Lok Jagruti Kendra University
University with a Difference

Diploma
in
Automobile Engineering

LJ Polytechnic

Course Code:025010204

Thermal Engineering

Programme / Branch Name			Diploma in Automobile Engineering			
Course Name	Thermal Engineering				**Course Code**	025010204
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week					**Evaluation Scheme**				
L	**T**	**P**	**Total Teaching Hours**	**Total Credit**	**CA**	**CCE**	**SEE (TH)**	**SEE (PR)**	**Total**
3	2	0	5	5	10	40	50	-	100

Legends: L: Lectures T: Tutorial P: Practical
CA: Continuous Assessment (Attendance + Activity)
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics (Pre-university level)

3. Rationale

To provide an appreciation of energy conversion processes in the context of engineering applications and to introduce the laws of thermodynamics.

4. Objectives

- ✓ Understand the energy conversion processes involving heat, work and energy storage.
- ✓ The application of thermodynamic principles to the propulsion of land, sea and air transport and in the generation of power.
- ✓ Analysis of various thermal processes and plant.
- ✓ Identify information requirements and sources for analysis and evaluation
- ✓ Synthesize information and ideas for use in the evaluation process.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1	Principles of Thermodynamics	1.1. Introduction to Thermodynamics 1.2. Thermodynamic System Types of System, Control Volume, Concept of Continuum 1.3. Thermodynamic Properties: Thermodynamic Terminologies, Macroscopic and Microscopic Approach, State, Process and Cycle, Quasi-static Process 1.4. Work and Heat Transfer 1.5. Zeroth Law of Thermodynamics	• Understand basics of thermodynamic. • Know about thermodynamic terminologies and processes.	10	08
2	First Law of Thermodynamics	2.1. First Law of Thermodynamics, Law of Conservation of Energy, First law of Thermodynamics changing Cycle, First law of Thermodynamics undergoing a change of State, Energy- A property of System 2.2. Flow and Non-Flow Process, Flow process & Control Volume, Steady & Unsteady flow Process 2.3. Steady Flow Energy Equation, SFEE Through a generalized open System, Application of SFEE to Thermal System 2.4. Perpetual Motion Machine of First Kind	• Understand & apply first law of thermodynamics & PPM 1.	25	12
3	Second Law of Thermodynamics	3.1. Second Law of Thermodynamics: Limitation of First law of Thermodynamics, Kelvin Plank and Claussis Statement of the second law of Thermodynamics, Comparisons of Kelvin Plank and Claussis	• Understand & apply second law of thermodynamics & PPM 2.	35	13

		Statement, Perpetual Motion Machine of the second kind 3.2. Thermal Energy Reservoir: Heat Engines, Heat Pumps, Refrigerator, Coefficient of Performance 3.3. Reversibility and Irreversibility: Causes of Irreversibility, Conditions for Reversibility, Carnot Cycle			
4	Properties of Gases and Mixtures	4.1. Gas Laws: Boyle's Law, Charles Law and Gay-Lussac Law, Avogadro's Law, Gibbs Dalton Law 4.2. Ideal Gas: Properties of Ideal Gas, Equation of Ideal Gas, Specific Heats, Internal Energy, Enthalpy and Entropy	• Comprehend principles of ideal gas.	15	5
5	Heat Transfer	5.1. Fundamentals of Heat Transfer 5.2. Conduction: Fourier's Law of Heat Conduction, One Dimension Steady-State Conduction 5.3. Convection: Types of Convection, Newton's Law of Cooling 5.4. Radiation: Fundamentals of Radiation, Kirchhoff's Law and Stefan Boltzmann Law of Radiation	• Understand & apply heat transfer methods.	15	4
				Total Hours	**42**

6. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1	Principles of Thermodynamics	40	40	0	0	20	0
2	First Law of Thermodynamics	30	35	15	0	20	0
3	Second Law of Thermodynamics	35	40	15	0	10	0
4	Properties of Gases and Mixtures	50	50	0	0	0	0
5	Heat Transfer	40	50	10	0	0	0

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

7. Textbooks

1) Engineering Thermodynamics by P.K Nag, Tata McGraw Hill.
2) Thermodynamics by S.C Gupta, Pearson.

8. Reference Books

1) Engineering Thermodynamics by Gordon Rogers, Pearson.
2) Elements of Mechanical Engineering by Dr Sadhu Singh, S.Chand Publications.
3) Heat and Mass Transfer by R. K Rajput, S.Chand Publications.
4) Thermal Engineering by R. K Rajput, S.Chand Publications.
5) Thermodynamics: An Engineering Approach, by Cengel & Boles, 4th Edition. McGraw Hill.
6) Thermodynamic and Transport Properties of Fluids, by Rogers and Mayhew, Basil Blackwell.
7) Thermal Engineering, by Rudra Moorthy R, Tata McGraw-Hill, New Delhi, 2010.

9. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/c/TheAutomotives
2) https://www.youtube.com/channel/UC4la8Cf7-DxaxsfMhaWpHiQ
3) https://theautomobileengineers.blogspot.com/
4) http://nptel.iitm.ac.in/courses/IIT-MADRAS/Applied_Thermodynamics/index.php
5) https://www.youtube.com/channel/UCqZQJ4600a9wIfMPbYc60OQ
6) https://www.youtube.com/channel/UC9ZmmnmSWeeg58lZ0ilDrOA
7) http://blog.automotive-technology.com/
8) https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/