# AMMR-4 THERMODYNAMICS AND KINETICS OF MATERIALS

1. Heterogeneous & homogeneous systems,
2. Extensive & intensive properties, Simple equilibrium.
3. First law of thermodynamics, constant volume & constant pressure processes,
4. Spontaneous process, Entropy quantification of irreversibility,
5. Properties of heat engines, Second law of thermodynamics,
6. Criterion for equilibrium, Entropy & disorder, most probable microstate.
7. Configurationally entropy & thermal entropy, Auxiliary functions, Maxwell's relations, Gibbs Helmholtz equation, Third law of thermodynamics,
8. Variation of Gibbs energy with temperature & pressure, Clausius-Clapeyron equation,
9. Thermodynamic properties of mixtures of ideal & imperfect gases, Ellingham diagrams, Raoults & Henry's laws, activity of a component, Gibbs
10. Duhem equation, Non-ideal solutions, Regular solutions, Quasi-chemical model of solution, activity & alternative standard states,
11. Gibbs phase rule, Binary systems involving compound formation, Solubility of gases in metals,
12. Formation of oxide phases of variable composition, relation between chemical & electrical driving forces,
13. Nernst equation, Thermodynamics of point defects.

**Reference Books:**


1. Introduction to Thermodynamics, Y. V. C. Rao
2. Textbook of Materials and Metallurgical Thermodynamics, A. Ghosh (PHI)