# Ch. Ranbir Singh State Institute of Engineering & Technology, Jhajjar

**Department of Mechanical Engineering**

II Yr. III Semester (Mechanical Engineering)

### LESSON PLAN

Program : **B. Tech**

Year & Sem. :  **II / III**

Course No : **PCC-ME-213 G**

Course Title : **Thermodynamics**

Max Marks **: 75**

No. of Total Lecture **: 65**

Schedule : **3L+2T=5**

Lecturer : **Dr. Parveen Kumar**

**Recommended Books:**

1. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
2. 4. Nag, P.K, 1995, Engineering Thermodynamics, Tata McGraw-Hill Publishing Co. Ltd

**Lesson Plan:**

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| Lect. No(s) | Topics to be covered |
| 1. | Fundamentals - System & Control volume; Property, State & Process; Exact & Inexact differentials; |
| 2 | Work-Thermodynamic definition of work; examples; Displacement work; |
| 3 | Path dependence of displacement work and illustrations for simple processes |
| 4 | Revision **(Tutorial G1)** |
| 5 | Revision **(Tutorial G2)** |
| 6 | Electrical, magnetic, gravitational, spring and shaft work. |
| 7 | Temperature, Definition of thermal equilibrium and Zeroth law; |
| 8 | Temperature scales; Various Thermometers- Definition of heat; examples of heat/work interaction in systems |
| 9 | Revision **(Tutorial G1)** |
| 10 | Revision **(Tutorial G2)** |
| 11 | First Law for Cyclic & Non-cyclic processes; Concept of total energy E |
| 12 | Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy.  |
| 13 | Definition of Pure substance, Ideal Gases and ideal gas mixtures, |
| 14 | Revision **(Tutorial G1)** |
| 15 | Revision **(Tutorial G2)** |
| 16 | Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems |
| 17 | Const. temperature and Const. pressure heating of water; Definitions of saturated states |
| 18 | P-v-T surface; Use of steam tables and R134a tables; Saturation tables |
| 19 | Revision **(Tutorial G1)** |
| 20 | Revision **(Tutorial G2)** |
| 21 | Superheated tables; Identification of states & determination of properties, |
| 22 | Mollier’s chart. |
| 23 | First Law for Flow Processes |
| 24 | Revision **(Tutorial G1)** |
| 25 | Revision **(Tutorial G2)** |
| 26 | Derivation of general energy equation for a control volume |
| 27 | Steady state steady flow processes including throttling |
| 28 | Examples of steady flow devices |
| 29 | Revision **(Tutorial G1)** |
| 30 | Revision **(Tutorial G2)** |
| 31 | Unsteady processes; examples of steady and unsteady |
| 32 | law applications for system and control volume. |
| 33 | Second law of Thermodynamics |
| 34 | Revision **(Tutorial G1)** |
| 35 | Revision **(Tutorial G2)** |
| 36 | Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP |
| 37 | Kelvin-Planck and Clausius statements |
| 38 | Definition of reversible process |
| 39 | Revision **(Tutorial G1)** |
| 40 | Revision **(Tutorial G2)** |
| 41 | Internal and external irreversibility |
| 42 | Carnot cycle; Absolute temperature scale |
| 43 | Clausius inequality |
| 44 | Revision **(Tutorial G1)** |
| 45 | Revision **(Tutorial G2)** |
| 46 | Thermodynamic cycles - Basic Rankine cycle |
| 47 | Basic Brayton cycle |
| 48 | Basic vapor compression cycle and comparison with Carnot cycle |
| 49 | Revision **(Tutorial G1)** |
| 50 | Revision **(Tutorial G2)** |
| 51 | Definition of entropy S ; Demonstration that entropy S is a property |
| 52 | Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes |
| 53 | Determination of s from steam tables- Principle of increase of entropy |
| 54 | Revision **(Tutorial G1)** |
| 55 | Revision **(Tutorial G2)** |
| 56 | Illustration of processes in Ts coordinates |
| 57 | Definition of Isentropic efficiency for compressors |
| 58 | turbines and nozzles-Irreversibility and Availability |
| 59 | Revision **(Tutorial G1)** |
| 60 | Revision **(Tutorial G2)** |
| 61 | Availability function for systems and Control volumes undergoing different processes |
| 62 | Lost work. Second law analysis for a control volume |
| 63 | Exergy balance equation and Exergy analysis. |
| 64 | Revision **(Tutorial G1)** |
| 65 | Revision **(Tutorial G2)** |

**(Dr. Parveen Kumar)**

Guest Faculty

Department of ME

CRSSIET, Jhajjar