SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
Mechanical Engineering Department

Semester/Year		IV/II	Program		B.Tech.
Subject Category	DC	Subject Code:	ME-402	Subject Name:	Applied Thermodynamics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

This course provides a simple understanding of the basic components of steam power plant. The course contains steam generators, the analysis of vapour power cycle, Gas dynamics and flow through steam nozzles, Reciprocating air compressors, Steam turbines for power generation and condensers.

Course Outcomes:

After completion of the course, students would be able to -

1. **Understand the Steam generator, its performance parameter and boiler code**
2. **Analyze the Vapour power Cycles**
3. **Evaluate the Mach Numberin Gas dynamics**
4. **Evaluate performance parameter of Reciprocating Compressor**
5. **Understand the working of Steam Turbine and Condensers**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1			1	1					1
CO2	3	3	1	1	1		1					1
CO3	3	2	1	2		1						1
CO4	2	3	3	3	2			1				1
CO5	2	3	1	2	1	1	2	1				1

Contents:			
UNITs	**Descriptions**	**Hrs.**	**CO's**
I	**Steam generators: Classification, conventional boilers, high-pressure boilers-Lamont, Benson, Loeffler and Velox steam generators, performance and rating of boilers, heat balance sheet, combustion in boilers, super critical boilers, fuel and ash handling, boiler draught, overview of boiler codes.**	**8**	**1**
II	**Phase Change Cycles: Vapor Carnot cycle and its limitation, Rankine cycle, effect of boiler and condenser pressure and superheat on end moisture and efficiency of ranking cycle, modified Rankine cycle, reheat cycle, perfect regenerative cycle, Ideal and actual regenerative cycle with single and multiple heaters, open and closed type of feed water heaters, regenerative-reheat cycle, supercritical pressure and binary-vapor cycle, work done and efficiency calculations.**	**8**	**2**
III	**Gas dynamics: Speed of sound, in a fluid Mach number, Mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases through variable area duct-Mach number variation, area ratio as a function of Mach number, mass flow rate and critical pressure ratio, velocity coefficient, coefficient of discharge, diffusers, normal shock, Steam nozzles: steam flow through nozzles, condition for maximum discharge, effect of friction, super-saturated flow.**	**8**	**3**
IV	**Air compressors: Working of reciprocating compressor, work input for single stage compression, different compression processes, effect of clearance, volumetric efficiency real indicator diagram, isentropic & isothermal and mechanical efficiency, multi stage compression, inter-cooling, condition for minimum work done.**	**8**	**4**
V	**Steam Turbine: Compounding of steam turbines, Impulse steam turbines, Impulse-Reaction steam turbines, Energy losses in steam turbines,** **Steam condensers: Introduction, types of condensers, back pressure and its effect on plant performance, air leakage and its effect on performance of condensers.**	**8**	**5**
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

1. **Study of High Pressure Benson Boiler**
2. **Study of High Pressure Loeffler Boiler**
3. **Study of Convergent and Divergent Steam Nozzles**
4. **Performance Analysis of Air Blower**
5. **Performance Analysis of Two Stage Reciprocating Air Compressor**
6. **Study of different types of Steam Condensers**
7. **Performance Analysis of Steam Power Generation (UNI-STA Test Rig)**

Text Books-

1. **Balachandran P; Gas Dynamics for Engineers; PHI Learning**
2. **Yahya SM; Fundamentals of Compressible flow; New Age**
3. **R. Yadav, Steam and Gas Turbines**

Reference Books-

1. **P. K. Nag; Basic and applied Thermodynamics; TMH**
2. **R.Yadav Thermal Engineering,**
3. **Sadhu Singh, ThermalEngineering, Pearson**
4. **Mahesh M Rathore, Thermal Engineering, TMH**

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	**Date:**
Approval by Academic council on	**Date:**
Compiled and designed by	**Name 1.Dr.Mangal Singh Lodhi**
Checked and approved by	**Name 1.Dr Sanjay Katarey**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		III / II	Program		B.Tech.
Subject Category	DC	Subject Code:	ME-403	Subject Name:	Machine Drawing and Design

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

Objective of this course is to give students basic understanding and conceptual knowledge of machine drawing and design.

