



Course code Course title
 METRO 001 Solidification of metals

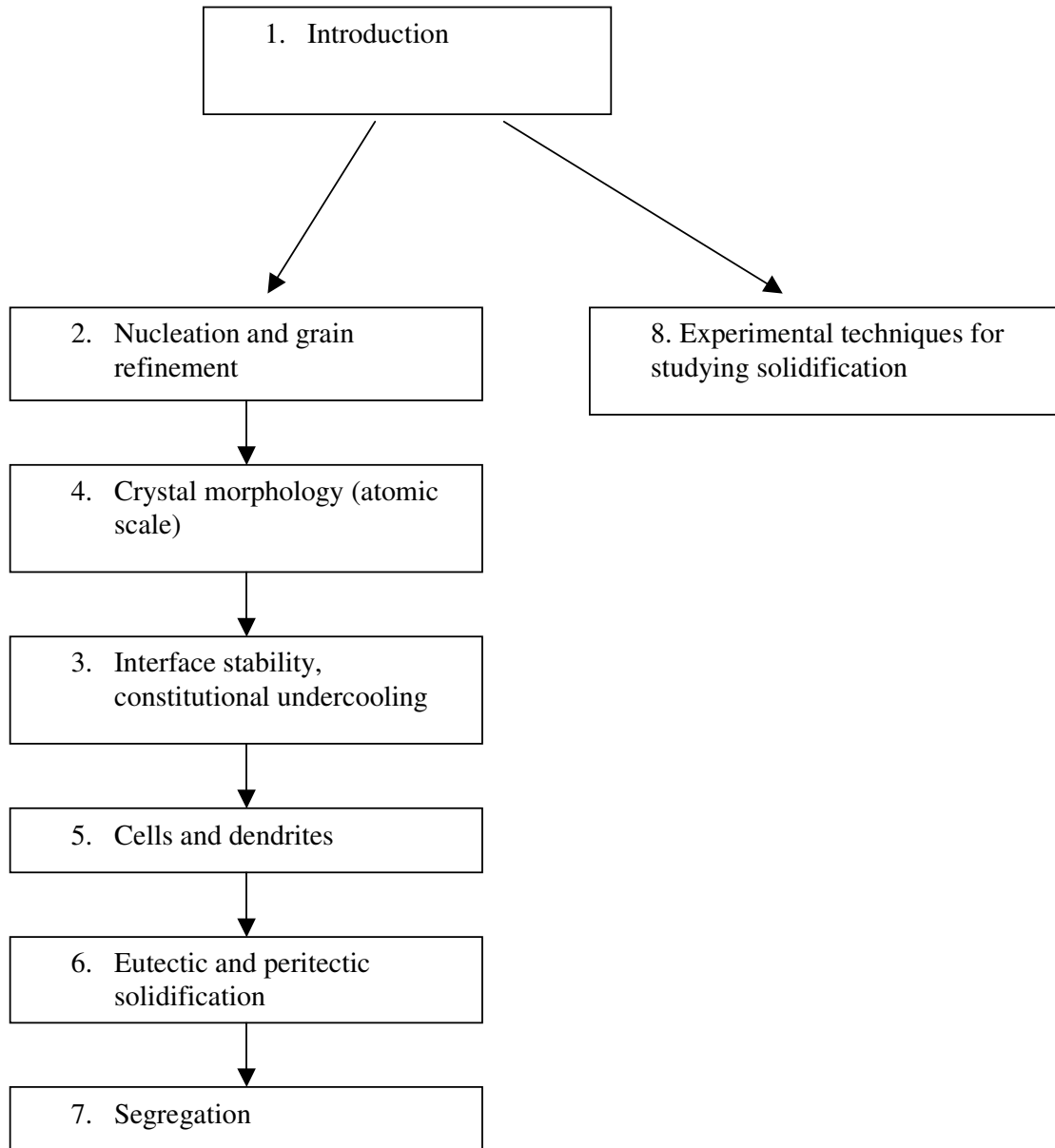
Course summary

The course gives an introduction to microstructure formation during solidification of metals. Nucleation and growth of crystals from the melt is treated and the morphology of different microstructural features such as cells and dendrites is described. Three phase reactions such as eutectic and peritectic solidification is treated. Redistribution of solute during solidification of alloys is described. Finally, some experimental techniques for studying solidification are described.

Lectures list

n.	Title	Summary	Lecturer	Duration
1	Introduction	Basic concepts, heat flow, solidification microstructures, capillary effects, solute redistribution	Arnberg, Lars	44'
2.	Nucleation and grain refinement	Formation of crystals from the melt. Homogeneous and heterogeneous nucleation, nucleation rate, grain refinement	Arnberg, Lars	35'
3.	Crystal morphology (atomic scale)	Interface structure, faceted & non-faceted growth, anisotropy, modification of growth mechanisms	Arnberg, Lars	34'
4.	Interface stability, constitutional undercooling	Solute pile-up at solid-liquid interface. Constitutional undercooling. Interface instability of alloys	Arnberg, Lars	32'
5.	Cells and dendrites	Morphology and crystallography of cells and dendrites. Supersaturation and growth undercooling. Primary and secondary arm spacing	Arnberg, Lars	31'
6.	Eutectic and peritectic solidification	Regular & irregular eutectics. Diffusion-coupled growth. Capillary effects. Peritectic growth	Arnberg, Lars	36'
7.	Segregation	Mass balance, solute redistribution during equilibrium, and non-equilibrium conditions. Freezing point. Microsegregation	Arnberg, Lars	33'
8.	Experimental techniques for studying solidification	Microscopy of solidified microstructures. Quenching, decanting. Transparent analogs, X-ray imaging, Thermal analysis	Arnberg, Lars	39'
				4h 45'

Lectures prerequisites chart



Each arrow means a prerequisite.