

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE MODULE

Faculty Name:				Academic Year: 2025-26			
Department: MECHANICAL ENGINEERING							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BME401	Applied Thermodynamics	CORE	Elements of Mechanical Engineering, Basic Thermodynamics	2	2	0	50 Hrs
Objectives	<p>Course objectives:</p> <ul style="list-style-type: none"> • Explain the air standard cycle and combustion in I. C. Engines. • Describe the gas power cycle and vapour power cycles. • Explain the performance of compressor. • Explain the concepts of Refrigeration and Air conditioning. 						
Topics Covered as per Syllabus							
<p>Module – 1 Air standard cycles: Carnot cycle. Otto, Diesel, Dual and cycles, p-v and T -s diagrams, description, efficiencies and mean effective pressures. Comparison of Otto and Diesel cycles. I.C. Engines: Classification of IC engines, Combustion of SI engine and CI engine, Detonation and factors affecting detonation, Performance analysis of I.C Engines, Heat balance, Morse test.</p> <p>Module –2 Gas power Cycles: Gas turbine (Brayton) cycle; description and analysis. Regenerative, Intercooling and reheating in gas turbine cycles. Jet Propulsion cycles: Turbojet, Turboprop, Turbofan, Ram Jet, Rocket, Pulse Jet, Ram Rocket.</p> <p>Module –3 Vapour Power Cycles: Carnot vapour power cycle, drawbacks as a reference cycle. Simple Rankine cycle; description, T-S diagram, analysis for performance. Comparison of Carnot and Rankine cycles. Effects of pressure and temperature on Rankine cycle performance. Actual vapour power cycles: Actual vapour power cycles, regenerative vapour power cycle with open and closed feed water heaters. Reheat Rankine cycle.</p> <p>Module –4 Refrigeration Cycles: Vapour compression refrigeration system; description, analysis, refrigerating effect. Capacity, power required, units of refrigeration, COP, Refrigerants and their desirable properties, alternate Refrigerants. Vapour absorption refrigeration system. Psychrometrics and Air-conditioning Systems: Psychrometric properties of Air (<i>only for review</i>), Psychrometric Chart, Analyzing Air-conditioning Processes; Heating, Cooling, Dehumidification and Humidification, Evaporative Cooling. Adiabatic mixing of two moist air streams.</p> <p>Module –5 Reciprocating Compressors: Operation of a single stage reciprocating compressors. Work input through p-v diagram and steady state steady flow analysis. Effect of Clearance and Volumetric efficiency. Adiabatic, Isothermal and Mechanical efficiencies. Multi-stage compressor, saving in work, Optimum intermediate pressure, Inter-cooling, Minimum work for compression. Steam nozzles: Flow of steam through nozzles, Shape of nozzles, effect of friction, Critical pressure ratio, Super saturated flow.</p>							

List of Text Books	
TEXT BOOKS:	
<ol style="list-style-type: none"> 1. Engineering Thermodynamics P. K. Nag Tata McGraw Hill 6th Edition 2018 2. Applications of Thermodynamics V.Kadambi, T.R.Seetharam, K.B.Subramanya Kumar Wiley Indian Private Ltd, 1st Edition, 2019 3. Thermodynamics Yunus A,Cengel, Michael A Boles Tata McGraw Hill ,7th Edition 	
List of Reference Books	
<ol style="list-style-type: none"> 1. Thermodynamics for engineers Kenneth A. Kroosand Merle C. Potter, Cengage Learning 2016 2. Principles of Engineering Thermodynamics, Michael J, Moran, Howard N. Shapiro, Wiley 8th Edition 3. I.C. Engines, M. L. Mathur & Sharma. Dhanpat Rai & sons-India 	
List of URLs, Text Books, Notes, Multimedia Content, etc	
<ul style="list-style-type: none"> • https://www.youtube.com/watch?v=AwbhbN20xl8&list=PLwdnzlV3ogoVJnW1S9GgOKYj5heOzl1dn • https://ciechanow.ski/internal-combustion-engine/ • https://www.youtube.com/watch?v=1Vn1PDuPHsY&list=PL4K9r9dYCOoozyQU9kmQFjkTz 	
Course Outcomes	<p>At the end of the course, the student will be able to</p> <ol style="list-style-type: none"> 1. Analyse air standard cycle to evaluate the performance of I C engines. 2. Analyze the gas power cycles to evaluate the overall efficiency of gas turbine plant. 3. Apply thermodynamic concepts to analyze the performance of vapour power cycles. 4. Analyze the vapour compression and vapour absorption systems to improve refrigeration and understand Psychrometry used in air conditioning system. 5. Determination of various parameters of air compressors and steam nozzles.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BME401	TITLE: Applied Thermodynamics						Faculty Name:				
List of Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	-	-	-	-	2	-	-	-	-	2
CO-2	3	3	-	-	-	-	-	-	-	-	-	2
CO-3	3	3	-	-	-	-	-	-	-	-	-	2
CO-4	3	3	2	-	-	-	2	-	-	-	-	2
CO-5	3	3	-	-	-	-	-	-	-	-	-	2

Note: 3 =Strong Contribution 2=Average Contribution 1=Weak Contribution

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code: BME401		TITLE: Applied Thermodynamics		FacultyName:			
List of Course Outcomes	Program Specific Outcomes						
	PSO1				PSO2		
CO-1	3				-		
CO-2	3				-		
CO-3	3				-		
CO-4	3				-		
CO-5	3				-		

Note: 3 =Strong Contribution 2 = Average Contribution 1= Weak Contribution = No Contribution