

COURSE CODE	THERMAL ENGINEERING	L	T	P	C
1151ME112		2	2	0	3

1. Preamble

This course imparts understanding about the power generation using heat energy conversion and makes an attempt to be conversant with the equipment's used in the process. It helps in understanding the thermodynamic concepts, the construction and the working principles of various engineering devices such as steam generators, steam nozzles, steam turbine, internal combustion engines and gas turbines.

2. Pre-Requisite

Heat and Mass Transfer 1151ME115

3. Links to Other Courses

1	Power Plant Engineering	1151ME116
2	Automobile Engineering	1152ME103

4. Course Educational Objectives

- To understand the concepts associated with the construction and the working principles of various thermal devices such as steam generators, steam nozzles, steam turbines, I.C. engines and gas turbines.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO No.	Course Outcome	Level of learning domain (Based on revised Bloom's)
CO1	Explain the working principle of various types of steam generator, components and its performance.	K3
CO2	Explain the working principle of steam ejector and solve the steam nozzle problems.	K3
CO3	Explain the working principles of steam turbines and its performance.	K3
CO4	Apply the concepts of radiation heat transfer and solve problems.	K3
CO5	Apply the concepts of mass transfer and solve problems.	K3

(K3-Apply)

6. Correlation of COs with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	L	L			L						L	M	
CO2	H	L	L									L	M	
CO3	H	L	L									L	M	
CO4	H	L	L			L	L					L	M	
CO5	H	L	L									L	M	

H- High; M-Medium; L-Low

7. COURSE CONTENTS

Steam tables, Mollier charts and psychometric charts are required.

UNIT I STEAM GENERATORS

L-6 T-6

Types and classification- low pressure fire & water tube boilers-mountings & accessories-performance testing of boilers-equivalent evaporation-boiler efficiency-boiler trial & Heat balance sheet – criteria for selection of a boiler.High pressure boilers introduction.

UNIT II STEAM NOZZLES

L-6 T-6

Expansion of steam through nozzle-types of nozzles-condition for maximum discharge- critical pressure ratio- effect of friction – super saturated flow – steam jet pump

UNIT III STEAM TURBINES

L-6 T-6

Principles of impulse, reaction and impulse-reaction turbines-compounding-velocity diagrams for simple & multistage turbines-work done on turbine blades & efficiencies-losses in steam turbines-governing of steam turbines.

UNIT IV INTERNAL COMBUSTION ENGINES

L-6 T-6

Engine types & applications-actual cycles-valve and port timing diagrams-fuel supply-ignition-cooling & lubrication systems for SI engines & CI engines.Cetane & octane numbers of fuels- combustion – knocking & detonation – scavenging, turbocharging and supercharging- performance of IC engine- frictional power & various efficiencies & energy calculations.

UNIT V GAS TURBINES

L-6 T-6

Open & closed gas turbines- ideal & actual cycles- compressor & turbine efficiency-effect of operating variables on thermal efficiency & work out put-work ratio-types of combustion of chambers-combustion efficiency –methods to improve performance-inter cooling reheating & regeneration.

Total: 30 + 30 = 60 Periods

8. Text Books

1. Nag. P.K., "Thermal Engineering", Tata McGraw Hill, Fourth Edition , 2012
2. Domkundwar, A., "A Course in Thermal Engineering", Dhanpat Rai & Co., New Delhi, 2011
3. V.Ganesan, " International Combustion Engines", Tata McGraw Hill, Fourth Edition , 2012

9. References

1. Rajput, R. K., "Thermal Engineering", Laxmi Publications, 9th Edition, New Delhi, 2013
2. J.B Heywood, "I.C engines fundamentals", McGraw Hill International Edition .2011.
3. P.W Gill. J.H Smith & E.J Ziurgs," Fundamentals Of I.C Engines", Oxford & I B H Publication, 2007, New Delhi.
4. R.YADAV, "Steam & Gas Turbines", Central Publishing House, 2000.
5. P.L Ballaney, "Thermal Engineering", Khanna Publication, 5th Edition, 2005.