COURSE SYLLABUS
Solidification Processing, 3 credits

Stelningsprocesser, 3 högskolepoäng

Course Code:	TSPS22	**Education Cycle:**	Second-cycle level
Confirmed by:	Dean Mar 1, 2022	**Disciplinary domain:**	Technology
Valid From:	Aug 1, 2022	**Subject group:**	MA2
Version:	1	**Specialised in:**	A1F
		Main field of study:	Product Development

Intended Learning Outcomes (ILO)

After a successful course, the student shall:

Knowledge and understanding
- Fundamental understanding of microstructure development during solidification
- Knowledge about the effects of composition and cooling rate on microstructure
- Knowledge about how microstructure can be controlled and altered by trace level additions such as inoculation

Skills and abilities
- Ability to calculate and discuss in details the formation of various solidification microstructures in relation to the phase diagram

Judgement and approach
- Ability to suggest methods to improve the microstructure and performance of cast metals

Contents

The formation of microstructure during solidification, mechanisms and impact of altered solidification conditions. The fundamental mechanisms of solidification including nucleation, primary phase growth, eutectics and peritectics. Furthermore, the mushy zone and its properties are discussed in relation to the formation of casting defects. Real-life examples of inoculation/grain refinement and modification of aluminium alloys and cast irons are described in detail.

The course includes the following elements:
1. Homogeneous and heterogeneous nucleation
2. Interface stability
3. Constitutional undercooling
4. Primary phase growth
5. Eutectics
6. Peritectics
7. Mushy zone characteristics and its importance for casting defects

8. Grain refinement and modification of aluminium
9. Cast iron - solidification characteristics, microstructures and control

Type of instruction

Recorded lectures. Discussion sessions and tutorials for the quizzes and examination.

The teaching is conducted in English.

Prerequisites

Passed courses at least 90 credits within the major subject Mechanical Engineering, 15 credits Mathematics, and completed course in Microstructural Engineering, 7,5 credits and Thermodynamics, 7,5 credits, proof of English proficiency is required (or the equivalent).

Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Quizzes	1 credit	U/G
Examination[I]	2 credits	5/4/3/U

[I] Determines the final grade of the course, which is issued only when all course units have been passed.

Course literature

Literature
The literature listfor the course willl be provided eight weeks before the course starts.

Kurz and Fischer, Fundamentals of Solidification, Trans-Tech Publications
Selected publications will be made available during the course, or retrieved from the library.