



## HÖGSKOLAN I GÄVLE

### Reliability, Maintainability and Safety Engineering 6 cr

*Tillförlitlighet, underhållsmässighet och säkerhetsteknik 6 hp*

Set by Faculty of Engineering and Sustainable Development

**Version**

**Set at**

**Valid from**

10/8/14

**HT2015**

<b>Level</b>	A1N
<b>Education level</b>	Second cycle
<b>Course identifier</b>	IEA009
<b>Credits</b>	6 cr
<b>Main field of study</b>	Industrial Economics
<b>Subject group</b>	Industrial Engineering and Management
<b>Disciplinary domain</b>	Technology 100.0 %

**Learning outcomes** This course focuses on how to measure, design, manage and optimize three important quality elements of products or systems: reliability, maintainability and safety (RMS). After completion of the course, the student shall be able to

Knowledge and understanding

1. describe the role of RMS concepts and measurements in product design, manufacturing and logistics service
2. define explicitly the operational reliability, maintainability and safety of products, processes and logistics systems

Competence and skills

3. characterize the main differences of the key RMS measurements in products, manufacturing processes and supply chain systems
4. identify the key activities of a RMS program under the umbrella of supply chain management
5. apply the methods to a practical operational problem or research project in R&D process, manufacturing, logistics and system.

Judgment and approach

6. explain the significance of Reliability, Maintainability and Safety Engineering from societal and ethical perspectives
7. make a comprehensive assessment of Reliability, Maintainability and Safety for systems.

**Course content**

Introduction  
 Definition and concepts  
 Review of Reliability Engineering  
 Relationship with Lean Manufacturing  
 Roles in Supply Chain Management

Basics  
 Lifetime distributions; Failure rate and bathtub curve; Reliability models; Computation software; Calculation of reliability

System reliability models  
 Reliability block diagram and Structure function  
 Series system; Parallel system; Series-Parallel systems  
 Computation of system reliability

System analysis techniques  
 Fault tree analysis  
 Failure mode and effect analysis  
 Probabilistic risk analysis  
 System safety  
 Reliability prediction and allocation  
 Reliability design and management

Reliability testing and data analysis  
 Types of reliability testing; Graphical techniques in reliability; Model selection; Reliability estimation

Maintainability  
 Maintainability requirements; Cost and maintainability; Availability; Maintenance strategies; Design guideline for maintainability

Prognostic Health Management  
 Methodologies for PHM research; PHM Design Techniques and Algorithms; Data-driven prognostics; Model-based prognostics; Hybrid approaches; Prognostic Performance Evaluation

**Teaching** The course consists of lectures, seminars, exercises, course project and study visits.

**Prerequisites** English language proficiency equivalent to (the Swedish upper secondary school) English course 6/B.  
 Bachelor Degree in Industrial Engineering or equivalent including a minimum of 15 credits in the basic course for Statistics, Total Quality Management or equivalent.

**Examination** Assignment, written examination and Project work

**Grade** A, B, C, D, E, Fx, F

**Other regulations** Criteria for final grade will be handed out at the beginning of the course.

**Sustainable environment** The majority of the course content deals with sustainable development..

<b>Module</b>	0010 Assignments	0.5 cr	Grade: AF
	0020 Written examination	2.5 cr	Grade: AF

