KURSPLAN

Modellering och simulering av gjutning, 6 högskolepoäng

Modelling and Simulation of Casting, 6 credits

Kurskod:	TMSS22	**Utbildningsnivå:**	Avancerad nivå
Fastställd av:	VD 2022-03-01	**Utbildningsområde:**	Tekniska området
Reviderad av:	Utbildningschef 2023-01-25	**Ämnesgrupp:**	MA2
Gäller fr.o.m.:	2023-08-01	**Fördjupning:**	A1F
Version:	2	**Huvudområde:**	Produktutveckling

Lärandemål

After a successful course, the student shall:

Kunskap och förståelse

• show familiarity with use of casting simulation in the development of new casting processes
• display knowledge of analytical and numerical methods used to calculate phenomena associated with casting.
• demonstrate comprehension of how material properties and boundary conditions affect the calculation results.

Färdighet och förmåga

• demonstrate skills of using analytical formulas and numerical programing of heat transport and solidification phenomena in relation to casting of metallic materials.
• demonstrate the ability to use professional software to optimize mold filling and resulting cast material properties.

Värderingsförmåga och förhållningssätt

• demonstrate the ability to chose adequate calculation methods and models for various kinds of cast materials.
• demonstrate an understanding of validation methods to determine if calculation results reflect real phenomena associated with casting.

Innehåll

The course covers trends in programing and simulation of solidification phenomena of cast metals. Examples from applications for process and materials development, solutions of technological problems using casting simulation. An analytical part treats the basic heat transport and solidification. A numerical part treats the heat equation by conduction using the Finite Different Method (FDM). Numerical solution of solidification via the Enthalpy method and associated heat transport is solved with the control volume based finite difference method FDM-CV. Numerical solutions based on 1D formulation are solved in MATLAB and compared with simulation in a commercial 3D simulation software.

The course includes:
• Fundamentals of heat flow and solidification
• Programming the heat flow and solidification
• Use of professional casting simulation software
• Validation of the casting simulation

Undervisningsformer

Teaching consists of lectures mixed with calculation exercises, laboratory work with programming 1D program codes to calculate heat conduction and solidification, laboratory work with commercial 3D program to test optimization of casting and solidification of cast components.

Undervisningen bedrivs på engelska.

Förkunskapskrav

Passed courses at least 90 credits within the major subject Mechanical Engineering, 15 credits Mathematics, and completed course in Component Casting, 6 credits, and Solidification Processing, 3 credits, and proof of English proficiency is required (or the equivalent).

Examination och betyg

Kursen bedöms med betygen 5, 4, 3 eller Underkänd.

The final grade for the course is based on a balanced set of assessments. The final grade will only be issued after satisfactory completion of all assessments.

Poängregistrering av examinationen för kursen sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Tentamen	3 hp	5/4/3/U
Inlämningsuppgift	3 hp	5/4/3/U

Övrigt

Dispens från förkunskapskravet medges enligt det programs urvalsgrupp där kursen ingår.

Kurslitteratur

Litteratur

The literature list for the course will be provided eight weeks before the course starts. Compendium based on "Fundamentals of Numerical Modelling of Casting Processes" by Jesper Hattel. Formula and exercise collection from Attila Diószegi. User's manual for program codes: MATLAB, Magma Soft, NovaFlow & Solid, Flow 3D, ProCast or Fluent.