Course No.	Course Name	L-T-P - Credits	Year of Introduction
AU202	ADVANCED THERMODYNAMICS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

- To impart knowledge to the students thermodynamic concepts and different power cycles.
- To make the students to solve numerical problems based on laws of thermodynamics and different power cycles.

Syllabus

Concepts of thermodynamic systems, Thermometry, first law of thermodynamics, first law for open and closed systems, second law of thermodynamics, concept of entropy, Availability, third law of thermodynamics, Thermodynamic relations, Properties of pure substances, Different power cycles.

Expected outcome.

After completing this course the students will be able to

i. explain thermodynamic concepts and different power cycles
ii. solve numerical problems based on laws of thermodynamics and different power cycles.

Text Book:

1 P K Nag, *Engineering Thermodynamics*, Tata McGraw Hill Publishing Company Ltd. New Delhi 2008.
2. *Thermal Engineering* by R.K.Rajput, Laxmi publications Ltd.

Data Book (Approved for use in the examination):

References:

1. *Thermodynamics an Engineering Approach* by Yunus A Cengel& Michael A Boles
2. *Engineering Thermodynamics* by R.K. Rajput.
3. J. F. Lee and FW Sears, *Engineering Thermodynamics*, Addison-Wesleg Publishing Company, London, 1962.
4. M. A.chuthan, *Engineering Thermodynamics*,Prentice Hall of India Private Ltd,
5. New Delhi 2002.
6. J.P. Holman, *Thermodynamics*, McGraw Hill book company New York, 1988.
7. Mark W. Zemansky, *Heat and Thermodynamic*, McGraw Hill, New Delhi, 2001.
8. Roy T, *Basic Engineering Thermodynamics*, Tata McGraw Hill Publishing Company Ltd. New Delhi 1989.
9. *Thermal Engineering* by Mahesh M Rathore

Course Plan

Module	Contents	Hours	Sem.ExamMarks
I	Fundamentals concepts–scope and limitations of thermodynamics. Thermodynamic systems– different types of systems – macroscopic and microscopic analysis – continuum – Properties– state – processes. Thermodynamics equilibrium – Equation of state of an ideal gas –Real gas relations	8	15%
II	Laws of thermodynamics- Zeroth law of thermodynamics – Thermal equilibrium – Concept of temperature – Thermometry –Temperature scales. Work and heat – First	9	15%

	law of thermodynamics– Concept of energy - First law for closed and open systems – Specific heats – internal energy and enthalpy – Steady flow energy equations - Joule Thompson effect.		
FIRST INTERNAL EXAMINATION			
III	Second law of thermodynamics- Various statements and their equivalence_ Reversible process and reversible cycles- Carnot cycles- Corollaries of the second law. Clausius inequality- Concept of entropy – Calculation of change in entropy in various thermodynamic processes – Reversibility and irreversibility – Available and unavailable energy – Third law of thermodynamics.	9	15%
IV	Thermodynamic relations – Combined first and second law equations – Hemholtz and Gibbs functions – Maxwell relations- Equations for specific heats, internal energy, enthalpy and entropy – Clausius-Clapeyron equations - applications of thermodynamic relations.	8	15%
SECOND INTERNAL EXAMINATION			
V	Properties of pure substances – PVT, PT and TS diagrams, Compressibility factor – Law of corresponding states, Mollier diagrams- Mixture of gases and vapours- mixture of ideal gases – Dalton's law – Gibbs law- Thermodynamic properties of mixtures-Numerical problems using steam tables.	11	20%
VI	Different power cycles- Brayton cycle, reversed Brayton cycle, Lenoir cycle, Stirling cycle, Atkinson cycle, Rankine cycle- Numerical problems based on power cycles.	11	20%
END SEMESTER EXAM			

Question Paper Pattern

Total marks: 100, Time: 3 hours
The question paper shall 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.