

In the name of God <u>Course Outline</u>

Semnan University Faculty of Materials and Metallurgical Engineering

2nd semester 2018/2019

updated on 01/23/2019

Course: Advance Solidification		No. of units:3	Level: Graduate		
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Lecturer: Dr.	Habibollahzadeh	Pre-request:			
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Hours per we	eek: 3h	Class No:			
Scope: Nucleation and grow during solidification; solidification of single- and binary-phase alloys					
Assessment	Class activities	Quiz	F	inal exam	
Percent	Unlimited extra credit for additional activities	25	7	5	
References:					

Schedule

Educational	Topics	
week		
1	Introduction; properties and structure of molten metals	
2	Introduction; wettability, viscosity of liquid metals, effect of different	
	parameters on melting and solidification points	
3	Homogeneous and heterogeneous nucleation	
4	Heterogeneous nucleation; grain refiner, modification of silicon,	Quiz
	inoculation and spheroidizing of graphite	
5	Interface of solid/liquid at atomic scale, interface velocity	
6	Heat transfer during solidification; single crystal growth (growth at	
	micro scale)	
7	Heat transfer during solidification; in molds (growth at micro scale)	Quiz
8	Solidification of single-phase alloys with planar interface, segregation	
	coefficient, equilibrium and non-equilibrium solidifications	
9	Solidification of single-phase alloys; solidification in continues	
	casting, simulation principles	
10	Solidification of single-phase alloys with non-planar interface;	Quiz
	cellular growth (micro-scale)	
11	Solidification of single-phase alloys with non-planar interface;	
	dendritic growth (micro-scale)	
12	Solidification of binary-phase alloys; eutectic growth, convection	
	effect	
13	Solidification of binary-phase alloys; peritectic and monotectic	Quiz
	growth, composite solidification, convection effect	
14	Macro-scale growth; grain in ingots and castings	
15	Macro-scale growth, segregation and partition, inclusions, gases	
16	Fluidity of liquid metal and affecting parameters	Ouiz