COURSE SYLLABUS
Failure Analysis, 6 credits

Haverianalys, 6 högskolepoäng

Course Code:	THAS26	**Education Cycle:**	Second-cycle level
Confirmed by:	Dean Mar 1, 2016	**Disciplinary domain:**	Technology (95%) and social sciences (5%)
Valid From:	Aug 1, 2016	**Subject group:**	MA2
Version:	1	**Specialised in:**	A1F
Reg number:	JTH 2016´/1124-313	**Main field of study:**	Product Development

Intended Learning Outcomes (ILO)

After a successful course, the student shall

Knowledge and understanding
- 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)

Skills and abilities
- 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.

Judgement and approach
- 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.

Contents

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 growthmechanism
- Study of environmental factors (temperature, corrosion) and related failures
- General outcomes and discussion about failure analysis

Type of instruction

Lectures, exercise and project work.

The teaching is conducted in English.

Prerequisites

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 (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[I]	3 credits	5/4/3/U
Exercises and Project Work	3 credits	U/G

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

Course literature

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 11 – Failure analysis