



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Mechanical Engineering Department
B. Tech. Semester VII

Course Name: Applied Thermodynamics **Course Code:** BTME15705
Type of course: Open Electives (OE)
Prerequisite: Engineering Thermodynamics
Rational of course: The course is prepared to provide understanding of energy conversion in various thermal devices and must understand phenomena occurring in high speed compressible flow.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	0	3	60	25	15	0	0	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Properties Of Gases and Gas Mixtures: Avogadro’s law, equation of state, Vander Waal’s equation, reduced properties, law of corresponding states, compressibility chart, internal energy; enthalpy and specific heat of a gas mixtures	6	13%
2.	Psychrometry: Dalton’s law of partial pressure, Properties of moist air, temperature and humidity measuring instruments, psychrometric chart, psychrometric processes such as sensible heating and cooling, heating and humidification cooling and dehumidification, chemical dehumidification, adiabatic saturation	7	15%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
3.	<p>Refrigerant and Refrigeration Cycles:</p> <p>Classification, nomenclature and desirable properties of refrigerant, secondary refrigerants, ODP and GWP, Compound compression with intercooler, flash gas removal and flash intercooler, Desirable characteristics of refrigerant absorbent pair for vapor absorption cycle, Simple H₂O –NH₃ cycle, LiBr₂ – H₂O cycle and its working</p>	8	18%
4.	<p>Fuel Air and Actual Cycles:</p> <p>Assumptions for fuel–air cycles, reasons for variation of specific heats of gases, change of internal energy and enthalpy during a process with variable specific heats, isentropic expansion with variable specific heats, effect of variable specific heats on Otto, Diesel and Dual cycle, dissociation, comparison of air standard and fuel air cycles, effect of operating variables, comparison of air standard and actual cycles, effect of time loss, heat loss and exhaust loss in petrol and diesel engines</p>	8	18%
5.	<p>Fundamentals of Compressible Flow:</p> <p>Ideal gas relationship, Adiabatic energy equation, Mach number and its significance, Mach waves, Mach cone and Mach angle, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility, Area velocity relationship</p>	8	18%
6.	<p>Reciprocating Compressors:</p> <p>Construction and working, Multistage conditions for minimum work, Intercooling, Efficiency and control of air compressors</p>	8	18%



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Sr. No.	Topics	Teaching Hrs.	Module Weightage
	<p>Centrifugal Compressors: Essential parts, Static and total head properties, Velocity diagram, Degree of reaction, surging and choking, Losses in centrifugal compressor</p> <p>Axial Flow Compressors: Construction and working of an axial flow compressor</p>		

Percentage Distribution of Marks as per Bloom’s Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	20	20	10	10

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create and above Levels

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication Year	Publication Edition
1.	Engineering Thermodynamics	P.K. Nag	McGraw-Hill Education	2017	6 th
2.	Refrigeration and Air Conditioning	C P Arora	McGraw-Hill India Publishing Ltd.	2021	4 th
3.	Internal Combustion Engines	Ganeshan	McGraw-Hill Education	2017	4 th
4.	Turbines, Compressors and Fans	S.M. Yahya	TMH Publishers	2017	4 th
5.	Internal Combustion Engine Fundamentals	John B. Heywood	McGraw Hill Education Pvt. Ltd.	2017	1 st



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Course Outcomes (CO):

Sr. No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-1	State the various gas laws of real gas and their mixture	13
CO-2	Describe psychrometric properties to identify basic psychrometric processes.	15
CO-3	Explain vapor compression and vapor absorption systems.	18
CO-4	Discuss fuel-air and actual cycles for IC engines and develop understanding of IC engines testing and their emission norms.	18
CO-5	Classify various properties of compressible fluid flow	18
CO-6	Distinguish of various types of air compressors.	18

Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO-1	3	1	2	1	0	0	1	0	0	0	0	0
CO-2	3	1	2	1	0	0	1	0	0	0	0	0
CO-3	2	2	2	2	1	1	0	0	0	0	0	0
CO-4	2	2	2	2	1	1	1	0	0	0	0	0
CO-5	3	1	2	1	0	0	0	0	0	0	0	0
CO-6	2	2	2	2	1	1	0	0	0	0	0	0
Rationale*	12	8	10	8	3	3	2	0	0	0	0	0

*** Rationale - Mapping of CO's with PO's:**

This course will develop engineering knowledge and analyze complex engineering problems reaching substantiated conclusions using principles of natural sciences & engineering sciences.

This course highly maps with Program outcomes 1, 2, 3 and 4. It states that the course will develop Engineering knowledge, Problem analysis, Design / development of solutions, Conduct investigations of complex problems. Finally it will lead to convert conceptual knowledge of mechanical engineering to real life application and with the use of modern computing tools and apply their technical, managerial and other soft skills in their professional life.



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Assignments to be given as per the requirement of the course.

List of Open Source/learning website:

- 1. <https://nptel.ac.in/courses/112103307>**