Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Technology and Science

Choice Based Credit System (CBCS) Scheme in light of NEP-2020

B. Tech/B.Tech+MBA in Mechanical Engineering

(2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTME401	DCC	FLUID MECHANICS	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

To introduction with (A) Fluid and its properties, (B) behavior of fluid under various conditions, (C) Applications.

Course Outcomes (COs):

After the successful completion of this course students will be able to

1. Understand the fundamentals of fluid mechanics.
2. Understand basics of compressible flow.
3. Understand fundamentals of flow through pipes.
4. Understand statics, dynamics and various approaches to fluid mechanics.

Syllabus

Unit – I **(9 Hrs)**

Flow and Fluid Properties: Viscosity, relationship between stress and strain-rate for Newtonian fluids, incompressible and compressible flows, differences between laminar and turbulent flows. Hydrostatics forces: Buoyancy and floatation, manometer, forces on submerged and floating bodies, stability conditions.

Unit – II **(9 Hrs)**

Kinematics: Types of fluid flow, rate of flow or discharge continuity equation, velocity and acceleration, velocity potential function and stream function, types of motion, vortex flow.
Ideal flow: Uniform flow, source flow, sink flow, free vortex flow.

Unit – III **(10 Hrs)**

Differential Analysis: Differential equations of mass and momentum for incompressible flows, inviscid - Euler equation and viscous flows - Navier-Stokes equations, Bernoulli's equation from Euler's equation and assumptions, concept of fluid rotation, vorticity, stream function, Exact solutions of Navier-Stokes equation for Coquette Flow and Poiseuille flow, Orifices and mouthpieces: classifications of and flow through orifice, hydraulic coefficients, experimental determination of hydraulic coefficients, classification and flow through convergent and divergent mouthpiece.

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Unit – IV **(9 Hrs)**

Dimensional Analysis: Introduction, secondary or derived quantities, methods of dimensional analysis, model analysis, similitudes-types of similarities, dimensionless numbers, models law and Concept of geometric, kinematic and dynamic similarity, some common non-dimensional parameters and their physical significance: Reynolds number, Froude number and Mach number.
Internal Flows: Fully developed pipe flow, various losses in pipe flow, empirical relations for laminar and turbulent flows: friction factor and Darcy-Weisbach relation.

Unit-V **(8 Hrs)**

Prandtl Boundary Layer Equations: Concept and assumptions, qualitative idea of boundary layer and separation, streamlined and bluff bodies, drag and lift forces. Flow measurements: Basic ideas of flow measurement using venturimeter, Pitot - static tube and orifice plate.

Text and Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K. kataria & Sons, 2015.
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications, 2016.
3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S. Chand & Co., 2017.
4. Fluid Mechanics by F. M. White, 5th ed., McGraw-Hill, New York, 2007.
5. Fundamentals of Fluid Mechanics by Munson, Willey India, 2012.
6. Fluid Mechnaics by A.K. Mohanty, PHI Learning Pvt. Ltd., 2011
7. Textbook of Fluid Mechanics by Suparna Mukhopadhyay, CBS Pub. 2015.

List of Experiments

1. To understand pressure measurement procedure and related instruments/devices.
2. To study meta-centric height of floating body.
3. Verification of Bernoulli's Theorem.
4. To study the velocity of flow using Pitot tube.
5. To determine the Coefficient of discharge through different flow meters. (Any two out of Orifice meter, Venturimeter and Nozzle meter.)
6. To determine the different types of flow Patterns by Reynolds experiment.
7. To study the Friction factor for the different pipes.
8. To study the loss coefficients for different pipe fittings.

