LESSON PLAN

Course Code	Course Title	Semester	Branche	Conduct Periods /Week	A.Y	Date of commencement of Semester
23ME5T02	THERMAL ENGINEERING	V	Mechanical Engineering	5	2025-26	09 -07 -2025

COURSE OUTCOMES

CO1	Summarize the principles and compare the performance of engine cycles
CO2	Analyze the performance characteristics of internal combustion engines and boilers
CO3	Demonstrate the working of steam nozzles, turbines, and condensers.
CO4	Apply the principles to determine the efficiency of compressors and gas turbines.
CO5	Distinguish between different types of jet propulsion and rocket systems
CO6	Describe the performance of solar energy systems and its applications

UNIT	Out Comes/ Blooms Level	Ref. No.	Topics/Activity **Air standard Cycles:**	Text Book /Reference	Conduct Hour	Delivery Method
I	CO1: Summarize the principles and compare the performance of engine cycles.		**UNIT –I (Air standard Cycles & Actual Cycles and their Analysis)**			Chalk& Talk, PPT, Flipped class room (active learning Method)
		1.1	Otto Cycle with P–V & T–s diagrams - and thermal efficiency - mean effective pressure	T_1& T_2	1	
		1.2	Diesel Cycle with P–V & T–s diagrams - and thermal efficiency	T_1&T_2	1	
		1.3	Dual Combustion cycle with P–V & T–S diagrams - and Thermal Efficiency	T_1	1	
		1.4	Comparison of Otto, Diesel and Dual Cycles, Brayton Cycle with P–V & T–S diagrams - and thermal efficiency.	T_1& R_1	1	
		1.5	Introduction, Comparison of Air standard and actual cycles	T_1& R_1	1	
		1.6	Time loss factor, Heat loss factor	T_2& R_2	1	
		1.7	Exhaust blow down, loss due to gas exchange process	T_2& R_2	1	
		1.8	Volumetric Efficiency	T_1&T_2	1	
		1.9	Loss due to Rubbing Friction	T_1 & T_2	1	
		1.10	Actual & fuel Air Cycles of CI Engines.	T_1, & R_1	1	
				Total	**10**	
II	CO2: Analyze the performance characteristics of internal combustion engines and boilers		**UNIT-II (I.C. Engines & Boilers)**			
		2.1	Classification & Working principles of I.C. Engines – four stroke petrol engine with theoretical and actual P-V diagrams	T_1&T_2	1	
		2.2	Four stroke Diesel engine with theoretical and actual P-V diagrams	T_1& R_1	1	
		2.3	Two stroke petrol engine & Diesel engine	T_1& R_1	1	
		2.4	Comparison between two stroke and four stroke engine and petrol and diesel engines	T_1& R_1	1	

		2.5	Valve & Port Timing Diagram	T_1& R_1	1	Chalk& Talk, &PPT, Videos. Model based learning (active learning Method)
		2.6	Engine systems – Fuel system-in petrol and diesel engine – working principle of simple Carburetor and fuel injector	T_1& R_1	1	
		2.7	Ignition system	T_1& R_1	1	
		2.8	Cooling system	T_1& R_1	1	
		2.9	Lubrication system	T_1& R_1	1	
		2.10	Principles of super charging & Turbo Charging	T_1& R_1	1	
		2.11	Boilers : Important terms, Classification, working principles of L.P. boilers	T_1& R_1	2	
		2.12	Working principles of H.P boilers	T_1& R_1	1	
		2.13	Boiler mountings and accessories	T_1& R_1	1	
		2.14	Draught- induced and forced.	T_1& R_1	1	
			Total		**15**	
	CO3: Demonstrate the working of steam nozzles, turbines, and condensers.	**UNIT-III (Steam nozzle, Steam turbines and Steam condensers)**				
		3.1	**Steam nozzles:** Functions, applications, types, flow through nozzles, ,.	T2& R_1	1	Chalk& Talk, &PPT, Videos, Flipped class room (active learning method)
		3.2	condition for maximum discharge	T2& R_1	1	
		3.3	criteria to decide nozzle shape, Wilson line	T2& R_1	1	
		3.4	**Steam turbines:** Classification – impulse turbine; velocity diagram, ,	T2& R_1	1	
		3.5	Effect of friction, Diagram efficiency	T2& R_1	1	
		3.6	De-leval turbine - methods to reduce rotor speed,	T2& R_1	1	
		3.7	Combined velocity diagram.	T2& R_1	1	
		3.8	Reaction turbine: Principle of operation, velocity diagram,	T2& R_1	1	
		3.9	Parson's reaction turbine – condition for maximum efficiency	T2& R_1	1	
		3.10	**Steam condensers**: Classification, working principles of different types	T2& R_1	2	
		3.11	vacuum efficiency and condenser efficiency.	T2& R_1	1	
		3.12	Problems	T2& R_1	3	
				Total	**15**	
IV	**CO4:** Apply the principles to determine the efficiency of compressors and gas turbines.	**UNIT-IV (Air Compressors and Gas Turbines)**				
		4.1	Air Compressors: function, applications and Classification, Reciprocating type Air Compressor- Working principles	T2& R_1	1	
		4.2	Expression for equation of work without and with clearance volume .	T2& R_1	1	
		4.3	Volumetric efficiency, clearance ratio, Multi-stage compression, Expression for equation of work for two stage compression.	T2& R_1	1	
		4.4	Conditions for minimum work for two stage reciprocating type air compressor. Centrifugal Compressors: Principle,	T2& R_1	1	

