COURSE SYLLABUS

Metallurgy, Solidification and Modeling of Cast Iron, 7.5 credits

Metallurgi, stelning och modellering av gjutjärn, 7,5 högskolepoäng

Course Code:	FTMSM34	**Education Cycle:**	Third-cycle level
Confirmed by:	Dean Feb 7, 2014	**Research subject:**	Materials and Manufacturing
Valid From:	Feb 7, 2014		
Version:	1		

Intended Learning Outcomes (ILO)

On completion of the course, the doctoral student must

Knowledge and understanding

- have good knowledge of cast iron metallurgy and thermodynamics
- have good understanding of the phenomena that occur in connection with the production of components made of cast iron
- have knowledge of methods to manufacture cast iron components
- have knowledge of methods used to control the quality and characteristics
- have an understanding of how the structure and defects affect material properties

Skills and abilities

- have the skills to formulate research and development questions related to cast iron based on the existing knowledge front
- have the ability to use modern tools for the exploration and development of cast iron material

Judgement and approach

- to evaluate which specific production processes are preferable for the production of a particular component intended to be manufactured in cast iron

Contents

The course gives graduate students an overview of the world's oldest metallic construction material produced by casting. Basic knowledge of cast iron are presented along a theoretical tread from production via melting, melt treatment, casting and solidification, resulting structure characteristics and defects, treatment for controlling and improving the properties and simulate phenomena associated with the production of cast components made of cast iron. The course goes through modern investigation and research methods that have been introduced for the past twenty years, promoting the understanding of the phenomena and properties of cast iron to develop new manufacturing methods, properties and applications. The course will supply castings manufacturers and casting consumers view on the manufacturing and use of components made of cast iron.

The course includes the following topics:

- Introduction and cast iron's history
- Cast iron metallurgy and thermodynamics
- Exploration research methods
- Melting, melt treatment and casting
- Solidification and pahse transformations
- Structural and defect formation mechanisms
- Mechanical properties of the as-cast, heat-treated and alloyed cast iron
- Thermo-physical and thermo-mechanical properties
- Fatigue
- Simulation of solidification, defect formation, structure and properties
- The use of cast iron as a structural material

Type of instruction

Lecture, discussion between lecturers-industry representatives-graduate students, foundry visits.

The teaching is conducted in English.

Prerequisites

Admitted to third level education or equivalent qualification.

Examination and grades

The course is graded Fail (U) or Pass (G).

The examination form is verbal. For a grade of Pass students must correctly answer questions related to the knowledge front of cast iron.

Course literature

Metallurgy, Solidification and Modeling of Cast Iron

Course literature will be appointed one month before start of the course.