

**Department of Materials Science and Engineering
Indian Institute of Technology Kanpur**

Course Name: *Thermodynamics of Materials*

Credits: 3-0-0-0-4

Course No: MSE 616

Prerequisite: None

Category: Compulsory course for all M.Tech. students of MSE Department, to be offered in odd semester

Course Content

Topics	No of Lectures
Thermodynamic systems and variables.	1
First, second and third laws of thermodynamics.	7
Statistical interpretation of entropy.	2
Free energy functions and criteria for equilibrium.	2
Thermodynamics of solutions. Ideal and non-ideal solutions, Partial and molar quantities	2
Quasi-chemical model and regular solutions,	2
Polynomial expressions for excess Gibbs energy of mixing for binary and higher order solutions. Multi-component dilute solutions and interaction parameters.	2
Chemical reaction equilibrium, equilibrium constant; applications to materials and metallurgical systems.	4
Electrochemical systems, cell reactions and EMF, Formation and concentrations cells.	3
Phase rule and binary phase diagrams	2
Free energy composition diagrams	3
Phase equilibrium calculations	5
Introduction to ternary phase diagrams.	1
Thermodynamics of interfaces; Surface tension and surface energy	2
Absorption and adsorption; Gibbs Thompson effect	2
TOTAL LECTURE HOURS:	40

Suggested Books:

1. Chemical Thermodynamics of Materials by C.H.P. Lupis
2. Introduction of Metallurgical Thermodynamics by D.R. Gaskell
3. Thermodynamics of Solid by R.A. Swalin
4. Physical Chemistry of Metals by L.S. Darken and R.W. Gurry