



GOVERNMENT POLYTECHNIC KANDHAMAL, PHULBANI

## LESSON PLAN: THERMAL ENGINEERING-I

**Subject Name:** Thermal Engineering-I

**Subject Code:** MEPC209 (TH:5)

**Semester:** 3<sup>rd</sup>, **Branch:** Mechanical Engineering

**Academic Calendar:** Winter 2026

**Name of the Faculty:** Dr Dillip Kumar Panigrahi, Lecturer in Mechanical, Govt. Polytechnic Kandhamal, Phulbani

L	T	P	<b>Total Marks: 100</b>	<b>Course Code: MEPC209</b>
3	0	3		<b>Theory Assessment</b>
<b>Total Contact Hours</b>				End Term Exam: 70
Theory: 45 Hrs				Progressive Assessment: 30
<b>Pre-Requisite: Nil</b>				
<b>Credit: 3</b>				Category of Course: PC

### RATIONALE:

Thermal-engineering is a crucial field that helps learners to understand and harness the power of heat transfer and energy conversion. From power generation to automotive engineering, the principles of thermal engineering have a wide range of applications in various industries.



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### LEARNING OUTCOMES:

After completion of the course, the students will be able to

- Describe various sources of Energy and their applications.
- Classify I.C. engines and their working and constructional features.
- Draw the energy flow diagram of an I.C. engine and evaluate its performance.
- Describe the constructional features of air compressor and working of different air compressors.
- Describe the applications of refrigeration and Classify air-conditioning systems.

SI No.	Date	Topics to be Covered as per Lesson Plan	Points / Contents to be Discussed (in detail)
1 <sup>st</sup> Week	01-07-2026 to 04-07-2026	➤ Introduction to Thermodynamics (Unit-I)	<ul style="list-style-type: none"><li>➤ Thermodynamic Systems (closed, open, isolated)</li><li>➤ Thermodynamic properties of a system (pressure, volume, temperature, entropy, enthalpy, Internal energy and units of measurement)</li><li>➤ Intensive and extensive properties</li></ul>
2 <sup>nd</sup> Week	06-07-2026 to 10-07-2026	➤ Introduction to Thermodynamics (Unit-I)	<ul style="list-style-type: none"><li>➤ Define thermodynamic processes, path, cycle, state</li><li>➤ Path function, point function</li><li>➤ Thermodynamic Equilibrium</li><li>➤ Quasi-static Process</li><li>➤ Laws of thermodynamics (statements only)</li></ul>
3 <sup>rd</sup> Week	13-07-2026 to 18-07-2026	➤ Sources of Energy (Unit-I)	<ul style="list-style-type: none"><li>➤ Brief description of energy Sources</li><li>➤ Classification of energy sources: Renewable, Non-Renewable; Fossil fuels (CNG &amp; LPG);</li><li>➤ Solar Energy: Flat plate and concentrating collectors &amp; its applications (working principles of Solar Water Heater, Photovoltaic Cell, Solar Distillation)</li></ul>
	16-07-2026	➤ <b>Rath Yatra</b>	
4 <sup>th</sup> Week	20-07-2026 to 24-07-2026	➤ Sources of Energy (Unit-I)	<ul style="list-style-type: none"><li>➤ Definitions of Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Biogas, Biomass, Bio-diesel; Hydraulic Energy, Nuclear Energy; Fuel cell.</li></ul>



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5 <sup>th</sup> Week	27-07-2026 to 01-08-2026	➤ Internal Combustion Engines (Unit-II)	<ul style="list-style-type: none"> <li>➤ Assumptions made in air standard cycle analysis</li> <li>➤ Brief description of Carnot, Otto and Diesel cycles with P-V and T-S diagrams</li> </ul>
6 <sup>th</sup> Week	03-08-2026 to 07-08-2026	➤ Internal Combustion Engines (Unit-II)	<ul style="list-style-type: none"> <li>➤ Internal and external combustion engines;</li> <li>➤ Advantages of I.C. engines over external combustion engines</li> <li>➤ Classification of I.C. engines</li> <li>➤ Neat sketch of I.C. engine indicating component parts</li> <li>➤ Function of each part and materials used for the component parts - Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve;</li> </ul>
7 <sup>th</sup> Week	10-08-2026 to 15-08-2026	➤ Internal Combustion Engines (Unit-II)	<ul style="list-style-type: none"> <li>➤ Working of four-stroke and two stroke petrol and diesel engines;</li> <li>➤ Comparison of two stroke and four stroke engines;</li> <li>➤ Comparison of C.I. and S.I. engines;</li> <li>➤ Valve timing and port timing diagrams for four stroke and two stroke engines.</li> </ul>
	15-08-2026	➤ <b>Independence Day</b>	
8 <sup>th</sup> Week	17-08-2026 to 21-08-2026	➤ I.C. Engine Systems (Unit-III)	<ul style="list-style-type: none"> <li>➤ Fuel system of Petrol engines</li> <li>➤ Principle of operation of simple and Zenith carburettors</li> <li>➤ Fuel system of Diesel engines;</li> <li>➤ Types of injectors and fuel pumps</li> </ul>
9 <sup>th</sup> Week	24-08-2026 to 29-08-2026	➤ I.C. Engine Systems (Unit-III)	<ul style="list-style-type: none"> <li>➤ Cooling system: air-cooling, water-cooling system with thermosiphon method of circulation and water-cooling system with radiator and forced circulation (description with line diagram).</li> <li>➤ Comparison of air cooling and water-cooling system;</li> </ul>
	26-08-2026	➤ <b>Birthday of Prophet Mohammad</b>	
	27-08-2026	➤ <b>Jhulana Purnima</b>	
10 <sup>th</sup> Week	31-08-2028 to 05-09-2026	➤ I.C. Engine Systems (Unit-III)	<ul style="list-style-type: none"> <li>➤ Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems</li> <li>➤ Types of lubricating systems used in I.C. engines with line diagram</li> </ul>
	04-09-2026	➤ <b>Janmastami</b>	



