INSTITUTE	**DIPLOMA STUDIES**
PROGRAM	**DIPLOMA ENGINEERING (MECHANICAL ENGINEERING)**
SEMESTER	**4**
COURSE TITLE	**THERMAL ENGINEERING – 1**
COURSE CODE	**09ME2402**
COURSE CREDITS	**5**

Objective:

1 Main aim to introduce thermal engineering-1 in the syllabus to provide basic knowledge of power plant devices. In industry, the mechanical engineers are supposed to operate and maintain thermal equipment. Furthermore, students will get detail information about working and construction of boiler, condenser, heat exchangers, steam prime movers, air compressor and regarding various modes of heat transfer.

Course Outcomes: After completion of this course, student will be able to:

1 To study about steam tables and mollier chart
2 To calculate the efficiency of the boiler
3 To understand the concept and applications of prime movers.
4 To understand concept of air compressor.
5 To identify to various modes of heat transfer
6 To calculate the efficiency of heat exchanger

Pre-requisite of course: Basics of thermodynamics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**TWO PHASE SYSTEM** Concept of two phase system, Concept of pure substance Formation of steam, Terminology of steam, Application of steam table & mollier chart, Method of measurement of dryness fraction of steam, Numerical	8

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Contents : Unit	Topics	Contact Hours
2	**BOILERS, MOUNTINGS AND ACCESSORIES** Concept of steam boilers as per definition of IBR, Classification of boiler, Babcock Wilcox boiler, Cochran boiler, Cornish boiler, Lancashire boiler, Waste heat recovery boiler, Boiler mountings and accessories and its working, Performance of boiler Maintenance of boiler	12
3	**STEAM PRIME MOVERS** Concept of steam prime movers, Principle of Steam nozzle, Classification of steam nozzle, Mass and velocity of steam through nozzle, principle of steam turbine, Main component and working of steam turbine, Necessity of compounding of steam turbine, Pressure compounding, Velocity compounding, Pressure Velocity compounding	8
4	**STEAM CONDENSERS AND COOLING TOWER** Elements of steam condensing plant and classification of condensers, Requirement of condenser, Jet condenser and its working, , Surface condenser, Vacuum and condenser efficiency of condenser,, Classification of cooling tower, Natural draught cooling tower, Chimney tower, Counter flow induced draught cooling tower, Counter flow forced draught cooling tower	8
5	**HEAT TRANSFER** Various modes of heat transfer, Conduction heat transfer, Fourier's law, Thermal conductivity, Heat transfer through single wall, composite wall and composite cylinder, Heat transfer by convection, Concept of boundary layer, Different numbers, Free convection and forced convection, Radiation heat transfer, Concept of black body, Numerical	12
6	**AIR COMPRESSOR** Principle of working of air compressor, Classification of air compressor, Terminology of compressor, Working of Reciprocating without clearance and with clearance, Work done for compressor, Single stage compressor and multistage compressor, Reciprocating air compressor with inter cooling, Working of rotary compressor, Application of compressor,	8
Total Hours		**56**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**To study about basic thermodynamic properties.** To study about basic thermodynamic properties.	2
2	**To calculate the dryness fraction of steam.** To calculate the dryness fraction of steam.	2
3	**To study about steam boilers.** To study about steam boilers.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
4	**To study about mountings and accessories.** To study about mountings and accessories.	2
5	**Determine the performance of steam boilers.** Determine the performance of steam boilers.	4
6	**Determine the various parameters related to nozzle efficiency.** Determine the various parameters related to nozzle efficiency.	2
7	**To study about various parameters of steam turbine.** To study about various parameters of steam turbine.	2
8	**Determine the performance of condenser.** Determine the performance of condenser.	2
9	**To study about cooling tower.** To study about cooling tower.	2
10	**Numerical based on dalton's law.** Numerical based on dalton's law.	2
11	**Numerical based on heat transfer processes.** Numerical based on heat transfer processes.	2
12	**Determine the performance of air compressor.** Determine the performance of air compressor.	4
Total Hours		**28**

Textbook :

1 Thermal Engineering - I, K. K. Patel, Atul Prakashan, 2018

References:

1 Thermal Engineering, Thermal Engineering, R. K. Rajput, Laxmi Publications, 2005

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
28.00	35.00	37.00			

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

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Instructional Method:

3 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc23_me31/preview