Course Outcomes:

After completion of the course, students would be able to -

1. **Illustrate various design consideration for machine component design**
2. **Judge failure modes and compute factor of safety**
3. **Design various joints subjected to static load in different working conditions**
4. **Analyse suitability of various joints**
5. **understand the concept of geometric modeling**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1								
CO2	3	2	3	1								
CO3	3	3	3	1								
CO4	2	2	3	1								
CO5	2	3	2	1	2							

Contents:			
UNITs	**Descriptions**	**Hrs.**	**CO's**
I	**Basic Design concepts, design process, stages/phases in design, design considerations (strengths manufacturing, maintenance, environment, economics and safety): design for recycle and reuse, Design and safety factors for steady and variable loads, impact and fatigue considerations, Surface Finish, limits, fits and tolerance.**	**8**	**1 & 2**
II	**Threaded Joints: Thread Nomenclature, Forms of Screw Threads, Designation of Indian Standard Thread, Designation of Bolts, Screws and Nuts, Common Screw Fasteners, representation of internal thread and external threads, Bolts Supporting Tensile Loads Only, static Stress in Screw Fastening, Eccentric Loading of Threaded Joints.**	**8**	**3 & 4**
III	**Welded Joints: Representation of welds, strength of Welded Steel Joints, Design of Welded Joints for Static Loads, Strengths of Welds at Varying Loads, Initial Stress, Exercises Eccentric Loading of welded Joints.**	**8**	**3 & 4**
IV	**Design of Cotter Joint and knuckle joint. Design of Keys and Coupling**	**8**	**3 & 4**
V	**Basic fundamentals of CAD and Application of computer for design, CAD data exchange, Graphics standards, modes of graphics operation, Geometric Modeling. Types of mathematical representation of curves, parametric representation wire frame modeling**	**8**	**5**
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

1. **Prepare Orthographic views of given object**
2. **Prepare Isometric view of given object**
3. **Convert isometric view in orthographic views and vice versa**
4. **CAD initial setting Commands-Snap, grid, Ortho, Snap. Limits. Units, Object tracking. Opening, saving and closing a new and existing drawing/template**
5. **Identify various tools/commands for sketching.**
6. **Prepare 2D CAD drawing of given object**
7. **Identify various tools/commands for solid modeling**
8. **Prepare 3D parts of flange coupling**
9. **Prepare assembly of flange coupling**
10. **Prepare assembly of cotter joint**
11. **Prepare assembly of knuckle joint**

Text Books-

1. **Design of machine elements by V B. Bhandari Tata McGraw-Hill Education**
2. **Mechanical Engineering Design by Joseph Edward'Shigley, McGraw-Hill**
3. **Machine Design by Robqrt. L., Norton**
4. **Design of Machine Elements: Volurrte, I by T. KrishñaRao, IK International**
5. **Machine Drawing by N. D. Bhatt.**
6. **CAD/CAM: Computer-Aided Design and ManufacturingGrooverPearson Education India**

Reference Books-

1. **Mechanical Design of Machine Elements and Machines by Jack A.Collins, Henry Busby, George Staab, Wiley**
2. **Machine Design by P.C. Sharma and D. K. Agarwal, S.K.Kataria& Sons.**
3. **Principles of Computer Graphics William M Neumann and Robert F.Sproul McGraw Hill Book Co. Singapore**

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	**Date:**
Approval by Academic council on	**Date:**
Compiled and designed by	**Name 1. Dr. Chandra Pal Singh**
Checked and approved by	**Name 1. Prof Sandeep Jain**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		IV / II	Program		B.Tech.
Subject Category	DC	Subject Code:	ME-404	Subject Name:	Fluid Mechanics

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

To provide an ability to apply the knowledge of fluid mechanics on engineering applications and fluid flow problems.

Course Outcomes:

After completion of the course, students would be able to -

1. **Identify the basic properties of fluids applicable in mechanical engineering and study the methods for measurement of pressure**
2. **Analyse the fluid behaviour under static condition and its application in mechanical engineering**
3. **Evaluate the concept of buoyant force and stability of floating and submerged bodies**
4. **Assess different types of flow, application of conservation of mass in the form of continuity equation**
5. **Apply the concept of conservation of energy to fluid flows in the form of Bernoulli's equation**
6. **Demonstrate the laminar and turbulent flows and analyse laminar flows through pipes and parallel plates**
7. **Identify the concept of dimensional analysis and similitude required for model studies and their application in mechanical engineering design**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1					2			
CO2	3	3		3					2			
CO3	3	3	2	2					2			
CO4	3	3		3					2			
CO5	3	3	2	3					2			
CO6	3	3		2					2			
CO7	3	3	2	3					2			