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11 <sup>th</sup> Week	07-09-2029 to 11-09-2026	➤ I.C. Engine Systems (Unit-III)	<ul style="list-style-type: none"> <li>➤ Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method and combination methods of governing; their applications</li> <li>➤ Objective of super charging</li> </ul>
12 <sup>th</sup> Week	14-09-2026 to 19-09-2026	➤ Performance of I.C. Engines (Unit-IV)	<ul style="list-style-type: none"> <li>➤ Brake power</li> <li>➤ Indicated power</li> <li>➤ Frictional power</li> <li>➤ Brake and Indicated mean effective pressures</li> </ul>
	14-09-2026	➤ <b>Ganesh Puja</b>	
	15-09-2026	➤ <b>Nuakhai</b>	
	16-09-2026	➤ <b>Day following Nuakhai</b>	
	21-09-2026 to 25-09-2026	➤ Performance of I.C. Engines (Unit-IV)	<ul style="list-style-type: none"> <li>➤ Brake and Indicated thermal efficiencies</li> <li>➤ Mechanical efficiency</li> <li>➤ Relative efficiency</li> </ul>
13 <sup>th</sup> Week	28-09-2026 to 03-10-2026	➤ Performance of I.C. Engines (Unit-IV)	<ul style="list-style-type: none"> <li>➤ Performance test</li> <li>➤ Morse test</li> <li>➤ Heat balance sheet</li> </ul>
	02-10-2026	➤ <b>Gandhi Jayanti</b>	
14 <sup>th</sup> Week	05-10-2026 to 09-10-2026	➤ Performance of I.C. Engines (Unit-IV)	<ul style="list-style-type: none"> <li>➤ Methods of determination of B,P., I.P. and F.P.</li> <li>➤ Simple numerical problems on performance of I.C. engines</li> </ul>
15 <sup>th</sup> Week	12-10-2026 to 17-10-2026	➤ Air Compressors (Unit-V)	<ul style="list-style-type: none"> <li>➤ Functions of air compressor</li> <li>➤ Uses of compressed air</li> <li>➤ Types of air compressors</li> <li>➤ Single stage reciprocating air compressor - its construction and working (with line diagram) using P-V diagram</li> </ul>
	17-10-2026	➤ <b>Maha Saptami</b>	
16 <sup>th</sup> Week	19-10-2026 to 23-10-2026	<ul style="list-style-type: none"> <li>➤ Air Compressors (Unit-V)</li> <li>➤ Refrigeration &amp; Air-conditioning (Unit-V)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Multi stage compressors – Advantages over single stage compressors</li> <li>➤ Rotary compressors: Centrifugal compressor, axial flow type compressor and vane type compressors</li> <li>➤ Refrigeration</li> </ul>



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			<ul style="list-style-type: none"><li>➤ Refrigerant</li><li>➤ COP</li><li>➤ Air Refrigeration system: components, working &amp; applications</li></ul>
	19-10-2026	➤ <b>Maha Nabami</b>	
	20-10-2026	➤ <b>Vijaya Dasami</b>	
17 <sup>th</sup> Week	26-10-2026 to 31-10-2026	➤ Refrigeration & Air-conditioning (Unit-V)	<ul style="list-style-type: none"><li>➤ Vapour Compression system: components, working &amp; applications;</li><li>➤ Air conditioning</li><li>➤ Classification of Air- conditioning systems</li><li>➤ Comfort and Industrial Air-Conditioning</li><li>➤ Window Air- Conditioner</li></ul>
18 <sup>th</sup> Week	02-11-2026 to 05-11-2026	➤ Refrigeration & Air-conditioning (Unit-V)	<ul style="list-style-type: none"><li>➤ Summer Air-Conditioning system</li><li>➤ Winter Air-Conditioning system</li><li>➤ Year-round Air-Conditioning system</li></ul>
	05-11-2026	➤ <b>Closing of Attendance</b>	

### REFERENCES:

1. Introduction to Renewable Energy– Vaughn Nelson, CRC Press
2. Thermal Engineering – P. L. Ballaney, Khanna Publishers, 2002
3. A Course in Thermal Engineering – S. Domkundwar & C.P. Kothandaraman, Dhanpat Rai.
4. Thermal Engineering – R. S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co, New Delhi.
5. Thermal Engineering – R. K. Rajput, 8th Edition, Laxmi publications Pvt Ltd, New Delhi.

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