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		IV / II	Program		B.Tech.
Subject Category	**DC**	Subject Code:	**ME-403**	Subject Name:	**Theory of Machine-I**

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 is focused on the study of different mechanisms and relative motion between numerous machine components.

Course Outcomes:

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

1. Interpret concepts of link, mechanisms,
2. Compute velocity and acceleration of a point or a link in Mechanism
3. Analyse Gear Mechanism
4. Illustrate Cam & follower mechanisms
5. Analyse stabilityoffourwheelers,Twowheelers,ships and planeundertheactionofgyroscopiceffect

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

CO4	2	3	3	3								
CO5	2	3	3	2								

Contents:

UNITs	Descriptions	Hrs.	CO's
I	**BASICS OF** MECHANISMS:Classification of mechanisms — Basic kinematic concepts and definitions - Degree of freedom,Mobility — Kutzbachcriterion,Gruebler's criterion — Grashof's Law — Kinematic inversions of four-bar chain and slider crank chains — Limit positions — Mechanical advantage — Transmission Angle — Description of some common mechanisms — Quick return mechanisms, Straight line generators,Universal Joint — rocker mechanisms.	8	CO1
II	**KINEMATICS OF LINKAGE MECHANISMS:** Displacement, velocity and acceleration analysis of simple mechanisms — Graphical method— Velocity and acceleration polygons — Velocity analysis using instantaneous centers — kinematic analysis of simple mechanisms — Coincident points — Coriolis component of Acceleration.	8	CO2
III	**GEARS:** Law of toothed gearing — Involutes and cycloidal tooth profiles —Spur Gear terminology and definitions—Gear tooth action — contact ratio — Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears	8	CO3
IV	**GEAR TRAINS** — Speed ratio, train value — Parallel axis gear trains – EpicyclicGearTrains. **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.	8	CO4
V	**KINEMATICS OF CAM JYIECHANISMS:** Cams - Classification of followers and cams, radial cam nomenclature, analysis of follower motion (uniform, modified uniform, simple harmonic, parabolic, cycloidal), pressure angle, radius of curvature, synthesis of cam profile by graphical approach, cams with specified contours.	8	CO5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

1. Calculate degree of freedom of various mechanisms and identify types of kinematic pairs present in it.
2. Measure torque at different speeds and find efficiency of epicyclic gear train.
3. Analysegyroscopiceffectforrotatingdiscinvariousdynamicconditions
4. Experimentally verifytheoreticalrelationof gyroscopic coupleforarotatingdisc.
5. MeasurevariousparameterscomprisingtheCorioli'scomponentofaccelerationandtoverify theoreticalexpression.
6. Plotgraphbetweenfollowerdisplacementandcamrotationanglefordifferentcamfollowerpairsand calculatejumpspeed.
7. Calculate module,gearratioandspeedratioforeachpairofgearsina simple gear train.
8. Calculategearratioandspeedratioforeachpairofgearsinaepicyclic gear train.
9. Analyse slider crank mechanism and its inversions.
10. Analyse double slider mechanism and its inversions

Text Books-

1. Rattan SS; Theory of machines; TMH
2. Ambekar AG; Mechanism and Machine Theory; PHI.
3. Sharma CS; Purohit K; Theory of Mechanism and Machines; PHI.
4. Thomas Bevan; Theory of Machines; Pearson/ CBS PUB Delhi.

Reference Books-

1. Ghosh,A,.Mallik,AK; Theory of Mechanisms & Machines.
2. Rao JS and Dukkipati; Mechanism and Machine Theory; NewAge Delhi

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 Sanjay 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	CO1, CO2 & CO3
II	**Kinematics of Flow**: Description of fluid flow, LagrangianandEulerianmethod, 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	CO2, CO4
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	CO4, CO5
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	CO6
V	**Dimensional Analysis and Dynamic Similitude**: Dimensional analysis, dimensional homogeneity, Rayleigh's method, Buckingham-	8	CO7

	pi theorem, Model analysis, Similitude-Types of Similarities, dimensionless numbers, Similarity laws, specific model investigations (submerged bodies, partially submerged bodies)		
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	**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	1	4	3

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 Jimmi Browne ,"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