–application–Problems

UNIT III

Kinematics: Velocity and acceleration–Motion of link in machine–Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Klein's construction, Carioles acceleration, determination of Carioles component of acceleration.

Plane Motion of Body: Instantaneous center of rotation – relative motion between two bodies – Three centre's in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT IV

Cams: Definitions of cam and followers–their uses–Types of followers and cams– Terminology–Types of follower motion – Uniform velocity – Simple harmonic motion and

uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases

Analysis of Motion of Followers: Roller follower – circular cam with straight and convex flanks.

UNIT V

Gears: Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Forms of teeth: Cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

UNIT VI

Gear Trains: Introduction–Train value–Types–Simple and reverted wheel train–epicyclic gear train. Methods of finding train value or velocity ratio – Epicyclic gear trains.

Selection of gear box-Differential gear for an automobile

COURSE OUTCOMES:

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

1. Describe the principles of kinematics, kinematic pairs, links, and their classification, degrees of freedom, simple mechanisms, and inversions.
2. Interpret different concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and universal joint.
3. Analyze the planar mechanisms for position, velocity and acceleration.
4. Construct cam profiles for various follower motions.
5. Understand the applications of different types of toothed gears and interference between the gears.
6. Gain knowledge about various gear trains, their applications and the effect of torque on the functioning of gear trains.

TEXTBOOKS:

1. Thomas Bevan, Theory of Machines, CBS, 3rd Ed, 2009.
2. Rattan .S.S, Theory of machines, TMH, 4th edition, 2014.

REFERENCE BOOKS:

1. R.K Bansal, Theory of Machines, Lakshmi Publications, 5th edition, 2012.
2. R.S Khurmi& J.K Gupta, Theory of Machines, S Chand, 14th edition, 2005.

Course Name	**INSTRUMENTATION AND METROLOGY LAB**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

COURSE OBJECTIVES:

- The Metrology and instrumentation Laboratory course is designed for measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements.
- The student can learn the measurements with and calibration of instruments.
- They also understand the machine tool alignment test.
- Instrumentation lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

  Note: The students have to conduct at least 8 experiments from each lab.

INSTRUMENTATION LAB

1. Calibration of pressure gauge.
2. Study and calibration of thermistor.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Study and calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a rotameter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.

METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers, vernier height guage.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
4. Thread inspection of pitch, depth, angle bytool maker's microscope.
5. Use of gear tooth vernier caliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear
6. Use of spirit level in finding the straightness of a bed and flatness of a surface.
7. Surface roughness measurement with roughness measuring instrument
8. Machine tool alignment test on the lathe.

9. Machine tool alignment test on drilling machine.
10. Machine tool alignment test on milling machine.

COURSE OUTCOMES:

Metrology Lab:

Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc)

Instrumentation Lab:

Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.

Course Name	**FLUID MECHANICS AND HYDRAULIC MACHINES LAB**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

COURSE OBJECTIVES:

- Measure the losses in pipes and coefficient of discharge using Venturimeter and orifice meter.
- To verify Bernoulli's theorem.
- Apply the impulse momentum equation and determine the force exerted by jet on vanes.
- Study the performance of hydraulic machines viz. turbines and pumps.

EXPERIMENTS:

Minimum of 10 experiments needs to be performed

1. Calibration of Venturimeter.
2. Calibration of Orificemeter.
3. Determination of friction factor for a given pipeline.
4. Determination of loss of head due to sudden contraction in a pipeline.
5. Verification of Bernoulli's theorem
6. Impact of jet on Vanes.
7. Performance Test on Pelton Wheel Turbines.
8. Performance Test on Francis Turbine.
9. Performance Test on Kaplan Turbine.
10. Performance Test on Single Stage Centrifugal Pump.
11. Performance Test on Multi Stage Centrifugal Pump.
12. Performance Test on Reciprocating Pump.

COURSE OUTCOMES:

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

1. Estimate minor and major losses in the pipelines.
2. Measure the coefficient of discharge of a flow measuring devices.
3. Evaluate the performance of centrifugal pumps, reciprocating pumps and hydraulic turbines
4. Evaluate the force exerted by a jet on different vanes.

