



## KURSPLAN **Haverianalys, 6 högskolepoäng**

### *Failure Analysis, 6 credits*

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<b>Kurskod:</b>	THAS26	<b>Utbildningsnivå:</b>	Avancerad nivå
<b>Fastställd av:</b>	VD 2016-03-01	<b>Utbildningsområde:</b>	Tekniska området (95%) och samhällsvetenskapliga området (5%)
<b>Gäller fr.o.m.:</b>	2016-08-01	<b>Ämnesgrupp:</b>	MA2
<b>Version:</b>	1	<b>Fördjupning:</b>	A1F
<b>Diarienummer:</b>	JTH 2016´ /1124-313	<b>Huvudområde:</b>	Produktutveckling

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### **Lärandemål**

After a successful course, the student shall

#### Kunskap och förståelse

- display knowledge of and be able to understand the various types of failures their mechanisms (Static and fatigue), and the material/process related reasons behind failure
- display detailed knowledge of the cast metal microstructural features and their role on the failure (Cast Iron, Al, and Mg)

#### Färdighet och förmåga

- demonstrate the ability to apply different analytical techniques to determine the cause of the failure and recognize the possible factors leading to materials failure
- demonstrate skills on how to plan, control and conduct a failure analysis process
- demonstrate the ability to identify the impact of different environmental (temperature, work environment, processing etc) conditions on the deformation and crack growth of cast metals.

#### Värderingsförmåga och förhållningssätt

- demonstrate the ability to choose the right methodology for conducting analysis and processing to provide root causes for a failure
- demonstrate an understanding of the various root causes (material, design, operational) of the failure and determine the exact failure mechanism.

### **Innehåll**

The course gives knowledge of various failure mechanisms and methodology of failure analysis especially in cast metals. The various factors behind the failure from aspect of materials, design, processing and operational parameters are discussed. It covers the deformation of cast metals at both room and elevated temperature and provides knowledge on fracture mechanics. The environmental factors such as temperature and corrosion affecting the failure are studied. The approach, planning and execution of failure analysis process and related analytical techniques are also discussed.

The course includes the following elements:

- Structure of metals
- Failure modes in cast materials: ductile and brittle fracture, fatigue, creep
- Analysis methods for the study of fracture surfaces
- Plastic deformation, crack nucleation and growth mechanism
- Study of environmental factors (temperature, corrosion) and related failures
- General outcomes and discussion about failure analysis

### Undervisningsformer

Lectures, exercise and project work.

Undervisningen bedrivs på engelska.

### Förkunskapskrav

Passed courses at least 90 credits within the major subject in Mechanical Engineering, and 21 credits Mathematics, and completed courses in Component Casting, 6 credits, and Material Testing and Characterisation, 6 credits. English Language requirements corresponding to English 6 or English B in the Swedish upper secondary school (eller motsvarande kunskaper).

### Examination och betyg

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

Poängregistrering av examinationen för kursen sker enligt följande system:

Examinationsmoment	Omfattning	Betyg
Tentamen <sup>1,3</sup>	3 hp	5/4/3/U
Övningar och projektarbete	3 hp	U/G

<sup>1</sup> Bestämmer kursens slutbetyg vilket utfärdas först när samtliga moment godkänns.

<sup>3</sup> Includes 3 main Tasks (mini-exams) that determine the final grade of the course, which is issued only when all course units have been passed.

### Kurslitteratur

The literature list for the course will be provided one month before the course starts.

Title: Understanding how components fail, 2nd Edition

Författare: Book of Donald J. Wulpi,

Title: ASM metals handbook – Vol II – Failure analysis