GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

**LESSON PLAN**

**Session (2023-2024)**

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| **Discipline:** Mechanical Engineering | **Semester:**  3RD | **Name of the Teaching Faculty:**  Dr. Sayantan Mukherjee |
| **Subject:**  Thermal Engineering-I, Theory-4 | **No. of Days/Week:** 04 | Class Test: 20  End Semester Examination: 80 |

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| **Week** | **Class Day** | **Theory Topics** |
| 1st | 1st | Define Thermodynamics. Define System, surroundings and  boundary. Explain open closed and isolated system. |
| 2nd | Define Intensive and extensive properties. Differentiate  between homogeneous and heterogeneous system. |
| 3rd | Define Microscopic and macroscopic approach of thermodynamics. Explain Continuum Approach, Quasi-static  process |
| 4th | Thermodynamic properties of a system (Pressure, volume,  temperature and units of measurement). |
| 2nd | 1st | Define thermodynamic State, path, process and cycle. |
| 2nd | Explain Thermodynamic equilibrium i.e. thermal mechanical  and chemical equilibrium. |
| 3rd | Conceptual explanation of energy and its sources. |
| 4th | Explain work and heat, their relation, units and Work transfer, |
| 3rd | 1st | Derive the formula for the work done in a closed system. |
| 2nd | Explain Mechanical equivalence of heat and differentiate  between heat and work. |
| 3rd | *Assignment evaluation /class test* |
| 4th | Numerical |
| 4th | 1st | State and explain Zeroth law and First law of  thermodynamics. Limitation of First law. |
| 2nd | Application of first law for flow process. Derivation of steady flow energy equation. |
| 3rd | Application of SFEE in Nozzle Turbine and Compressor. |
| 4th | Define Thermal reservoir. Concept of heat engine, heat pump |

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|  |  | and refrigerator. |
| 5th | 1st | Statement of Second law of thermodynamics (Clausius and Kelvin Planck Statement) |
| 2nd | Application of second law in heat engine, and determination  of efficiency. |
| 3rd | Application of second law in Refrigerator, and determine the Coefficient Of Performance. |
| 4th | Application of second law in Heat Pump, and determine the  Coefficient Of Performance. |
| 6th | 1st | Review Class |
| 2nd | Classroom Problems |
| 3rd | Classroom Problems |
| 4th | *Assignment evaluation / class test* |
| 7th | 1st | Explain Laws of Perfect gas, Boyle’s law, Charle’s  law, Avogadro’s law, |
| 2nd | Dalton’s law of Partial pressure, Gay-Lussac law, General gas  equation |
| 3rd | Explain Characteristic gas constant, Universal gas constant and define the relation between them. |
| 4th | Define Enthalpy, Entropy, and Internal Energy of a Thermodynamic system. |
| 8th | 1st | Explain specific heat of gas (Cp and Cv) Relation between Cp & Cv |
| 2nd | Derive the work done during a non- flow process i.e. Isochoric, Isobaric. |
| 3rd | Application of first law in Isothermal, Isentropic and Polytrophic Process. |
| 4th | *Assignment evaluation / class test* |
| 9th | 1st | Classroom Problems |
| 2nd | Classroom Problems |
| 3rd | Define & classify I.C engine |
| 4th | Terminology of I.C Engine |
| 10th | 1st | Explain the working principle of 4-stroke S.I engine. |
| 2nd | Explain the working principle of 4-stroke C.I engine. |
| 3rd | Explain the working principle of 2-stroke S.I engine. |
| 4th | Explain the working principle of 2-stroke C.I engine. |
| 11th | 1st | Differentiate between S.I and C.I engine. |
| 2nd | Differentiate between 2-stroke & 4- stroke engine. |
| 3rd | Review class |
| 4th | *Assignment evaluation / class test* |
| 12th | 1st | Explain the Carnot cycle with P-V and T-S diagram and derive the process involved in Carnot cycle. |
| 2nd | Derive the efficiency of Carnot cycle. |

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|  | 3rd | Explain the Otto cycle with P-V and T-S diagram and derive the process involved in Otto cycle. |
| 4th | Derive the efficiency of Otto cycle. |
| 13th | 1st | Explain the Diesel cycle with P-V and T-S diagram and derive the process involved in Diesel cycle. |
| 2nd | Derive the efficiency of Diesel cycle. |
| 3rd | Explain the Dual cycle with P-V and T-S diagram and derive the process involved in Dual cycle. |
| 4th | Derive the efficiency of Dual cycle. |
| 14th | 1st | Classroom Problems |
| 2nd | Classroom Problems |
| 3rd | Define Fuel and its types. Explain application of fuel. |
| 4th | Define Heating value of fuel. |
| 15th | 1st | Explain Calorific value and Quality of I C engine fuel. |
| 2nd | *Discussion on Previous year question paper* |
| 3rd | *Discussion on Previous year question paper* |
| 4th | *Discussion on Previous year question paper* |