

Course code: Course Title	Course Structure			Pre-Requisite
ME104: Thermal Engineering I	L	T	P	
	3	0	2	NIL

**Course Objective:**

S. NO	Course Outcomes (CO)
<b>CO1</b>	Describe the basic thermal engineering concepts, boilers, steam turbines and condensers.
<b>CO2</b>	Describe the various types of Steam nozzle with its efficiency and the condition of maximum discharge
<b>CO3</b>	Analyse the working of boilers, steam turbines and condensers
<b>CO4</b>	Evaluate the performance of Simple, Reheat, Regenerative Rankine Cycle for various operating conditions
<b>CO5</b>	Examine and investigate the working and performance of impulse and reaction steam turbines with its losses and governing; various types of Steam Condensers and Cooling Towers

S. NO	Contents	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	7
UNIT 2	Rankine Cycle and Analysis: Rankine cycle and its representation on T-S and H-S diagrams; effect of low back pressure and high entry pressure and temperature and its limitations; necessity of reheating, ideal and actual regenerative feed water heating cycle and its limitations, typical feed water heating arrangements for various capacity power plants.	7
UNIT 3	Introduction to Boilers: Classification of boilers, boiler mountings and accessories; draft systems, circulation system; combustion and its calculations, and boiler performance.	7
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.	7
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, blade twisting, comparison of impulse and reaction turbines, condition line and reheat-factor, losses in steam turbines; governing of steam turbines	7

<b>UNIT 6</b>	Steam Condensers: Types and working of condensers, types and performance of cooling towers	7
	<b>TOTAL</b>	<b>42</b>

<b>REFERENCES</b>		
<b>S.No.</b>	<b>Name of Books/Authors/Publishers</b>	<b>Year of Publication / Reprint</b>
1	Basic and Applied Thermodynamics by P K Nag, Tata McGraw Hill Education private limited	2017
2	Thermodynamics by Yunus A Cengel and Michael A Boles, MacGraw Hill Education	2017
3	Thermal Engineering by Mahesh M Rathore, Tata McGraw Hill Education private limited	2010
4	Thermal Engineering by P L Ballney, Khanna Publishers	1966
5	Thermal Engineering by Sadhu Singh and Sukumar Pati, Pearson India Education Services Pvt. Ltd. , 2018.	2018
6	Applied Thermodynamics by Onkar Singh, Third edition, 2009, New Age Publications	2009