APPLIED THERMODYNAMICS - II

V Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AMEB18	Core	2	1	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Thermal Engineering is the applications of thermodynamics. The objective of the course is to introduce the mechanical engineering students an understanding of the performance of Rankine cycle, parameters to improve the performance like reheating, regenerating and also Gas turbines and rocket engines and their performance. The knowledge of thermal engineering helps us in improving and designing the various parts of machine elements. The course content is designed in such a way that efficiencies of different turbines could be achieved by the calculation of different empirical values.

II. OBJECTIVES:

The course should enable the students to:

I. Apply the concepts of basic thermodynamics to analyses the performance parameters of steam Gas power cycles.
II. Contrast between various steam generator operating principles to evaluate best possible devices for specific application.
III. Analyze various thermal systems to create futuristic designs.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Explain** the thermodynamic processes, working and analyses of combustion, vapor and gas power cycles for producing electrical and mechanical power.	Understand
CO 2	**Apply** the basic thermodynamic, stoichiometric and fluid dynamics laws for detailed analyses of vapor and gas power cycles thermal turbomachinery combustion and rocket propulsion.	Apply
CO 3	**Illustrate** the schematic and technical diagrams for the representation of vapor and gas power cycles related to by understanding appropriate parametric assumptions and limitations.	Understand
CO 4	**Identify** and obtain values of performance parameters of chemical rocket engine and relationship between them based on rocket thrust equations related to different practical scenarios.	Analyze
CO 5	**Categorize** different configurations and modified methods of vapor and gas power cycles for enhancement of the performance during the production of electrical/mechanical power	Analyze
CO 6	**Describe** the principles of operation, classification, working, accessories and mountings of various steam generators and condensers.	Understand
CO 7	**Illustrate** the schematic diagrams of various steam generators and condensers for depicting and visualizing the flow of the working fluids.	Understand
CO 8	**Interpret** various concepts, principles of operation, theories and phenomena related to the thermal turbomachinery and nozzles.	Understand
CO 9	**Illustrate** the velocity diagrams for the representation of various blade configurations in the designing and solution process of practical turbomachinery problems.	Understand
CO 10	**Discuss** the methodologies, variations in the configurations of thermal gas turbomachinery and rocket propulsion based on the availability of resources.	Understand

CO 11	**Examine** several properties and parameters across various stages of the vapor and gas power cycles related to different practical scenarios of thermal turbomachinery and rocket propulsion.	Apply

IV. SYLLABUS:

MODULE-I	**BASIC CONCEPTS OF RANKINE CYCLE and FUELS & COMBUSTION**	**Classes : 09**
Rankine cycle schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance, regeneration and reheating. Combustion: fuels and combustion, adiabatic flame temperature, stoichiometry, exhaust gas analysis.		
MODULE-II	**BOILERS AND STEAM NOZZLES**	**Classes : 09**
Boilers: Classification, working principles with sketches, boilers mountings and accessories, working principles.; Basics of compressible flow, Isentropic flow of a perfect gas through nozzle, subsonic, supersonic and choked flow-normal shocks-ideal gas tables for isentropic and normal shock flow, flow of steam and refrigerant through nozzles, thermodynamic analysis of nozzle.		
MODULE-III	**STEAM TURBINES AND CONDENSERS**	**Classes: 09**
Steam Turbines: Classification, Impulse turbine-velocity diagrams, pressure and velocity compounding. Reaction turbine-principle of operation, thermodynamic analysis of a stage, degree of reaction, velocity diagrams. Steam Condensers: Requirements of steam condensing plant, classification of condensers, working principle of different types.		
MODULE-IV	**GAS TURBINES**	**Classes: 09**
Gas turbines: Simple gas turbine plant, ideal cycle, essential components, parameters of performance, actual cycle, regeneration, inter cooling and reheating, closed and Semi-closed cycles, merits and demerits, brief concepts of combustion chambers of gas turbine plant.		
MODULE-V	**JET POPULSION AND ROCKETS**	**Classes : 09**
Jet propulsion: Principle of operation, classification of jet propulsive engines, working Principles with schematic diagrams and representation on T-S diagram, thrust, thrust power and propulsion efficiency, turbo jet engines, needs and demands met by turbo jet, schematic diagram, thermodynamic cycle, performance evaluation; Rockets: Application, working Principle, classification, propellant type, thrust, propulsive efficiency, specific impulse, solid and liquid propellant rocket engines.		

V. Text Books:

1. R. K. Rajput, "Thermal Engineering", Lakshmi Publications, 8th Edition, 2015.
2. V.Ganeshan "Gas turbines", Tata McGraw-Hill, 3rd Edition, 2010.

VI. Reference Books:

1. P. Khajuria, S. P Dubey, "Gas Turbines and Propulsive systems", Dhanpat Rai Publishers., 1st Edition, 2012.
2. Ballaney, "Thermal Engineering", Khanna Publishers, 1st Edition, 2012.
3. R. Yadav, "Thermodynamics and Heat Engines", Central Book Depot, 1st Edition, 2002.
4. P.K Nag, "Engineering Thermodynamics", Tata McGraw-Hill publishing Co. Ltd.

VII. Web References:

1. http://www.newworldencyclopedia.org/entry/Internal_combustion_engine
2. http://www.livescience.com/50776-thermalengineering.html

VIII. E-Text Book:

1. http://www.ebookdownloadz.net/2014/08/ Thermal engineering -by-R.K Rajput.html