Dislocations and Mechanical Behaviour of Materials, 10.0 credits

Dislokationsteori och mekaniska egenskaper hos material, 10.0 hp

Third-cycle education course

6FIEI08

Department of Management and Engineering

Valid from: Second half-year 2025

Approved by
Head of Department

Approved
2019-03-18

Revised by
Head of Department

Revised
2025-09-24

Registration number
IEI-2025-00517

Entry requirements

Admitted to doctoral studies. PhD students at IEI have priority for the course.

Specific information

Dislocations are defects in the crystal structure of important engineering materials, such as metals, ceramics and semi-conductors, that strongly influence the properties of these materials. The purpose of this course is to give the fundamental background to dislocation theory and highlight the linking between dislocation theory and plastic deformation and strengthening mechanisms with a special focus on the microscopic view of plastic deformation. However, in the beginning of the course we will also cover elementary mechanical testing methods and basic theory of elasticity and plasticity from a macroscopic point of view.

Learning outcomes

Students should become familiar with dislocations and dislocation structures in metals and their impact on mechanical properties. They should be able to discuss how texture development occurs during plastic deformation, and when different deformation mechanisms dominate. After completing the course, the students should be able to assess and evaluate their own and others' research results with regard to dislocation theory and mechanical properties of different materials.

Contents

- Material testing methods for strength
- Theory of Elasticity
- Strain hardening and theory of plasticity
- Slip and crystallographic textures
- Defects in crystals
- Movement of dislocations
- Dislocation interactions
- Mechanical Twinning and martensitic shear
- Strength of crystalline solids

Educational methods

There will be 6 seminars covering briefly the content of the course. Reading instructions and assignments will be given for each seminar.

Examination

Individual home assignments

Oral presentations at the seminars

Grading

Two-grade scale

Course literature

To be announced at the start of the course.

General information

The course considers equal opportunities and aims to utilize the resources that students with diverse backgrounds, life situations, and competencies contribute to the education.

The reading list and schedule are determined separately.

The course coordinator must conduct a course evaluation after each course session.

The results of the course evaluation must be communicated to the participants of the current and upcoming course sessions, as well as to the Research Education Council at IEI.