



## COURSE SYLLABUS

# Component Casting, 7.5 credits

*Komponentgjutning, 7,5 högskolepoäng*

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<b>Course Code:</b> TKGK19	<b>Education Cycle:</b> First-cycle level
<b>Confirmed by:</b> Dean Jun 1, 2019	<b>Disciplinary domain:</b> Technology
<b>Revised by:</b> Director of Education Jun 13, 2022	<b>Subject group:</b> MT1
<b>Valid From:</b> Aug 1, 2022	<b>Specialised in:</b> GIF
<b>Version:</b> 2	<b>Main field of study:</b> Mechanical Engineering

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### Intended Learning Outcomes (ILO)

After a successful course, the student shall;

Knowledge and understanding

- display knowledge of different casting processes and function of equipment
- display knowledge of the microstructure of cast materials
- demonstrate comprehension of castings, molds, molding materials and defects in casting.

Skills and abilities

- demonstrate the ability to analyze how different cast components are manufactured and how the material properties depend on the manufacturing process
- demonstrate the ability to formulate heat balances for molds and solidifying materials
- demonstrate the ability to apply heat balances for mathematical connection between heat flow and microstructure
- demonstrate the ability to calculate mold filling.

Judgement and approach

- demonstrate the ability to compare and choose the appropriate alloy / material, the correct part design / mold design and casting process to obtain the requested properties
- demonstrate the ability to use and evaluate different solutions through process simulation.

### Contents

The course intends to give the student basic knowledge and in-depth knowledge of component production of cast metallic materials, including castings design, material properties and manufacturing processes. In the course a technical scientific approach is used to both a systematic approach and a mathematical language to be able to analyze and evaluate solutions and associated problems.

The course contains the following:

- Manufacture of components by casting
- Applications of heat transfer; including heat conduction, convection and heat radiation for

calculation of solidification and feeding

- Applications of fluid flow, Bernoulli's equation, continuity equation, lamellar and turbulent flow
- Cast materials, solidification, microstructure and properties
- In depth understanding of phase diagrams
- The relationship between casting process, microstructure and properties of cast alloys
- Shrinkage and gas porosity formation
- Rules of thumb for castings design and materials selection
- Introduction to computer simulation of the casting process

### Type of instruction

Lectures, laboratory work and assignments. The course is given both on campus and as a distance course/online course.

The teaching is conducted in English.

### Prerequisites

General entry requirements and completed courses in Solid Mechanics, 6 credits and Basic Thermodynamics and Transport Phenomena, 3 credits (or the equivalent).

### Examination and grades

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

Registration of examination:

Name of the Test	Value	Grading
Examination <sup>†</sup>	4.5 credits	5/4/3/U
Laboratory work and assignment	3 credits	U/G

<sup>†</sup> Determines the final grade of the course, which is issued only when all course units have been passed.

### Course literature

The literature is preliminary until eight weeks before the course starts.

Component Casting with Simulation”, School of Engineering, Jönköping University. Editor: Ingvar L Svensson.

The book is available free of charge as a PDF for the students.

Supplementary reference literature (not compulsory) is the following books:

- “Complete casting handbook: Metal casting processes, metallurgy, techniques and design”, John Campbell. The book is available as an online e-book free of charge for students via the homepage of the university library.
- “Materials Processing During Casting”, Hans Fredriksson & Ulla Åkerlind.
- “Science and Engineering of Casting Solidification”, D. M. Stefanescu.