Contents:			
UNITs	**Descriptions**	**Hrs.**	**CO's**
I	**Fluid properties: Fluid and continuum, mass, density, specific weight, volume and gravity, viscosity, surface tension, capillarity, bulk modulus of elasticity, pressure and vapor pressure** **Fluid statics: Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces; buoyant force, Stability of floating and submerged bodies**	**8**	**1, 2 & 3**
II	**Kinematics of Flow: Description of fluid flow, Lagrangian and Eulerian method, Types of flow; ideal & real, steady & unsteady, uniform & non uniform, One, two and three dimensional flow, path lines, streak-lines, streamlines, Continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, velocity potential function, stream function, Separation of flow, sources & sinks, Flow nets**	**8**	**2, 4**
III	**Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, linear momentum equation for steady flow; The moment of momentum equation, forces on fixed and moving vanes** **Fluid measurement: Velocity measurement (Pitot tube, Prandtl tube); Flow measurement (Venturi meter, Orifice meter, Nozzle meter, Rotameter)**	**8**	**4, 5**
IV	**Viscous flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number, relation between shear & pressure gradient, Laminar flow through circular pipes, Laminar flow between parallel plates, Energy correction factor, momentum correction factor**	**8**	**6**
V	**Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, Rayleigh's method, Buckingham-pi theorem, Model analysis, Similitude-Types of Similarities, dimensionless numbers, Similarity laws, specific model investigations (submerged bodies, partially submerged bodies)**	**8**	**7**
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

1. **Verification of Energy equation**
2. **Calibration of Venturimeter**
3. **Calibration of Orifice meter**
4. **Calibration of Mouth Piece**
5. **Calibration of Water meter**
6. **Calibration of Nozzle meter**
7. **Determination of C_c, C_d, C_v of orifice**
8. **Reynolds experiment for demonstration of streamlines & turbulent flow**
9. **Determination of friction factor of a pipe**
10. **Verification of impulse momentum principle**

Text Books-

1. **R.K. Bansal; A text book Fluid Mechanics and Hydraulic machines; Laxmi Publication LTD**
2. **Cengel; Fluid Mechanics; TMH**
3. **R.W. Fox & A.T. McDonald; Introduction to Fluid Mechanics; WILEY**
4. **S.K. Som and G. Biswas; Introduction to Fluid Mechanics and Fluid Machines; TMH**

Reference Books-

1. **Frank M. White; Fluid Mechanics; TMH**
2. **Donald F. Young; Fundamentals of fluid mechanics; WILEY**

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	**Date:**
Approval by Academic council on	**Date:**
Compiled and designed by	**Name 1. Dr.Neetesh Singh Raghuvanshi**
Checked and approved by	**Name 1. Dr AshishManoria** **2 Dr Rajiv Jain**

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Mechanical Engineering Department

Semester/Year	IV/II	Program	B.Tech.
Subject Category: DC	Subject Code: ME405	Subject Name:	Dynamics of Machine

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10				100	3	1		4

Prerequisites:(Only for open electives)

Course Objective:

Objective of this course to provide fundamental knowledge about the force/thrust acting on moving parts of mechanical machines.

Course Outcomes:

After completion of the course, students would be able to -

1. **Understand turning moment diagrams of different engines and fluctuation of speed**
2. **Understand balancing concepts of Balancing and analyze inertia forces in IC engines**
3. **Learn functions of various Governors and analysis various forces associated in Governors**
4. **Learn concepts of frictional torque and analyze functioning of Clutches, Bearing**
5. **Understand concepts of vibrations**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								

Contents:

UNITs	Descriptions	Hrs.	CO's
I	**Turning Moment and Flywheel: Turning Moment Diagram for a Four Stroke Cycle I.C. Engine and Multi Cylinder Engine, Fluctuation of Energy and Production of Energy and Co-Efficient of Fluctuation of Energy, Co-Efficient of Fluctuation of Speed, Energy Stored in a Flywheel**	8	1

