

BMEE303L	Thermal Engineering Systems	L	T	P	C
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Pre-requisite	BMEE203L	Syllabus version			
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Course Objectives					
<ol style="list-style-type: none"> 1. To guide the students to apply the laws of thermodynamics in applications of thermal systems. 2. To help students gain essential and basic knowledge of various types of internal and external combustion engines and train them with the procedures for the testing of engines and fuels. 3. To equip the students to analyse steam turbine, gas turbine cycles, refrigeration and air – conditioning systems. 					
Course Outcome					
At the end of the course, the student will be able to					
<ol style="list-style-type: none"> 1. Apply the thermodynamics laws to the working of IC engines. 2. Analyze performance parameters of IC engines. 3. Design a steam nozzle for thermal power plant and analyze the performance of reciprocating air compressors. 4. Analyze the performance parameters of steam and gas power cycles. 5. Compare various refrigeration systems based on their performance. 6. Evaluate the cooling load requirements for conditioned space. 					
Module:1	IC Engines	7 hours			
Working principle of 2-stroke and 4-stroke SI and CI engines - Valve and port timing diagrams, Wankel engine, simple carburettor - Ignition system - Combustion stages in SI and CI engine - Knocking and detonation - Fuel injection system - MPFI, CRDI, GDI – Rating of fuels - Cooling system, Lubrication system - super charging and Turbo charging.					
Module:2	IC Engines Performance	6 hours			
Performance test - Measurement of Brake power, Indicated power and Frictional power, Fuel consumption, Air consumption - Heat balance test - Morse test and Retardation test on IC engine.					
Module:3	Air Compressor	6 hours			
Reciprocating compressors - Construction - Working - Effect of clearance volume – Multi-staging – Volumetric efficiency – Isothermal efficiency.					
Module:4	Steam nozzle	6 hours			
Steam Nozzles – One-dimensional steady flow of steam through a convergent and divergent nozzle – Metastable flow.					
Module:5	Steam turbine and Gas turbine	6 hours			
Steam turbine – Impulse and Reaction turbine – Performance Gas turbine - Open and Closed cycle gas turbine, Reheating, Regeneration and Intercooling.					
Module:6	Refrigeration	6 hours			
Air refrigeration system - Vapour compression refrigeration system - Components - Working - P-H and T-S diagrams - Calculation of COP - Effect of sub-cooling and super-heating – Selection and properties of refrigerant - Vapour absorption system - NH ₃ - water system, Vapour adsorption system. Cryogenic engineering - Introduction, Application, Cryo-coolers.					
Module:7	Air-conditioning	6 hours			
Types of air-conditioning system and its working principle – Psychrometry - Psychrometric properties, processes and chart – heating and cooling load calculations.					
Module:8	Contemporary Issues	2 hours			
		Total Lecture hours:		45 hours	

Text Book			
1.	Rajput R.K., Thermal Engineering, 2017, 10 th Edition, Laxmi Publications (P) Ltd.		
Reference Books			
1.	Ganesan, V., Internal combustion engines. 2012, McGraw Hill Education (India) Pvt Ltd.		
2.	Manohar Prasad., Refrigeration and Air Conditioning, 2015, 3 rd Edition, New Age International.		
3.	Soman, K., Thermal Engineering. 2011, PHI Learning Pvt. Ltd.		
Mode of Evaluation: CAT, Written assignment, Quiz, FAT.			
Recommended by Board of Studies		09-03-2022	
Approved by Academic Council		No. 65	Date 17-03-2022