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BTME402	DCC	**THEORY OF MACHINES**	60	20	20	30	20	3	1	2	**5**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

This course provides comprehensive knowledge of (A) Mechanism and machine (B) Kinematics of plane motion, (C) Cam and Follower, (D) Gears and Gear Train, (E) Gyroscope.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Students will be able to define systematically design and develop mechanisms to perform a specified task and demonstrate an understanding of the concepts of various mechanisms and pairs.
2. Students will be able to do the velocity and acceleration analysis of simple mechanisms.
3. Students will be able to explain effectively present written, oral, and graphical solutions to design problems & develop ability to come up with innovative ideas and design a layout of cam for specified motion.
4. Students will be able demonstrate an understanding of principle of gears.
5. Students will be able to synthesis simple gyroscopic forces and couple, and gyroscopic effect in airplanes, ship and vehicle.

Syllabus

Unit – I **(9 Hrs)**

Mechanisms and Machines: Mechanism, machine, plane and space mechanism, kinematic pairs, kinematic chains their classification, degrees of freedom, Grubler's criterion, kinematics inversions four bar mechanism and slider crank mechanism, equivalent linkages, pantograph, straight line motion mechanism, Devis and Ackermann's steering mechanism, Hooke;s joint.

Unit – II **(10 Hrs)**

Motion: kinematics of Plane motion, Absolute & Relative motion, Displacement, Velocity and Acceleration Analysis by Graphical & Analytical methods, Velocity image, Velocity of rubbing, Kennedy's Theorem, Acceleration image, Acceleration polygon, Coriolis acceleration component, Klein's construction, Velocity and Acceleration Analysis using complex Raven's methods..

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BTME402	DCC	THEORY OF MACHINES	60	20	20	30	20	3	1	2	5

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Unit – III **(9 Hrs)**

Cams: Classification of Cams and Followers, Radial Cam Terminology, Analysis of Follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), Pressure Angle, Radius of Curvature, Cam Profile for radial and offset followers Synthesis of Cam Profile by Graphical Approach.

Unit – IV **(9 Hrs)**

Gears: Classification of gears and its type, Gear Terminology, Law of gearing, Tooth profiles, velocity of sliding, Path of contact, Arc of contact, Contact Ratio, Interference and Undercutting, Conjugate action.

Gear Trains: Simple, compound, reverted and epi-cyclic gear trains. Velocity ratio and torque calculation in gear trains

Unit – V **(8 Hrs)**

Gyroscope: Gyroscopic Action in Machines, Angular Velocity and Acceleration, Gyroscopic torque/ couple, Gyroscopic effect on Naval Ships, Stability of Two and Four Wheel Vehicles, Rigid disc at an angle fixed to a rotating shaft.

Text and Reference Books:

1. "Mechanism and Machine Theory" by Ambekar AG; PHI. Eastern Economy Edition 2015
2. " Theory of machines & Mechanism " by Uicker & Shigley, Second Edition, Oxford University Press, 2010.
3. "Theory of Machines" by S.S. Ratan, 3rd Ed., TMH, 2012.
4. "Theory of Machines" by Dr. Jagdish Lal; Metropolitan Book Co; Delhi, 2015
5. " Mechanism and Machine Theory "by Rao J S and Dukkipati; New Age, 2014
6. "Mechanics of Machines" by V. Ramamurti, 3rd Ed. Alpha Science, 2010.

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BTME402	DCC	**THEORY OF MACHINES**	60	20	20	30	20	3	1	2	**5**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

List of Experiments

1. To synthesize and demonstrate the inversion of four bar mechanism through animation and model.
2. To synthesize and demonstrate the inversion of single slider and double slider crank mechanism through animation and model.
3. To construct and demonstrate the steering mechanism based on Davis & Ackermann's Steering mechanisms principles.
4. To find out velocity & acceleration of slider crank mechanism by Klein's Construction.
6. To draw Involutes profile of a gear by generating method.
7. To find out velocity ratio of various gear trains.
8. To study working of sun and planet epicycle gear train mechanism using models
9. To study various types of belt drives & find out the velocity ratio of the drive.
10. To finds out gyroscopic couple

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BTME403	DCC	APPLIED THERMODYNAMICS	60	20	20	30	20	3	1	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

(A) To gain knowledge of Economics of Steam Power Plant, Different types of Boilers & their application with Ash and Coal Handing Systems, and Heat Balance Sheet calculation during Combustion in Boiler. (B) To study of various vapour cycle of Steam Power plant and Effect on efficiency of this vapour cycle of various operating conditions etc. (C) To study of Ideal gas relationship, Mach number and its significance, Effect of Mach number on compressibility etc. (D) To gain knowledge of One Dimensional Isentropic Flow. (E) To study of various types of condenser and their applications in steam power plant.

