

## Course Syllabus

### Materials Testing and Analysis 7.5 Credits, First Cycle

#### Learning Outcomes

##### *Knowledge and understanding*

Upon completion of the course, students will be able to:

- explain the importance of including material-related quality control and troubleshooting in the production chain, from both a quality perspective and a sustainability perspective,
- explain central concepts in material analysis and material testing,
- describe the most common methods of material analysis and material testing and when they can be used to solve material-related problems within the product manufacturing chain.

##### *Skills and abilities*

Upon completion of the course, students will be able to:

- master the various steps of metallographic sample preparation,
- perform hardness testing and tensile testing of various engineering materials,
- perform simple material analyses using light optical microscopy and scanning electron microscopy / X-ray analysis,
- distinguish between different types of product defects such as handling defects, process / production defects and material defects,
- distinguish different types of product defects that arise in handling, process, production or that are linked to the material,
- interpret and communicate the meaning of the results obtained in connection with material testing and analysis.

##### *Evaluation ability and approach*

Upon completion of the course, students will be able to:

- discuss and reflect on how different types of material defects can affect the robustness of the production process and the quality of the final product as well as ways to avoid this type of problem,
- critically discuss and reflect on the role of materials so that the production processes and products can be made more sustainable.

#### Course Content

The course includes the following theoretical and practical elements: mechanical testing

(tensile test, impact test, hardness measurement), metallographic sample preparation, basic light and scanning electron microscopy, basic surface analysis methods. The course covers the methodology for material-related quality control and systematic troubleshooting in the production chain, from both a quality perspective and a sustainability perspective, with the aim of preventing or reducing the frequency and consequences of various types of material-related product errors.

#### **Assessment**

- Written examination
- Laboratory sessions

#### **Grades**

The grading scale used for the final course grade is U, 3, 4, 5.

Grades are reported as follows:

- Written examination - 4 Credits | U, 3, 4, 5
- laboratory Work, Material testing - 2 Credits | U–G
- Laboratory Work, Material analysis - 1.5 Credits | U–G

#### **Prerequisites**

Role of Materials in the Production Chain, 7,5 credits

#### **Other Information**

This course cannot be counted towards the same degree along with courses that have equivalent content.

If the student has received a decision/recommendation granting study support from Dalarna University because of a disability, then the examiner has the right to offer an alternative examination arrangement. The examiner takes into account the objectives in the course syllabus when deciding whether the examination can be adapted in accordance with the decision/recommendation.

#### **Subject:**

Mechanical Engineering

#### **This course can be included in the following main field(s) of study:**

1. No main field of study

#### **Progression Indicator:**

1. GXX

#### **Approved:**

Approved 30 May 2023

Valid from 1 July 2023