MECHANICAL ENGINEERING

Phase Transformation in Materials

Type of Course : New
Course Snapshot : Elective, UG/PG
: Students from Metallurgical Engineering /Ceramic Engineering/ Materials Science
Pre-requisites : Basic knowledge on thermodynamics, diffusion, and phase diagrams.
Course Duration : 30 hours / 12 weeks
Industry Support : 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.

INSTRUCTOR:

Prof. Krishanu Biswas
Department of Materials Science and Engineering
IIT Kanpur

ABOUT INSTRUCTOR:

Prof. Krishanu Biswas has made significant contribution towards understanding of the several important scientific and technological aspects of metallurgy and materials engineering. The research work performed by him ranging from development of hard low friction wear-resistant quasicrystalline coating for coating application , understanding the solidification behaviour of complex concentrated alloys, novel processing ofceramic composites, understanding the alloying behaviour at nanoscale, development of bulk alloy catalysis for hydrogen energy has clearly demonstrated versatile nature of research activities undertaken by him, which is unique for a young researcher in the field of metallurgy and materials engineering. His recent research activities involve research on sintering of nanomaterials, nanocrystalline high entropy alloys (HEAs), ionic nanoparticles, graphene 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