Course Outcomes (COs):

After completions of this course student will be able to understand the following points.

1. Student will be able to understand steam generators, its application in steam power plant also able to make calculation of steam generator efficiency and steam plant economics.
2. They will understand various vapour cycles and also able to analyze them.
3. Student will be able to understand Fundamentals of Compressible Flow and relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number.
4. Student will understand One Dimensional Isentropic Flow and flow in nozzle under various conditions.
5. Student will get idea about the various types of Circulating Water System, Feed water, Condenser and their application according to requirements.

SYLLABUS

Unit –I **(8 Hrs)**

Economics of Power Plant: Review of thermodynamics, Steam Power Plant, Layout and Design of Power Plant, Site selection of Steam Power Plant, Power Plant Economics and Consideration, Load duration curves, Indian energy scenario.

Unit-II **(10 Hrs)**

Steam Boiler: Introduction of steam generating devices, types of steams, Boiler, high and low pressure boiler, boiler mountings and accessories, critical and non-critical boiler, coal and Ash handling system, combustion in boilers, performance and rating of boilers, heat balance

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BTME403	DCC	APPLIED THERMODYNAMICS	60	20	20	30	20	3	1	2	5

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sheet, boiler draught, overview of boiler codes, Performance and rating of boilers.

Unit-III **(9 Hrs)**

Analysis of Steam Cycles: Carnot Cycle, Rankine Cycle, Mean Temperature of Heat Addition, Effect of Variation of Steam Condition on Thermal Efficiency, Reheating of Steam, Regeneration, Feed water Heater, Optimum Degree of Regeneration, Ideal and actual regenerative cycle with single and multiple heaters, Supercritical Pressure Cycle, Deaerator.
Combined Cycle: Binary Vapour Cycles, Coupled Cycles, Combined Cycle Plants

Unit-IV **(9 Hrs)**

Fundamentals of Compressible Flow: Ideal gas relationship, The adiabatic energy equation, Mach number and its significance, Mach waves, Mach cone and Mach angle, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility, Area velocity relationship

Unit-V **(9 Hrs)**

One Dimensional Isentropic Flow: General features of isentropic flow, performance curve, Comparison of adiabatic and isentropic process, One dimensional isentropic flow in ducts of varying cross-section- nozzles and diffusers, operation of nozzles under varying pressure ratio, mass flow rate in nozzles, diffusers, critical properties and choking, area ratio as function of Mach number, Impulse function, non-dimensional mass flow rate in terms of pressure ratio, area ratio and Mach number, Working charts and gas tables, Application of Isentropic flow

Text and Reference Books:

1. Power plant Engineering by P.K. Nag, TMH, 2015
2. Basic and applied Thermodynamics by P. K. Nag, TMH, 2017
3. Applied Thermodynamics by R. Yadav, Central Pub. House, 2012.

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BTME403	DCC	APPLIED THERMODYNAMICS	60	20	20	30	20	3	1	2	5

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4. Fundamental of Compressible flow by S. M. Yahya, New age international Publication, Delhi, 2012.
5. Fundamentals of compressible fluid dynamics by P. Balachandran, PHI Learning, 2013.
6. Gas Dynamics by E. Rathakrishnan, PHI Learning Pvt. Ltd, 2010.
7. Steam & Gas Turbines and Power Plant Engineering by R. Yadav, Central Pub. House, 2013.

