

1.	Title of the course	Structural Transformations in Crystalline Solids
2.	Course number	ME608L
3.	Status of the course	Elective
4.	Structure of credits	3-0-0-3
5.	Offered to	PG
6.	New course/modification to	New
7.	To be offered by	Department of Mechanical Engineering
8.	To take effect from	July 2022
9.	Prerequisite	CoT
10.	Whether approved by the Department	Yes
11.	Course Objective(s): To introduce important structural transformations in crystalline solids during the thermo-mechanical processing and the related continuum theories.	
12.	Course Content: Review of lattice and crystals; Crystal defects; Thermo-mechanics of continuum; Reciprocity theorem; Extremal principles for dissipative solids; Dislocations and plasticity; Interfaces in single-phase and multi-phase solids; Hadamard's compatibility; Coherent and incoherent interfaces; Kinetics of interfaces; Diffusion; Precipitation; Diffusional phase transformations; Martensitic phase transformations - martensitic variants, symmetry, twinning, invariant plane, crystallographic theory of twinned martensite, stress and temperature-induced transformations in elastic solids, phase-field approaches; Reconstructive phase transformations.	
13.	Textbook(s): 1. Abeyaratne R and Knowles J K, <i>Evolution of Phase Transitions - A Continuum Theory</i> , 1st Edition, Cambridge University Press (2006). 2. Porter D A, Easterling K E and Sherif M Y, <i>Phase Transformations in Metals and Alloys</i> , 3rd Edition, CRC Press (2017).	
14.	Reference(s): 1. Balluffi R W, Allen S M and Carter W C, <i>Kinetics of Materials</i> , 1st Edition, Wiley Interscience (2005). 2. Bhattacharya K, <i>Microstructure of Martensite: Why It Forms and How It Gives Rise to the Shape-Memory Effect</i> , 1st Edition, Oxford University Press (2003). 3. Gurtin M E, Fried E and Anand L, <i>The Mechanics and Thermodynamics of Continua</i> , 1st Edition, Cambridge University Press (2013). 4. Sutton A P and Balluffi R W, <i>Interfaces in Crystalline Materials</i> , 1st Edition, Oxford University Press (2006).	