Course Name	**MECHANICS OF SOLIDS LAB**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

COURSE OBJECTIVES:

- Calculate the various Mechanical properties of materials
- Determine compressive and strength of material
- Determine Elastic Constants of material by basic principles
- Determine Rigidity modulus of material by basic principles
- Perform hardness test to find the hardness of given material
- Perform impact test to find the toughness of given material

LIST OF EXPERIMENTS:

Any 10 experiments from the list given below

1. Direct tension test
2. Compression test on cube
3. Punch shear test
4. Torsion test
5. Test on springs
6. Brinell‘s hardness test
7. Rockwell hardness test
8. Vickers hardness test
9. Charpy Impact test
10. Izod Impact test
11. Simply supported beam
12. Cantilever beam

COURSE OUTCOMES:

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

- Perform tensile test to determine tensile strength and modulus of elasticity of a given material
- Determine the compressive and shear strength of given material.
- Perform torsion test and determine the rigidity modulus of given specimen
- Determine the stiffness and rigidity modulus of given spring.
- Determine hardness number of given material
- Find the toughness of given material
- Determine the deflection and modulus of elasticity of given beam material

Course Name	**APPLIED THERMODYNAMICS LAB**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

COURSE OBJECTIVES:

- Interpret the basic concepts in the area of IC engines and other power input devices of thermal engineering field
- Evaluate the performance of various types of petrol, diesel engines and reciprocating air compressor
- To study the boilers used in steam turbines and locomotives

EXPERIMENTS:

Any 10 experiments from the list given below

1. Valve Timing Diagram of a four stroke Engine & Port timing diagram of a two stroke Engine
2. Preparation of Bio diesel
3. Estimation of given fuel properties, carbon content and the calorific value
4. Performance test on 4 stroke diesel engine.
5. Performance test on4 stroke CI engine with Bio-diesel.
6. Performance Test on 4 -Stroke SI engines
7. Heat Balance Sheet on 4 stroke CI engine.
8. Exhaust gas emission measurements of 4-stroke petrol engine
9. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.
10. Determination of FP by retardation test on IC engine.
11. Determination of FP by motoring test on IC engine.
12. Performance test on variable compression ratio engines.
13. Performance test on reciprocating air compressor unit.
14. Study of Boilers
15. Dis-assembly / Assembly of Engines.

COURSE OUTCOMES:

At the end of course students will be able to:

- Evaluate performance of petrol and diesel engines at different operating conditions
- Determine the performance of air compressors
- Discuss the different types of boilers
- Draw Valve Timing and Port timing diagrams of an IC engine.
- Estimate the given fuel properties.

Course Name	**BUSINESS ENGLISH COMMUNICATION LAB**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

COURSE OBJECTIVES:

- To expose student to different situations for better communication
- To inculcate the habit of learning vocabulary for effective communication
- To enable students to acquire Business English communication

UNIT I: (2 sessions)

Listening: Listening to short conversations or monologues

Speaking: Giving information about oneself and their opinions and Giving a short talk on business related topics

Reading: Reading short and simple texts to understand the central idea/theme.

Writing: Writing a piece of internal business communication of 30-40 words (Email)

UNIT II: (2 sessions)

Listening: Listening to a conversation/ monologue and taking notes

Speaking: Giving short talk on business related topics.

Reading: Matching descriptions of people to short texts. Matching statements toinformation given in a graph or graphs.

Writing: Writing a piece of internal business communication of 30-40 words (Message)

UNIT III (2 sessions)

Listening: Listening to longer conversations/interviews.

Speaking: Debates & Extempore

Reading: Reading a longer text and deciding whether the statements about the text are right or wrong or if the information is not given.

Writing: Write a business letter 60-80 words, based on an input text and some notes.

UNIT IV (2 sessions)

Listening: Listening to TV news channels and taking notes.

Listening to songs and writing down the lyrics.

Speaking: Interview sessions

Reading: Read a longer text andanswering questions. .

Writing: Writing a Business Report

UNIT V: (2 sessions)

Listening: Watching short documentaries and making notes.(General)

Speaking: Short plays, Presentations.

