

**GOVERNMENT POLYTECHNIC, MALKANGIRI**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**LESSON PLAN**

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| Discipline:<br>Mechanical<br>Engineering | Semester 3rd   | Name of the Teaching Faculty: BIBHAMI MANDAL   |
| THERMAL<br>ENGINEERING<br>G1             | No. of days/week<br>class allotted<br>3  | Semester from date: 14.07.2025<br>No. of Week: 15<br>To date: 15.11.2025   |
| PRE-<br>REQUISITE                        | THERMAL ENGINEERING I  |  |
| Course<br>Outcomes                       | 1. Describe various sources of Energy and their applications.<br>2. Classify I.C. engines and their working and constructional features.<br>3. Draw the energy flow diagram of an I.C. engine and evaluate its performance.<br>4. Describe the constructional features of air compressor and working of different air compressors.<br>5. Describe the applications of refrigeration and Classify air-conditioning systems. |  |
| Week                                     | Class Day  | Theory/Practical Topics  |
| 1st                                      | 1st  | Introduction to Thermodynamics: Thermodynamic Systems (closed, open, isolated)   |
|  | 2nd  | Thermodynamic properties of a system (pressure, volume, temperature, entropy)  |
|  | 3rd  | Thermodynamic properties of a system ( Internal energy and units of measurement)   |
| 2nd                                      | 1st  | Intensive and extensive properties   |
|  | 2nd  | Define thermodynamic processes, path, cycle, state, path function, point function  |
|  | 3rd  | Thermodynamic Equilibrium, Quasi-static Process  |
| 3rd                                      | 1st  | Laws of thermodynamics   |
|  | 2nd  | Sources of Energy: Brief description of energy Sources: Classification of energy   |
|  | 3rd  | sources: Renewable, Non-Renewable; Fossil fuels (CNG & LPG); Solar Energy  |
| 4th                                      | 1st  | Definitions of Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy  |
|  | 2nd  | Internal Combustion Engines: Assumptions made in air standard cycle analysis   |
|  | 3rd  | Brief description of Carnot, Otto and Diesel cycles with P-V and T-S diagrams  |
| 5th                                      | 1st  | Internal and external combustion engines, advantages of I.C. engines over external combustion engines                      |
|  | 2nd  | classification of I.C. engines; neat sketch of I.C. engine indicating component parts; Function of each part and materials |
|  | 3rd  | component parts - Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin                           |
| 6th                                      | 1st  | piston, cooling pins cylinder heads, exhaust valve, Inlet valve  |
|  | 2nd  | Working of four-stroke and two stroke petrol and diesel engines  |
|  | 3rd  | Comparison of two stroke and four stroke engines; Comparison of C.I. and S.I. engines                                      |
| 7th                                      | 1st  | Valve timing and port timing diagrams for four stroke and two stroke engines   |
|  | 2nd  | I.C. Engine Systems: Fuel system of Petrol engines; Principle of operation of simple and Zenith carburetors                |
|  | 3rd  | Fuel system of Diesel engines  |
| 8th                                      | 1st  | Types of Injectors and fuel pumps; Cooling system  |
|  | 2nd  | air cooling, water cooling system with thermo siphon method of circulation   |
|  | 3rd  | Comparison of air cooling and water cooling system; Ignition systems – Battery coil ignition and magneto ignition          |
| 9th                                      | 1st  | Comparison of air cooling and water cooling system; Ignition systems – Battery coil ignition and magneto ignition          |
|  | 2nd  | Types of lubricating systems used in I.C. engines with line diagram  |
|  | 3rd  | Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method                          |
| 10th                                     | 1st  | combination methods of governing; their applications; Objective of super charging.   |
|  | 2nd  | Performance of I.C. Engines: Brake power; Indicated power;   |
|  | 3rd  | Frictional power; Brake and Indicated mean effective pressures   |
| 11th                                     | 1st  | Brake and Indicated thermal efficiencies   |
|  | 2nd  | Mechanical efficiency; Relative efficiency   |
|  | 3rd  | Performance test; Morse test; Heat balance sheet   |
| 12th                                     | 1st  | Methods of determination of B.P., I.P. and F.P.  |
|  | 2nd  | Methods of determination of B.P., I.P. and F.P.  |
|  | 3rd  | Simple numerical problems on performance of I.C. engines   |
| 13th                                     | 1st  | Simple numerical problems on performance of I.C. engines   |
|  | 2nd  | Air Compressors: Functions of air compressor; Uses of compressed air   |
|  | 3rd  | Types of air compressors; Single stage reciprocating air compressor - Its construction and working                         |
| 14th                                     | 1st  | Multi stage compressors – Advantages over single stage compressors   |
|  | 2nd  | Rotary compressors; Centrifugal compressor, axial flow type compressor and vane type compressors.                          |
|  | 3rd  | Refrigeration & Air-conditioning: Refrigeration; Refrigerant, COP  |
| 15th                                     | 1st  | Air Refrigeration system: components, working & applications   |
|  | 2nd  | Vapour Compression system: components, working & applications; Air conditioning  |
|  | 3rd  | Classification of Air- conditioning systems; Comfort and Industrial Air-Conditioning                                       |

**Learning Resources:**

Thermal Engineering – P. L. Ballaney, Khanna Publishers  
 Thermal Engineering – S. Dornkundwar & C.P. Kothandaraman  
 Thermal Engineering – R. S. Khurmi and J.K. Gupta, 10th Edition

*Bibhami Mandal*  
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Signature

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