ME355 THERMAL SYSTEM										
L	**T**	**P**	Credit	Area		**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
3	0/1	2/0	4	DEC/GEC		15/25	25	20/25	40/50	-

Objective: To enable the students to understand the basics of pure substance, ideal and real gases, Rankine cycle. To understand boilers, steam turbines, and condensers.

Syllabus		**Contact Hours**
Unit-1	**Fundamentals**: properties of pure substance in Solid, Liquid and Vapour Phases, PVT Behavior of simple compressible system, T-S and H-S diagram, Steam Tables, determination of quality of steam, Throttling Calorimeter, Combined Separating & Throttling Calorimeter, Maxwell and other thermodynamics relations, mixture of non reactive ideal gases, Real gases, Compressibility chart, Law of corresponding state, Air water vapor mixture, calculation of properties of air water vapour mixture.	**8**
Unit-2	**Rankine Cycle and Analysis**: Rankine cycle and its representation on T-S and H-S diagrams; Effect of low backpressure and high entry pressure and temperature and its limitations; necessity of re-heating, ideal and actual regenerative feed water heating cycle and its limitations. Typical feed water heating arrangements for various capacity power plants.	**8**
Unit-3	**Introduction To Boilers**: Classification of Boilers, Boiler mountings and accessories; draft systems, circulation system; Combustion and its calculations, and Boiler performance.	**6**
Unit-4	**Steam Nozzles**: Types of Nozzles, Flow of steam through nozzles; Condition for maximum discharge through nozzle; Nozzle efficiency. Effect of friction and Supersaturated flow through nozzle.	**6**
Unit-5	**Steam Turbines** : Working principle and types of steam turbines; Velocity diagrams for impulse and reaction turbines, compounding of impulse turbines; Optimum velocity ratio and maximum efficiency. Comparison of impulse and reaction turbines. Condition line and reheat-factor, losses in steam turbines; governing of steam turbines.	**8**
Unit-6	**Condensers and Cooling towers**: Types and working of condensers, types and performance of cooling towers.	**6**
	Total	**42**

Reference Book:	
1	**Engineering Thermodynamics** by P.K.Nag, Tata McGraw Hill Publishing Company Limited, ISBN – 1259062562, 2013.
2	**Engineering Thermodynamics**byRogers, Pearson Education, ISBN- 631197036.
3	**Thermodynamics** by Kenneth Wark, Mcgraw-hill Book Company, 5th edition, ISBN- 0070682860, 1988.
4	**Engineering Thermodynamics: work and heat transfer** by Gordon Rogers and Yon Mayhew, Longman, 4th edition, ISBN – 0471861731, 1992.
5	**Fundamentals of Classical Thermodynamics** by Van Wylen and Sonntag, John Wiley & Sons Inc., 3rd edition, ISBN – 0471861731, 1986.
6	**Fundamentals of Engineering Thermodynamics** by Moran and Shaprio, **John Wiley & Sons, Inc., 7th edition, ISBN – 0470917687, 2010.**
7	**Thermodynamics: An Engineering Approach** by Cengel and Boles, The McGraw-Hill Companies, 8th edition, ISBN: 0073398179, 2014.
8	**Applied Thermodynamics for Engineering Technologists**byT.D. Eastop, Prentice Hall, 5th edition, ISBN-05820919344, 1993.
9	**Treatise on Heat Engineering** by V. P.Vasandani and D.S. Kumar, Metropolitan Book Co. (p) Ltd., ISBN- 810003500.

Course Outcomes

CO1	Use thermodynamic terminology correctly.
CO2	Explain fundamental thermodynamic properties.
CO3	Derive and discuss the first and second laws of thermodynamics.
CO4	Solve problems using the properties and relationships of thermodynamic fluids.
CO5	Students must have understanding of thermodynamic fundamentals before studying their application in applied thermodynamics.
CO6	The understanding of thermodynamic properties and processes will assist students in other related coursework.

CO-PO/PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1
CO2	3	3	2	3	1	0	0	0	0	0	0	1	2	1	1
CO3	3	3	3	3	1	0	0	0	0	0	0	2	3	3	2
CO4	3	3	3	3	1	0	0	0	0	0	0	1	3	3	2
CO5	2	2	2	2	2	0	0	0	0	0	0	1	2	2	2