Reading: Read short texts and fill in a form using information from the texts.

Writing: Write a skit and enact.

UNIT VI:(2 sessions)

Listening: Watching documentaries and making notes.(Business specific)

Speaking: Nail your point.

Reading: Critical Reading to know author's perspective.

Writing: Write a skit and enact.

REFERENCE BOOKS:

1. Cambridge English – Business English Certificate Preliminary
2. Suresh Kumar. E. &Sreehari P.A (2007), Handbook for English Language Laboratories,Cambridge University Press India Pvt. Ltd, New Delhi.
3. MandalS.K(2006), EffectiveCommunication&PublicSpeaking,JaicoPublishingHouse,New Delhi.
4. Grant Taylor (2004), English Conversation Practice, Tata McGraw Hill, New Delhi.
5. Balasubramanian.T(2000),AtextbookofEnglishPhoneticsforIndianStudent,MacMillan Publishers, India.
6. KamaleshSadanand,SusheelaPunitha(2008),SpokenEnglish:AfoundationCourse:Parts1& 2, New Delhi, Orient Longman Pvt. Ltd

WEB REFERENCES:

1. www.cambridgeenglish.org.
2. www.esl-lab.com

ADDITIONAL SOURCES:

1. A Planning Checklist for Business Messages https://open.lib.umn.edu/businesscommunication/chapter/5-2-a-planning-checklist-for-business-messages/
2. How to Improve Business Writing https://www.writing-skills.com/how-to-improve-your-business-writing
3. Self Compassion (Source - YouTube)
4. Bailey Finishes Marathon (Source - YouTube)
5. How to Conquer Public Speaking Fear (Source - Wordpress)
6. I am Sorry, I am so Nervous- RakeshGodhwani (Source - LinedIn)
7. Interpersonal Communication in the Future World (Source: YouTube)
8. The Power of Introverts (Source: YouTube)
9. Boost Power Through Body Language (Source: YouTube)
10. Take Control of your Non-Verbal Communication (Source: YouTube)
11. How to have a Good Conversation (Source: YouTube)

Course Name	**INNOVATIVE IDEA PROJECT**				
Year/Semester	II B. Tech/II Sem	L	T	P	C
Regulation Year	2020-2021	0	0	3	1.5

Introduction

1. Innovative idea project is anexperientiallearningstrategythatintegratesmeaningfulcommunityservicewithinstruction,participation,learningandcommunitydevelopment
2. Innovative idea projectinvolvesstudentsincommunitydevelopmentand service activitiesandappliestheexperiencetopersonalandacademicdevelopment.
3. Innovative idea projectismeanttolinkthecommunitywiththecollegeformutual benefit.
4. The community will be benefited with the focused contribution of the college studentsforthevillage/localdevelopment.Thecollegefindsan opportunityto developsocialsensibilityandresponsibility amongstudentsandalsoemerge asasocially responsible in situation.

Objective

Innovative idea projectshouldbean integralpartofthe curriculum, thespecific objectivesare;

1. Tosensitizethe studentstothe livingconditionsofthepeoplewhoarearoundthem,
2. To helpstudentstorealizethe starkrealitiesofthesociety.
3. Tobringaboutanattitudinalchangeinthestudentsandhelpthemtodevelopsocietal consciousness,sensibility,responsibilityandaccountability
4. Tomakestudentsawareoftheirinnerstrengthandhelpthemtofindnew/outofbox solutions tothe socialproblems.
5. Tomakestudentssociallyresponsiblecitizenswhoaresensitivetotheneedsof thedisadvantagedsections.
6. Tohelpstudentstoinitiatedevelopmentalactivitiesinthecommunityin coordinationwithpublicandgovernmentauthorities.
7. Todevelopaholisticlifeperspectiveamongthestudentsbymakingthemstudyculture, traditions,habits,lifestyles,resourceutilization,wastagesanditsmanagement, socialproblems,publicadministrationsystemandtherolesandresponsibilitiesof differentpersons acrossdifferentsocialsystems.

