



Semnan University
Faculty of Materials and Metallurgical Engineering

In the name of God

Course Outline

2nd semester 2018/2019

updated on 01/23/2019

Course: Solidification of Metals		No. of units:2	Level: Undergraduate
Lecturer: Dr. Habibollahzadeh		Pre-request: Heat Transfer	
Internal Phone No: 3383			
Email: ahabibolahzadeh@semnan.ac.ir		Website: http://ahabibolahzadeh.profile.semnan.ac.ir	
Hours per week: 2		Class No:	
Scope: Nucleation and grow during metal solidification, solidification of single phase alloys			
Assessment	Class activities	Quiz	Final exam
Percent	5% + unlimited promoting credits via extra class activities	15	80
References: Solidification Processing- Flemings			

Headlines

Educational week	Topics	Notes
1	Structure and properties of molten metals, comparison with gases and solids	
2	A brief review on thermodynamical condition of nucleation in molten metals, homogeneous and heterogenous nucleation	
3	Grain refiners, properties and varieties	
4	Refining of second phase precipitation during solidification; modifying of Si in Al-Si alloys, inoculation and spheroidizing of graphite in cast iron	Quiz
5	Solid/liquid interface, grow rate in atomic scale, transforming from spherical nuclei to dendrite, heat transfer during solidification, micro-scale growth, methods of single crystal growth	
6	Heat transfer during solidification; solidification in sand mold, feeding practice	
7	Feeding calculations	
8	Feeding calculations	Quiz
9	Heat transfer during solidification; solidification in permanent mold, continuous casting, electroslog refining	
10	Solidification modes in single-phase alloys; equilibrium solidification, segregation	
11	Solidification modes in single-phase alloys; non-equilibrium solidification, convection effect	
12	non-equilibrium solidification; planar growth certain, constitutional supercooling	
13	non-equilibrium solidification; cellular and dendrite growth	
14	Macroscopic growth; grain, grain refining	Quiz
15	Inclusions; primary and secondary, fluxing	
16	Gas in molten metals; degassing methods, deoxidation of molten	