

1.	Title of the course	Advanced Solidification Processes
2.	Course number	ME524L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To ME5034/16
6.	To be offered by	Department of Mechanical Engineering
7.	To take effect from	July 2022
8.	Prerequisite	CoT
9.	<b>Course Objective(s):</b> To present a logical progression of the essential elements of materials science relevant to molten phases and processes leading to their crystallization. To integrate the aspects of solidification and crystal growth.	
10.	<b>Course Content:</b> Introduction and advances in metal casting processes; Crystals and melts; Thermodynamics of crystal-melt phase change; Solidification of pure materials; Macro-scale phenomena; Macro-segregation; Plane front solidification; Composition control; Crystal melt interfaces; Constitutional supercooling; Linear morphological stability; Non-linear stability models; Nucleation catalysis; Microstructure evolution; Dendritic growth; Micro-segregation; Interface structure and growth kinetics; Polyphase solidification; Rapid solidification; Casting defects, properties and simulations; Foundry industry tour and experiments.	
11.	<b>Textbook(s):</b> 1. Fleming M C , <i>Solidification Processing</i> , 1st Edition, McGraw-Hill Book Company, New York (1974). 2. Stefanescu D M, <i>Science and Engineering of Casting Solidification</i> , 2nd Edition, Kluwer Academic Publishers (2009).	
12.	<b>Reference(s):</b> 1. Campbell J, <i>Complete Casting Handbook: Metal Casting Processes, Techniques and Design</i> , 1st Edition, Butterworth-Heinemann (2011). 2. Kurz W and Fisher D J, <i>Fundamentals of Solidification</i> , Trans Tech Publications (1998). 3. Minkoff I, <i>Solidification and Cast Structure</i> , John Wiley & Sons (1986). 4. Tuttle R B, <i>Foundry Engineering: The Metallurgy and Design of Castings</i> , Createspace Independent Pub (2012).	