List of Experiments

1. To Study different types of boilers with application.
2. To Study boiler mountings and accessories.
3. To study performance and rating of boiler.
4. To study different types of coal & Ash handling system.
5. Determination of thermal efficiency of steam power plant.
6. To study Regenerative & Reheat cycle of steam power plant.
7. To study Binary Vapour & Combined cycle plant.
8. To determine mass flow for different condition of Nozzle.
9. To determine mass flow for different condition of Diffuser.
10. To study performance curve for one dimensional isentropic flow

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BTME404	DCC	MACHINE DESIGN I	60	20	20	30	20	3	0	2	4

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***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To understand the design methodology for machine elements.
2. To analyse the forces acting on a machine element,
3. Apply suitable design methodology.
4. To understand the various standards and methods of standardization.
5. To apply the concept of parametric design and validation by strength analysis.

Course Outcomes (COs):

Student will be able to

1. Understand the design concepts of various machine elements.
2. Design the various types of springs.
3. Design the shafts and couplings.
4. Design the threaded and welded joints.
5. Understand the concepts of bearing lubrication and design the journal bearings.

Syllabus

Unit –I **(8 Hrs)**

Introduction: Introduction to Design process, Design considerations, engineering materials properties and processes of their selection, BIS designation of steels, manufacturing considerations in design, Bending and Torsional stress equations, Impact and Shock loading, Stress concentration factor, Size factor, Surface limits factor, Design stress.

Unit –II **(10 Hrs)**

Fatigue strength and design of springs: Variable and cyclic loads, Fatigue Strength, Endurance limit, S- N Curve, Soderberg, Gerber and Goodman equations, fatigue failure, design consideration in fatigue, classification and spring materials, Spring end formation, Design of helical compression springs, helical extension springs, torsion springs, laminated springs, Protective coatings, Equalized stress in spring leaves. Multi - leaf springs. Surge in springs, nipping and shot peening.

Unit –III **(9 Hrs)**

Shafts, keys and couplings: Shafts design on strength basis, torsional rigidity basis, ASME

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BTME404	DCC	MACHINE DESIGN I	60	20	20	30	20	3	0	2	4

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codes for shafts, Keys and cotter design, Flat and square keys, Splines, Rigid and flange couplings, Flexible couplings.

Unit –IV **(9 Hrs)**

Threaded and welded joints: Forms of threads, basic types of screw fastenings, ISO metric screw threads, eccentrically loaded bolted joints, Torque requirement for bolt tightening, Fluctuations loads on bolted joints, fasteners, Joints with combined stresses. Power screws, Force analysis. Collar friction, Differential and compound screws design. Types and strength of weld joints subjected to bending and fluctuating loads, cotter and knuckle joints, welded joints, different types welded joints and their design aspects.

Unit – V **(9 Hrs)**

Journal Bearing: Types of lubrication, viscosity, hydrodynamic theory, design factors, temperature and viscosity considerations, Reynold's equation, stable and unstable operation, heat dissipation and thermal equilibrium, boundary lubrication, dimensionless numbers, Design of journal bearings, Rolling-element Bearings: Types of rolling contact bearing, bearing friction and power loss, bearing life; Radial, thrust & axial loads; Static & dynamic load capacities; Selection of ball and roller bearings; lubrication and sealing.

Text and Reference Books:

1. Design of Machine Elements by V.B. Bhandari, TMH, 3rd Ed. 2010.
2. Machine Design by R.S. Khurmi nad J.K. Gupta, Eurasia Pub. House, 2013.
3. Machine Design by J.E. Shingley, TMH, 2011.
4. Design of Machine Elements by Sharma and Purohit, PHI, 2014.
5. Machine Design by Wentzell Timothy H., Cengage learning, 2008.
6. Machine Design by Mubeen, Khanna Pub. 2013.
7. Machine Design by Sharma and Agrawal, Kataria & Sons, 2016.

List of Experiments

Solve various design problems as per the syllabus

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BTME405N	DCC	IC ENGINES AND ELECTRIC VEHICLES	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs)

This course provides a fundamental understanding and impart the knowledge of (A) working of I.C. engines and engine performance (B) fuel injection and ignition system (C) fuel combustion (D) engine cooling, lubrication system and testing of IC engines (E) Electric Vehicles and its components.

