

PMM332: SOLID STATE PHASE TRANSFORMATION

L	T	P	Cr
3	1	0	3.5

Course Objective(s): To introduce the students with various phase transformations involved in materials processing in solid state. To provide the students scientific backgrounds (thermodynamics and kinetics) of the above phase transformations. Provide ideas on the importance of these phase transformations in materials designing for specific applications.

Ordering: Ordered and disordered transformation, Intermediate phases and compounds, Superlattices, Degree of order, Ordered domain and their boundaries, Kinetics of ordering.

Nucleation and Growth: Nucleation and transformation, Rate concepts, Precipitation, Ostwald ripening, Spinodal transformation, Discontinuous precipitation, Martensitic transformation, Nucleation of martensite, Pearlitic transformation, Massive transformation.

Transformation in Steel: TTT diagram for Fe-Fe₃C system, Transformation in steels, Effect of alloying elements, Various heat treatment processes, Transformation in alloy steels, Superalloys.

Cast Iron: Heat treatment of cast irons, Thermomechanical treatments.

Non-Ferrous Alloys: Ni based alloys, Ti alloys, Al alloys, Cu alloys and their transformation behaviour.

Course Learning Outcomes (CLO):

The course would serve as a prerequisite for more advanced level courses such as bulk heat treatment and surface engineering which would use principles of phase transformations elaborated in the present course, for application specific metallurgical processes.

Recommended Books:

1. Rajan, T.V., and Sharma, C.P., *Heat Treatment*, PHI (1997).
2. Polmear, J.P., *Light alloys*, Arnold (2005).
3. Haasan P., *Physical Metallurgy*, Cambridge Press (1996).
4. Jena, A.K., Chaturvedi, M.C., *Phase Transformation*, McGraw Hill (1991).
5. Raghavan, V., *Phase Transformation*, PHI (1992).