

Branch Name:	Automobile Engineering
Program Code:	ET408
Course Title:	Thermodynamics and Hydraulics
Course Code:	2ET4080401
Pre-requisite Course:	-----

Course Objectives:

1. Identify and use units and notations in thermodynamics.
2. State and illustrate first and second law of thermodynamics.
3. Apply the first and second law to various gas processes and cycles.
4. To understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's, energy and momentum equations.
5. To understand the application and working of various hydraulic devices generally used in industries.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	0	0	4	60	40			100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Basic of Thermodynamics • Thermodynamic system. • Properties of substance like Pressure, temperature, volume, heat, work, energy. • Thermodynamic processes & cycles. • Work and heat transfer, Difference between heat and work • Various forms of energy like static energy, kinetic energy, potential energy internal energy, enthalpy etc. • Concept of enthalpy and entropy	07	20
2	Laws of Thermodynamics • Zeroth Law of Thermodynamics • First Law of Thermodynamics, its limitations & Application to flow Processes. (No numerical) • Second law of Thermodynamics Kelvin Planck & Claudius statements, Refrigerator & heat Pump. • Concept of Reversible and Irreversible Processes. • Heat Engine	07	20
3	Ideal Gases And Processes • Ideal gas laws and equation • Specific heat of ideal gas • Various thermodynamic processes like constant pressure, constant volume, constant temperature etc.	07	13
4	Thermodynamic Cycles • Different air standard cycles and their importance- Carnot cycle, Otto cycle, Diesel cycle, Dual cycle. • Determine work done and efficiency of above cycles. • Applications of different Thermodynamic cycles.	08	17

5	Fundamentals of Hydraulics - Properties of Fluid. - Fluid statics -concept, definitions of total pressure and center of pressure, Buoyant force and criteria for stability of floating body. Pascal's law. - Fluid dynamics- Types of flow, continuity equation, Bernoulli's Theorem, Euler's equation of motion	06	15
6	Fluid Control System And Pumps - Concept and need of control system. - Types of pumps - Working of reciprocating pumps - Working of Centrifugal pumps - Comparison of RC of CF pumps. - Simple problems on pumps.	07	15

Reference Books:

- Fluid Mechanics and Hydraulics Khurmi R. S. S Chand publication
- Thermodynamics VARIA R. B. ATUL PRAKASHAN
- Oil Hydraulic Systems Majumdar S.R. Tata McGraw-Hill Publication, 3/e, 2013
- Hydraulic and Pneumatic Controls Srinivasan, R. Vijay Nicole Imprints Private Limited, 2/e, 2008
- Thermodynamic for Engineers Mathur.M.L., Gupta.S.C. Metropolitan Book Company-1985
- Hydraulics & Hydraulic machinery Patel.R.C. & Pandya.A.D. Acharya Book Depot (1967)

List of Open-Source Software/learning website:

- https://www.youtube.com/watch?v=xdRtWK1_2Eo
- <https://www.youtube.com/watch?v=OmhXb-miAhw>
- <https://www.youtube.com/watch?v=YvQp2qy5l60>
- <https://en.wikipedia.org/wiki/Thermodynamics>
- <http://www.howstuffworks.com/search.php?terms=hydraulics>
- <http://www.youtube.com/watch?v=FVR7AC8ExIM>
- <http://www.youtube.com/watch?v=iOXRoYHdCV0>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/fluid.html#flucon>

Course Learning Outcomes (CLO):

- To understand the basics of thermodynamics.
- To analyse the thermodynamic principles.
- To apply thermodynamic cycles with P-V and T-S diagrams.
- To understand Fluid & its related concepts.
- To develop hydraulic devices like pumps based on fluid laws.

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	M					L					L	L		L	
CLO2	L		L	M	L							L		M		
CLO3		L	M		M								M		M	
CLO4	L	M		M	M		L					L		L	L	
CLO5			L	L			L						M	M		

H: High, M: Medium, L: Low