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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BTME401	DCC	FLUID MECHANICS	60	20	20	30	20	3	0	2	4

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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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			THEORY			PRACTICAL		L	T	P	CREDITS
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BTAU406	DCC	**KINEMATICS AND DYNAMICS 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 and Governor Mechanisms.

Course Outcomes (COs):

After the successful completion of this course

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 analyse Cam movement.
3. Students will be able demonstrate an understanding of principle of gears.
4. Students will be able to synthesis simple gyroscopic forces and couple, and gyroscopic effect in airplanes, ship and vehicle.
5. Students will be able to understand the basics of Balancing of masses and Governor Mechanisms.

Syllabus

Unit – I **12 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 **11 Hrs**

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

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BTAU406	DCC	**KINEMATICS AND DYNAMICS 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.

Unit – III **12 Hrs**

Cams: Classification of Cams and Followers, Radial Cam Terminology, Analysis of Follower motion, Pressure Angle, Radius of Curvature, Cam Profile for radial and offset followers Synthesis of Cam Profile by Graphical Approach.

Dynamic Analysis of Cams: Response of un-damped cam mechanism (analytical method), follower response analysis by phase-plane method, jump and cross-over shock.

Unit – IV **15 Hrs**

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

Belt drives: Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts; maximum power transmitted by belt; initial tension; creep; chain and rope drives.

Gyroscope: Gyroscopic Action in Machines, Angular Velocity and Acceleration, Gyroscopic torque/ couple, Gyroscopic effect on Naval Ships, Stability of Two- and Four-Wheel Vehicles.

Unit – V **10 Hrs**

Balancing of Inertia Forces: Balancing of rotating masses; Two plane balancing; Determination of balancing masses (graphical and analytical methods); Balancing of rotors; Balancing of internal combustion engines.

Governor Mechanisms: Types of governors, characteristics of centrifugal governors, gravity and spring controlled centrifugal governors; hunting of centrifugal governors; inertia governors.

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*
3. *" Theory of Machines,"by Dr. Jagdish Lal; Metropolitan Book Co; Delhi*

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BTAU406	DCC	**KINEMATICS AND DYNAMICS 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.

4. *Mechanism and Machine Theory, by Rao J S and Dukkipati; New Age Delhi.*
5. *"Theory of Machines" by S.S. Rattan, (2009), Third Edition, Tata McGraw-Hill*
6. *"Theory of Mechanisms and Machines", by Ghosh and Malik; Publisher: East-West Press, 2015.*
7. *"Kinematics and dynamics of machinery", by Norton RL; Publisher: TMH, 2009.*

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.
5. To Study dynamic behaviour of cam & follower under various operating conditions using CAM Analysis Apparatus.
6. To draw Involutes profile of a gear by generating method.
7. To find out velocity ratio of various gear trains.
8. To study various types of belt drives & find out the velocity ratio of the drive.
9. To determine gyroscopic couple on Motorized Gyroscope.
10. To study gyroscopic effects through models.
11. To Perform Experiment on Watt and Porter Governors & also Prepare Performance Characteristic Curves in order to find Stability & Sensitivity.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTAU402N	DCS	MANUFACTURING TECHNOLOGY	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):
The primary objective of the course is to describe the (A) Unconventional machining processes, Jigs and Fixtures (B) Gear manufacturing, (C) Group technology and flexible manufacturing system, (D) Computer integrated manufacturing.

Course Outcomes (COs):
After completion of this course the students will be able to describe the followings:

1. Students will be able to understand & describe concepts of unconventional machining process.
2. Students will be able to describe Jigs and fixtures and its uses.
3. Students will be able to describe the principles of gear manufacturing and its nomenclature.
4. Students will be able to understand the working principles Group technology and flexible manufacturing system.
5. Students will be able to understand the concepts of computer integrated manufacturing.

Syllabus

Unit I

Unconventional machining processes: Need for unconventional processes; Classifications of Unconventional Manufacturing Processes; Construction and working principal of unconventional machining processes such as USM, WJM, AJM, Chemical Machining, Electrolytic Grinding, EDM, LBM, EBM, Plasma Arc Cutting etc. and applications & limitations.

