

COURSE SYLLABUS

Component Casting, 7.5 credits

Komponentgjutning, 7.5 högskolepoäng

Course Code: TKGK19	Education Cycle: First-cycle level
Confirmed: Jun 13, 2022	Disciplinary domain: Technology
Valid From: Aug 31, 2026	Subject group: Mechanical Engineering
	Specialised in: G1F First cycle, has less than 60 credits in first-cycle course/s as entry requirements
	Main field of study: Mechanical Engineering

Intended Learning Outcomes (ILO)

On completion of the 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.

Content

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.

Language of instruction is English.

Entry Requirements

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 U.

Registration of examination:

Name of the Test	Value	Grading
Examination ¹	4.5 credits	5/4/3/U
Laboratory work and assignment	3 credits	G/U

¹Determines the final grade of the course, which is issued only when all course units have been passed.

Course Literature

Please note that the course literature may be revised up to eight weeks before the start of the course.

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.