



## COURSE SYLLABUS – THIRD-CYCLE EDUCATION

### **Casting, 7,5 higher education credits**

*Gjutning, 7,5 högskolepoäng*

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<b>Education Level:</b>	Third-cycle education
<b>Area of degree:</b>	Industrial product realisation
<b>Research subject:</b>	Materials and manufacturing
<b>The course applies fr.om :</b>	Course syllabus reviewed by RUF 2012-10-19, established 2013-11-14 by the dean (vd-beslut 2013/096)

#### **Learning outcome**

On completion of the course the student should:

##### *Knowledge and Understanding*

- Have knowledge of and be able to explain how the cast components are manufactured and how material properties depend on manufacturing process
- Understand and be able to describe the various factors that affect quality molded components

##### *Skills and Abilities*

- Be able to describe and analyze the impact of different transport phenomena such as heat conduction and convection , which are relevant for foundry
- Be able to select the appropriate alloy / materials , proper design / design and casting process to get the right component characteristics , with good process yields
- Demonstrate the ability to model basic precipitation phenomenon

##### *Judgement and approach*

- Be able to criticize models for the formation of material microstructure and resulting properties
- To evaluate and compare different models and solutions

#### **Contents**

The course aims to give students basic knowledge and deepening of component preparation and pouring of metals , including design, material properties and manufacturing processes. The course will give good skills in modeling transport phenomena and precipitation kinetics .

The course covers the following topics :

- Manufacture of components by casting.
- Applications of heat transfer, including conduction, convection , and radiation for calculation of solidification and feeding.
- Application of fluid flow, Bernoulli's equation , continuity equation , laminar and turbulent flow



- Molded materials , solidification , phase diagrams and microstructure and properties .. The relation casting process , microstructure and properties of casting alloys .
- Shrinkage and gas porosity.
- Design of castings and materials
- Introduction to computer simulation of the casting process . Integration of CAD / CAM, heat and fluid microstructure, property and power simulation

### **Instruction**

Lectures, laboratory assignments. Teaching is conducted in English.

The course is offered in conjunction with Component Casting TKGK12 where TMGK12 serves as an introduction to the subject. Progression to PhD level is done through self-study in the form of journal articles with assignments that are presented and discussed in seminars.

### **Prerequisites**

Admission to postgraduate studies or equivalent qualification with basic expertise in materials.

### **Assessment and grading**

The course will be graded Pass or Fail.

Name of the test	Value	Grading
Exam	2.5 hec	P/F
Laborations	1.5 hec	P/F
Assignments	3.5 hec	P/F

### **Reading List**

Component Casting with Simulation, Kompendium School of Engineering, Jönköping University

Materials Processing during Casting, H. Fredriksson och U. Åkerlind, John Wiley & Son, Hoboken, 2006 (ISBN-13: 978-0-470-+1513-1)

Journal articles