Unit II

Jigs and Fixtures:

Definition, Principles of location, locating method and devices; principles of clamping, clamping devices; drilling jigs and its types; drill bushes, fixture and economics; types of fixtures; milling, grinding, broaching, assembly fixtures indexing jig and fixtures, indexing devices.

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BTAU402N	DCS	MANUFACTURING TECHNOLOGY	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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Unit III

Gear Manufacturing

Types of gears; nomenclature of spur and helical gears; Gear generating and forming processes: concept, differences and applications, working and application of gear milling, gear hobbing and gear shaping machines; Nomenclature of gear hob and gear shaping cutter; Gear Cutting parameters for commonly used materials and work-piece; Gear finishing processes- shaving & grinding.

Unit IV:

Flexible Manufacturing System: definition, types of FMS and applications; concept of flexibility, need of flexibility, types of flexibilities and its measurement; economic justification for FMS; Functional requirements for FMS equipment's.

Unit V

Group Technology: GT concept, advantages of GT; part family formation-coding and classification Systems; part-machine group analysis; Production flow analysis; Methods for cell formation; FMS related problem and Solution Methodology.

Reference Book:

1. *"Workshop Technology" by W. A. J. Chapman part I, II & III, 5th ed., 2001.*
2. *"Automation, Production System & Computer Integrated Manufacturing" by Mikell P. Groover, Prentice Hall, 2008.*
3. *"Manufacturing Technology" by P. N. Rao, Vol. 1 and 2, 2018.*
4. *"Fundamentals of Machining and Machine Tools" by D. G. Boothroy and W.A. Knight, Marcel Dekker, NY, 2007.*

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BTAU402N	DCS	MANUFACTURING TECHNOLOGY	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.

5. *"Metal Cutting Theory and Practice" by Bhattacharya, New Central Book Agency, 2000.*
6. *"Fundamentals of Metal Cutting and Machine Tools" by B.L. Juneja and G.S. Sekhon, New Age International, 2003.*
7. *"Principles of Metal Cutting" by G. Kuppuswamy, Universities Press, 1996.*
8. *"Metal Forming-Fundamentals and Applications" by T Altan, Soo-Ik-Oh and H.L. Gegel, American Society of Metals,* Metal Park, 1983
9. *"Metal cutting Theory & Cutting Tool Designing" by V. Arshinov, G Alekseev, 1970.*
10. *"Elements of Workshop Technology" by Hazra Chaudhary Vol I, II, 12th ed., 2007.*

List of Experiments:

1. Explain working principles and working parameters of non-conventional machining methods.
2. To study various Non-traditional Machining processes
3. Study and experimentation with EDM
4. Study and experimentation with plasma arc cutting
5. To study various types of jigs used in production.
6. To study various types of fixtures used in production
7. Describe constructional features and working of various gear manufacturing machines
8. Explain procedural steps for producing accurate gears using gear milling machines
9. Explain procedural steps for producing accurate gears using gear hobbing machines
10. Explain procedural steps for producing accurate gears using gear shaping machines.
11. Describe the working principal of group technology system and its application.
12. Describe the working principal of Flexible manufacturing systems and its application.
13. To study of Computer integrated manufacturing

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BTME404	DCC	MACHINE DESIGN I	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):

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

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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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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BTAU407N	DCC	AUTOMOTIVE THERMAL SYSTEM	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):

(A)To gain knowledge of Basic Concepts of thermodynamics, (B) law of Thermodynamics, (C) Energy, Entropy and Exergy, (D) Gas Power cycles and (E) conduction, convection and radiation.

Course Outcomes (COs):

After learning the course, the students should be able to

1. Understand basic terms used in thermodynamics.
2. Understand laws of thermodynamics and its applications.
3. Comprehend the concept and applications of energy, entropy and exergy.
4. Understand various gas and vapor power cycles.
5. Solve/describe the problems related to heat transfer by conduction, convection and radiation.

