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 and its analysis, 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