Course Outcomes (COs)

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Demonstrate the working of IC engines and its performance
2. Describe the fuel injection and ignition system.
3. Explain the fuel combustion within IC engine.
4. Understand the cooling and lubrication system and know various engine performances through testing and measurement.
5. Understand and describe the Electric Vehicles and its systems

Syllabus

Unit – I **(9 Hrs)**

Air Standard Cycles: Internal and external combustion engines, classification and applications of I.C. Engines, IC engine components and terminology, 2S and 4S engines, Assumptions made in air standard cycle, comparison of Otto, diesel and dual combustion cycles, Stirling and Ericsson cycles, air standard efficiency, specific work output, specific weight, work ratio, mean effective pressure, deviation of actual engine cycle from ideal cycle, valve and port timing diagrams. IC engine performance parameters: Engine power, engine efficiencies, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, specific fuel consumption (BSFC, ISFC), variable affects engine performance, heat balance, engine performance curves.

Unit – II **(9 Hrs)**

Carburetion: factors influencing carburetion; mixture requirements for various operating conditions, types of carburetors.

Fuel Injection System: Functional requirements of an injection system, types of inject systems, components of injection system.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTME405N	DCC	IC ENGINES AND ELECTRIC VEHICLES	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Ignition System: Requirements of ignition system, battery ignition system, magneto ignition system, electronic ignition system, firing order, ignition timing.

Unit – III **(8 Hrs)**

Combustion in S.I. engines: Stages of combustion in S.I. engines; effect of engine variables on ignition lag, combustion phenomenon; knock in S.I. engines; effects of engine variables on knock, combustion chamber for S.I. engines.

Combustion in C.I. engines: Stages of combustion in C.I. engines; variables affecting delay period; knock in C.I. engines; C.I. engine combustion chambers.

Unit – IV **(10 Hrs)**

Lubrication and Cooling Systems: Functions of a lubricating system, types of lubrication system; mist, wet sump and dry sump systems, crankcase ventilation, properties of lubricant, SAE rating of lubricants, engine performance and lubrication, necessity of engine cooling; effect of engine variables on engine heat transfer, different types of cooling systems.

Engine measurements and Testing: Friction power, indicated power, brake power, fuel and air consumption, speed, temperature of coolant and exhaust, noise and emission measurement.

Pollution and Its Control: Pollutants from S.I. and C.I. engines, Methods of emission control; alternative fuels for I.C. Engines, catalytic convertor.

Unit – V **(9 Hrs)**

Electric Vehicles (EVs): Need of EVs, Components of Electric Vehicle, Comparison with IC Engine in terms of technology, advantages and disadvantages, EV Classification, EV Terminology, general layout of EV, concept of electric traction, electric drives, energy storage and management system in EVs etc., Indian and global scenario.

Text and Reference Books:

1. "Internal Combustion Engine Fundamentals" by J.B. Heywood, McGraw-Hill, 1988.
2. "Fundamentals of Internal Combustion Engines" by Paul W. Gill & James H. Smith, Oxford & IBH Pub. Ltd., 1986.
3. "A Course in Internal Combustion Engines" by V. M. Domkundwa, Dhanpat Rai Publication, 2013.
4. "Internal Combustion Engines", by V. Ganesan, Tata McGraw-Hill, 2012.

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BTME405N	DCC	IC ENGINES AND ELECTRIC VEHICLES	60	20	20	30	20	3	0	2	**4**

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5. "Internal Combustion Engines", by M.L. Mathur & R.P. Sharma, Dhanpat Rai Publications, 4th edition, 2014.
6. "Electric Vehicle Technology Explained" by James Larminie, John Lowry, John Wiley & Sons Ltd, 2003.
7. "Electric and Hybrid Vehicles: Design Fundamentals" by Iqbal Hussein, CRC Press, 2003.
8. "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design" by Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, CRC Press, 2004.