Syllabus

Unit – I **10 Hrs**

First Law and Energy: Basic Concepts, Concept of Continuum, Microscopic and Macroscopic Approach, Thermodynamic Systems (Closed, Open, Isolated), Control Volume, Property, Point and Path Functions, Thermodynamic Equilibrium, State, Path and Process, Reversible and Quasi-Static Process, Work, Modes of Work, Zeroth Law, Concept of Temperature and Heat. First Law, Application to Closed and Open Systems, Internal Energy, Enthalpy, Specific Heat Capacities (Cp & Cv), Steady flow process with reference to various engineering devices. Limitations of first law of thermodynamics

Unit – II **8 Hrs**

Second Law, Entropy and Exergy: Second Law – Kelvin Planck and Clausius Statements, Heat Engine, P-V, P-T, T-V, T-S and H-S Diagrams, PVT Surfaces, Refrigerator and Heat Pump, Efficiency and COP, Carnot Cycle, Clausius Inequality, Concept of Entropy, Entropy of Ideal Gases, Principle of Increase of Entropy, Quality of Energy, Exergy (Availability).

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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*				
BTAU407N	DCC	AUTOMOTIVE THERMAL SYSTEM	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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Unit – III **10 Hrs**

Thermodynamics Cycles: Recapitulation of Carnot, Otto and Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, air standard efficiency, brake thermal efficiency, relative efficiency.

Gases and Gas Mixtures: Properties of Ideal and Real Gases, Avogadro's Hypothesis and Gas Laws, Vander Walls and Other Equations of State, Non-Reactive Ideal Gas Mixtures, Mass and Mole Fractions, Dalton's Law of Additive Pressures, Amagat's Law of Additive Volumes, Properties of Ideal Gas Mixtures.

Unit – IV **8 Hrs**

Conduction Heat Transfer: Basic laws of heat transfer i.e. Conduction, Convection and Radiations; Fourier equation and Thermal Conductivity, Steady State Conduction, Heat conduction through plane wall, Composite wall and cylindrical wall. effect of variable conductivity.

Unit – V **9 Hrs**

Convection Heat transfer: Free and forced convection, Laminar and Turbulent flow, Newton- Rekhman Law: Convection rate equation, Nusselt Number; radiation heat exchanger; salient features and characteristics of radiation. Absorptive, reflectivity and transmittance, wavelength distribution of black body radiation, Plank's law; total emissive power: Stefan Boltzman law, Kirchoffs Law, gray body and selective emitters.

Text and Reference Books:

1. *Engineering Thermodynamics by P.K. Nag, McGraw-Hill Education.*
2. *Fundamentals of Thermodynamics by Borgnakke & Sonntag, 7th Ed. Wiley India (P) Ltd.*
3. *Thermodynamics Engineering Approach by Yunus Cengel & Boles, McGraw-Hill Education.*
4. *Engineering Thermodynamics by Gordon Rogers and Yon Mayhew, Pearson Education Ltd.*
5. *Engineering Thermodynamics by Krieth, CRC Press.*
6. *Engineering Thermodynamics by Jones and Dugan, PHI Learning Pvt. Ltd.*
7. *"Heat and mass transfer" by Sukhatme SP, University Press Hyderabad, 2005.*
8. *"Heat transfer" by Holman JP, TMH, 2011*
9. *"Heat and Mass Transfer" by Nag PK, TMH, 2007.*
10. *"Heat Transfer Principles and App, by Dutta BK, PHI Learning, 2015.*

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BTAU407N	DCC	AUTOMOTIVE THERMAL SYSTEM	60	20	20	30	20	3	0	2	4

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List of experiments

1. To Study of positive displacement work (PdV work) and Heat transfer for various processes.
2. To Study of first law of Thermodynamic.
3. To Study of second law of thermodynamic.
4. To determine the efficiency of Otto cycle.
5. To determine the efficiency of Diesel cycle.
6. To determine the efficiency of Dual cycle.
7. To Study of Properties of gases and gas mixtures.
8. To determine the thermal conductivity of a metallic rod.
9. To determine Forced and free convection over circular cylinder.
10. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
11. To verify the Stefen-Boltzmann constant for thermal radiation

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

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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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