



PHASE TRANSFORMATION IN MATERIALS

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Engineering IIT Kanpur

INTENDED AUDIENCE : UG/PG students from Metallurgical Engineering/Ceramic Engineering/Materials Science

PREREQUISITES : Basic knowledge on thermodynamics, diffusion, and phase diagrams.

INDUSTRY APPLICABLE TO : Metal Processing Companies (SAIL, HINDULCO etc.), Manufacturing (Auto, Oil etc companies)

COURSE OUTLINE:

The present course will deal with the basics of phase transformation in materials. Using thermodynamics, kinetics of phase transformation, different liquid to solid and solid to solid transformations will be covered in this course.

ABOUT INSTRUCTOR :

Prof. Krishanu Biswas, Ranjit Singh chair professor at the Department of Materials Science and Engineering at IIT Kanpur. He is a prolific teacher, developed courses on Phase Diagrams, Phase Transformation and Nanomaterials under the umbrella of NPTEL. He teaches both UG/PG courses at IIT Kanpur. He also works on application of AI-ML in materials engineering. His research includes multicomponent materials, materials for hydrogen energy, electron microscopy etc.

COURSE PLAN:

Week 1: Introduction

Week 2: Gibbs free energy change calculations

Week 3: Interfaces

Week 4: Nucleation

Week 5: Solidification

Week 6: Growth

Week 7: Transformation kinetics

Week 8: Precipitation

Week 9: Recrystallisation and grain growth

Week 10: Martensitic Transformation

Week 11: Isothermal and continuous cooling transformations

Week 12: Spinodal decomposition