GUIDELINES:

- The students in convenient groups of not more than 4 members have to take one small innovative idea, if necessary in terms of their own domain or subject area and that could be benefit to the society. Every innovative project work shall have a supervisor who is the member of the faculty of the institution.
- Students will be exposed to lecture modules or could conduct a real time general survey on the project. A common survey format could be designed. An Industrial problem may also be undertaken by the student and it be supervised jointly by Industry personnel and the supervisor.
- Based on comprehensive literature survey and interaction with supervisor, the student shall identify the problem statement clearly and prepare the plan of action within do course time.
- The innovative project comes with a suitable solution in the form of design &fabricated product or service and combination of both. A project report should be

submitted by each student.

- A viva shall be conducted by a review committee constituted by the Head of the department.
- The innovative project documentation in the form of a report is to be submitted at the end of semester.

Thedifferentareas,couldbelike–

Agriculture
Health
MarketingandCooperation
AnimalHus
bandry
Horticultur
e Fisheries
Sericulture
RevenueandSurvey
NaturalDisasterManagement
Irrigation
Law&Order
ExciseandProhi
bition
MinesandGeol
ogy Energy
Internet
FreeElectricity
DrinkingWater

EXPECTEDOUTCOMES

BENEFITSOFINNOVATIVE IDEA PROJECTTOSTUDENTS

LearningOutcomes

1. Positive impactonstudents'academiclearning
2. Improvesstudents' abilitytoapplywhattheyhavelearnedin "therealworld"
3. Positiveimpactonacademicoutcomessuchasdemonstratedcomplexityofunderstanding, problemanalysis,problem-solving,criticalthinking,andcognitivedevelopment
4. Improvedabilityto understandcomplexityandambiguity

Personal Outcomes

1. Greatersense ofpersonalefficacy,personal identity,spiritualgrowth,and moral development
2. Greaterinterpersonaldevelopment,particularlytheabilitytoworkwellwith others, andbuildleadershipandcommunicationskills

SocialOutcomes

1. Reducedstereotypesandgreaterinter-culturalunderstanding
2. Improvedsocialresponsibilityandcitizenshipskills
3. Greaterinvolvementincommunityserviceaftergraduation

CareerDevelopment

1. Connections withprofessionalsandcommunitymembersforlearningand Career opportunities.
2. Greateracademiclearning,leadershipskills,andpersonalefficacycanleadtoGreater

opportunity.

Relationshipwith theInstitution

1. Strongerrelationshipswithfaculty
2. Greatersatisfactionwithcollege
3. Improvedgraduationrates

SUGGESTIVE LIST OF PROGRAMMES UNDER INNOVATIVE IDEA PROJECT

The following there commended list of projects for Engineering students.The lists are not. Exhaustive an dopen for additions, deletions and modifications.College sareexpected to focus on specific local issues for this kind of projects.The students are expected to carry outtheseprojectswithinvolvement,commitment,responsibilityandaccountability.The mentorsofagroupofstudentsshouldtaketheresponsibilityofmotivating,facilitating,and guiding the students.They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects.The project report shall be placed in the college website for reference.Systematic,Factual,methodical and honestreporting shall been sured.

ForEngineeringStudents

1. Water facilities and drinking water availability
2. Health and hygiene
4. Stress levels and coping mechanisms
5. Health intervention programmes
6. Horticulture
7. Herbal plants
8. Botanical survey
9. Zoological survey
10. Marine products
11. Aqua culture
12. Inland fisheries
13. Animals and species
14. Nutrition
15. Traditional health care methods
16. Food habits
17. Air pollution
18. Water pollution
19. Plantation
20. Soil protection
21. Renewable energy
22. Plant diseases
23. Yoga awareness and practice
24. Health care awareness programmes and their impact
25. Use of chemicals on fruits and vegetables
26. Organic farming
27. Crop rotation
28. Floury culture
29. Access to safe drinking water
30. Geographical survey
31. Geological survey
32. Sericulture

33. Study of species
34. Food adulteration
35. Incidence of Diabetes and other chronic diseases
36. Human genetics
37. Blood groups and blood levels
38. Internet Usage in Villages
39. Android Phone usage by different people
40. Utilization of free electricity to farmers and related issues
41. Gender ration in schooling level- observation.