Course code	Course Name	L-T-P - Credits	Year of Introduction
ME207	THERMAL ENGINEERING-I	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

- To impart the basic knowledge of the properties of steam and its application.
- To give knowledge on the analysis of air compressors and gas turbines
- To provide ideas on modes of heat transfer and heat transfer equations

Syllabus

Review of Thermodynamic laws and corollaries- Thermodynamic relations -Steam Engineering- Rankine cycle, steam boilers, steam nozzle, steam turbines-Air compressors- Gas turbines- Heat transfer – rate equations – laws of radiation heat transfer..

Expected outcome .

At the end of the course the students will be able to

i. Integrate the concepts, laws and methodologies of thermodynamics in the analysis of cyclic processes

ii. Apply the thermodynamic concepts in applications like Steam Turbines, Compressors, Gas turbines.

Text Books:

1. Rudramoorthy , Thermal Engineering, McGraw Hill Education India,2003
2. R.K Rajput, Thermal Engineering, Laxmi publications,2013
3. Rathore**,** Thermal Engineering 1e, McGraw Hill Education India, 2010
4. Ballaney P.L, Thermal Engg, Khanna Publishers, 2007

Data Book (Approved for use in the examination): Steam Tables

References:

1. Kearton WJ, Steam turbines theory and practice- A text book for engineering students, Aristophanes press, 2011
2. Cohen, Rogers and Saravanamuttoo, Gas turbine Theory, Longman, 1996.
3. Nag P K, Thermodynamics, Tata McGrawhill, 2011

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Review of thermodynamic laws and corollaries: Transient flow analysis, second law of thermodynamics, Availability and unavailability. Thermodynamic relations.	8	15%
II	Steam engineering- Entropy of steam, temperature-entropy diagram, Rankine cycle, modified Rankine cycle, Improvement in steam cycles, binary vapour cycle, Steam condensers.	8	15%
	FIRST INTERNAL EXAMINATION		
III	Steam boilers- Working of high pressure boilers- Babcock and Wilcox boiler, Benson boiler. Steam turbines – different types,	10	15%

	velocity diagrams, condition for maximum efficiency, Cycles with reheating and regenerative heating. Steam nozzle- Flow through steam nozzles, super saturated flows.		
IV	Compressors- reciprocating air compressors- work done and efficiency, volumetric efficiency, effect of clearance, Rotary compressors, centrifugal and axial compressors.	10	15%
SECOND INTERNAL EXAMINATION			
V	Gas turbines-open and closed cycles. Ideal gas turbine cycle, compressor and turbine efficiencies, simple cycle with regeneration, intercooling and reheating.	10	20%
VI	Heat transfer- Different modes of heat transfer, Derivation of heat transfer equations for all modes of heat transfer (Fourier law, Newtons law of cooling, Planck's law, Kirchoff's law, Wiens displacement law and Stefan Boltzmanns law)- Simple problems.	10	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Time: 3 hours

The question paper should consist of three parts

Part A
4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B
4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C
6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.