List of Experiments

1. To study the working of 2 stroke and 4 stroke petrol (S.I.) engine
2. To study the working of 2 stroke and 4 stroke diesel (C.I.) engine
3. To study valve/port timing diagram of I.C. Engines.
4. To study fuel injection and ignition system of both S.I. & C.I. engines.
5. To study the different lubrication systems of I.C. engine.
6. Evaluate performance of 4-stroke C.I. engine and prepare heat balance sheet.
7. Evaluate performance of 2-stroke C.I. engine and prepare heat balance sheet.
8. Performance evaluation of four and two stroke S.I. engine.
9. Performance evaluation of multi-cylinder Diesel/Petrol Engine.
10. Study of general layout and components of Electric Vehicle.

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BTME406N	SEC	CAD AND SOLID MODELLING LAB	0	0	0	0	50	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit;
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Course Educational Objectives (CEOs):

To paraphrases with (A) CAD, commands and CAD related applications and its need. (B) 2-D and 3-D modeling terms, draw and editing commands and utility commands.

Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

The students will be able to

1. Student would be able to understand CAD, its application and limitations.
2. Students would be able to use 2-D drawing, editing commands and its applications.
3. Student would be able to use solid modelling commands and to understand various modelling methods.
4. Students would be able to solve assembly related problems.
5. Students would be able to draw various 2-D, solid models and analyze various machine assemblies.

Syllabus:

UNIT I **(4 Hrs)**

Introduction to CAD: Introduction, history of 2D and solid modelling, menus, toolbars, pointing device, command prompt, function keys.

UNIT II **(6 Hrs)**

2-D Drawing& Editing Commands: Introduction, line commands, coordinate systems, orthogonal lines, circle and arc commands, etc

Editing Commands: Introduction, erase and selection commands, move commands, copy commands, extend command, trim command, mirror command, etc

Layers & Linotypes: Introduction, layers status, line weights, object properties.

UNIT III **(8 Hrs)**

Solid modelling Types of Modelling: Solid modelling, surface modelling and wire frame modelling

Draw Commands: Introduction, polygon, cuboids, donut, ellipse, multiline, conic sections, etc

Editing Commands: Introduction, extrudes, revolve, sweep, etc

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UNIT IV **(8 Hrs)**

Assembly Drafting: Introduction, constraints, exploded views, interference check, layout, standard and section views, dimensioning, detailing and plotting.

UNIT V **(8 Hrs)**

Part Design: Introduction, 2-d model (triangle, rectangle, circle, etc), solid models (nut, bolts, small machine parts), machine assemblies.

Text and Reference Books:

1. "Introduction to AutoCAD 2017" by Palm and Yarwood, Routledge Pub. 2016.
2. "An Introduction to Computer Aided Design (CAD)" by A. Mustun
3. "Mastering AutoCAD 2016 and AutoCAD LT 2016" by G. Omura and Benton, Sybex, 2015.
4. "AutoCAD 3D Training Manual" by K.S. Kurland, 2004.
5. "CAD/CAM: Principles and Application" by P.N. Rao, McGraw Hill, 2010.
6. "Computer Aided Manufacturing" by P.N. Rao, N.K. Tewari and T.K. Kundra, McGraw Hill, 2017.
7. "CAD/CAM: Theory and Practices" by Zeid and Sivasubramanian, McGraw Hill, 2009.
8. "Mastering CAD/CAM" by Zeid, McGraw Hill, 2006.

List of Experiments:

1. To study various software for Computer Aided drafting.
2. To study various drawing commands for 2-D drawing in AutoCAD.
3. To study various editing commands from 2-D drawing in AutoCAD.
4. To draw various 2-D drawing using AutoCAD.
5. To study various solid modelling commands in AutoCAD.
6. To draw various solid models using AutoCAD.
7. To study various utility commands in AutoCAD.
8. To study various assemblies and drafting used in machine components.

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