			velocity and pressure variation, velocity diagrams.			Chalk& Talk, &PPT, Videos, Think, pair share (active learning Method)
		4.5	Rotary type air compressors – Lysholm compressor – Working principle and efficiency considerations.	T2& R_1	1	
		4.6	Roots blower compressor, Vane blower compressor – Working principle and efficiency considerations.	T2& R_1	1	
		4.7	Axial flow Compressors: Working principle, pressure rise and efficiency calculations.	T2& R_1	1	
		4.8	**Gas Turbines:** Applications, classification. Simple gas turbine plant – ideal cycle, components	T2& R_1	1	
		4.9	Methods for Improvement of thermal efficiency of open cycle gas turbine plant-reheating.	T2& R_1	1	
		4.10	Regeneration, Inter cooling	T2& R_1	1	
		4.11	Methods for Improvement of thermal efficiency of Closed cycle gas turbine plant	T2& R_1	1	
		4.12	Problems	T2& R_1	2	
				Total	**13**	
V	**CO6:** Describe the performance of solar energy systems and its applications **CO5** :Distinguish between different types of jet propulsion and rocket systems	**Jet Propulsion, Rockets and Solar Engineering:**				Chalk& Talk, &PPT, quiz (active learning Method
		5.1	Jet Propulsion: Principle, classification, Turbo jet engine – T-S diagram, performance evaluation	T2& R_1	1	
		5.2	Turbo prop engine – T-S diagram, performance evaluation	T2& R_1	1	
		5.3	Ram-jet and pulse-jet engine – Working principle	T2& R_1	1	
		5.4	**Rockets:** Working Principle, classification	T2& R_1	1	
		5.5	Solid propellant rocket engines.	T2& R_1	1	
		5.6	Liquid propellant rocket engines.	T2& R_1	1	
		5.7	Solar radiation, Solar radiation at the earth Surface, Measurement of Solar radiation: Solar energy – Importance	R4	1	
		5.8	Solar collectors	R4	1	
		5.9	PV cells	R4	1	
		5.10	Storage methods and applications	R4	1	
				Total	**10**	
				CUMULATIVE PROPOSED PERIODS	**63S**	

Text Books:

S.No	Authors, Book Title, Edition, Publisher, Year of Publication
T1	V. Ganesan, Internal Combustion Engines, 4th Edition, Tata McGraw Hill, 2017
T2	R. K. Rajput, Thermal Engineering,10th Edition, Lakshmi Publications, 2018

T3	R. S. Khurmi, & J S Gupta, Thermal Engineering, 5th Edition, Chand, 2020
Reference Books:	
S.No.	**Authors, Book Title, Edition, Publisher, Year of Publication**
R1	Mahesh M Rathore. Thermal Engineering-I, 4th Edition, Tata McGraw Hill, 2018
R2	Rudramoorthy, Thermal Engineering, 4th Edition, Tata McGraw-Hill Education India, 2010
R3	G.N. Tiwari, Solar Energy: Fundamentals, Design, Modeling and Applications, 5th Edition, Narosa Publishing House, 2021
R4	S P Sukhatme , Solar Energy, 4th Edition, Tata McGraw Hill, 2017
Web Details	
W1	https://onlinecourses.nptel.ac.in/noc20_me42/preview
W2	https://www.youtube.com/watch?v=gCKiXpIQ8n8
W3	https://www.youtube.com/watch?v=OkHXxHgPpOs
W4	https://www.youtube.com/watch?v=n1O8C6lb2Ho
W5	https://www.youtube.com/watch?v=DuLFDzQVTU4
W6	https://www.youtube.com/watch?v=QLcxx6MJnbA&list=PLbMVogVj5nJSCWZNo0sUSxanAp4TN2G-x

S.NO.	Details	Name	Signature
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ii.	Course Coordinator	Mr. B SRINIVAS.	
iii.	Module Coordinator	Dr. R. LALITHA NARAYANA.	
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Principal