II	**Balancing of Inertia Forces and Moments in Machines: Balancing of rotating masses, two plane balancing, determination of balancing masses (graphical and analytical methods), balancing of rotors, balancing of internal combustion engines (single cylinder engines, in-line engines, V-twin engines, radial engines, Lanchester technique of engine balancing, Alignment of shaft..**	**8**	**2**
III	**Governors: Functions Various Terms Used, Types of Governor Watt, Porter, Proell & Hartnell, Inertia Governor, Sensitiveness and Stability of Governor; Isochronous Governor, Hunting, Effort and Power of a Porter Governor, Controlling Force Diagrams For Porter and Spring Controlled Governor, Coefficient of Insensitiveness**	**8**	**3**
IV	**Brakes & Clutches: Materials for friction surface, uniform pressure and uniform wear theories, Design of friction clutches: Disk, plate clutches, cone & centrifugal clutches. Design of brakes: Rope, band & block brake, Internal expanding brakes, Disk brakes**	**8**	**4**
V	**Single Degree Free Vibration: Basic features of vibratory systems, Degrees of freedom ,single degree of freedom, Free vibration, Equations of motion, Natural frequency, Types of Damping, Damped vibration** **Forced Vibration: Response of one degree freedom systems to periodic forcing, Harmonic disturbances, Disturbance caused by unbalance, Support motion, transmissibility, Vibration isolation** **vibration measurement**	**8**	**5**
Guest Lectures (if any)			
Total Hours		**40**	

Suggestive list of experiments:

Text Books-

1. **Rattan SS; Theory of machines; TMH**
2. **Ambekar, AG; Mechanism and Machine Theory; PHI**
3. **Sharma and Purohit; Design of Machine elements; PHI**
4. **Ghosh and Mallik; Theory of Mechanisms and Machines; Affiliated East-West Press, Delhi**
5. **Grover; Mechanical Vibrations**
6. **Theory of Vibrations by Thomson Shingley J.E; Machine Design; TMH**

Reference Books-

1. **Bevan; Theory of Machines**
2. **Norton RL; kinematics and dynamics of machinery; TMH**
3. **Balaney; Theory of Machines**

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. The practical marks are 50, out of which 30 marks will be awarded for viva voce and 20 marks for lab work. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	**Date:07-06-2024**
Approval by Academic council on	**Date:**
Compiled and designed by	**Name 1.Dr. Chandra Pal Singh**
Checked and approved by	**Name 1.Prof. Sandeep Jain**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Mechanical Engineering Department

Semester/Year		IV / II	Program		B.Tech.
Subject Category	DL	Subject Code:	ME-406	Subject Name:	Computer Aided Design

Maximum Marks Allotted						Contact Hours			Total Credits
Theory		Practical			Total Marks				
End Sem	Mid-Sem	End Sem	Lab-Work	Quiz		L	T	P	
-	-	30	10	10	50	0	0	4	2

Prerequisites:(Only for open electives)

Course Objective:

The main learning objective of this course is to prepare the students to create CAD models.

Course Outcomes:

After completion of the course, students would be able to -

1. **understand the fundamental of CAD Graphic standards and their modes**
2. **understand the concept of geometric modelling**
3. **Create 2D and 3D models**
4. **Manipulate models**
5. **get idea of strategic plan of CAD system Design & development**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1							
CO2	3	2	2	1	1							
CO3	3	2	2	1	1							
CO4	3	2	2	1	1							
CO5	3	2	2	1	1							

Contents:

Fundamental concepts of computer graphics and its tools in a generic framework. Create and manipulate geometric models. Create 3D models. Creating and adding geometric tolerances in assembly modelling and apply CAD standard practices in engineering design.

Suggestive list of experiments:

Text Books-

1. **Donald Hearn and M.PaulineBaker"ComputerGraphics",Prentice Hall, Inc. 1992**
2. **CAD/CAM: Computer-Aided Design and ManufacturingGrooverPearson Education India**
3. **Principles of Computer GraphicsWilliam M Neumann and Robert F.SproulMcGraw Hill Book Co. Singapore**

Reference Books-

1. **Chris McMohan and JimmiBrowne ,"CAD/CAM Principles, practice and manufacturingmanagement ", Pearson Education Asia , Ltd, 2000**
2. **Ibrahim Zeid"CAD/CAM- Theory and practice"-McGraw Hill, International edition,1998**

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 marks in laboratory assignments/performance/quiz and 60 marks for End term practical examination where student is supposed to complete the given assignment/task.

Recommendation by Board of studies on	**Date:**
Approval by Academic council on	**Date:**
Compiled and designed by	**Name 1.Dr. Chandra Pal Singh**
Checked and approved by	**Name 1.Prof Sandeep Jain**