Module description

Mechanics of Elastic Structures

General information

Number of ECTS Credits

3

Abbreviation

TSM_Mechanic

Version

2.12.2016

Responsible of module

Hans Rudolf Manz, FHNW

Language

	Lausanne	Bern	Zürich
Instruction	☑ F ☐ E	☐ D ☐ E ☐ F	☐ D ☑ E
Documentation	☑ F ☐ E	☐ D ☐ E ☐ F	☐ D ☑ E
Examination	☑ F ☐ E	☐ D ☐ E ☐ F	☐ D ☑ E

Module category

☐ Fundamental theoretical principles

☑ Technical/scientific specialization module

☐ Context module

Lessons

☑ 2 lecture periods and 1 tutorial period per week

Brief course description of module objectives and content

In this module, students learn calculation methods for furnishing proof of the load-bearing capacity of structures and are made aware of the limits of these procedures.

The module imparts methods and procedures for calculating and measuring the mechanical behavior of structures and highlights their importance for the development of load-bearing structures.

Aims, content and methods

Learning objectives and acquired competencies

- In selected fields of engineering mechanics, students acquire the theoretical knowledge to solve problems in product development with regard to product lifecycles.
- Students know the failure mechanisms of load-bearing structures subject to mechanical load and are familiar with the possibilities and limits for designing and dimensioning structures.
- Students are familiar with selected extended material laws, e.g. elasto-plastic behavior, anisotropic materials, etc.

Contents of module with emphasis on teaching content

- 2D and 3D distortion/stress state, elastic and elasto-plastic stress-strain behavior of isotropic materials, stress-strain behavior of anisotropic materials
- Yielding criteria (v. Mises, Tresca) and damage criteria for anisotropic materials. Criteria for fatigue failure, rated and local stresses, counting methods for compiling load collectives, linear damage accumulation, plastic and multi-axial hardening, fatigue strength in the low cycle and endurance limit range
- Stress intensity factors, fracture toughness, microplastic deformation at the crack tip, crack propagation,
- Measuring mechanical stresses
- Stability of beams and plates, post buckling behavior; collapse

Teaching and learning methods

- Ex cathedra
- Demonstrations
- Specialist literature
- Exercises

Prerequisites, previous knowledge, entrance competencies

- Basic knowledge of structural mechanics: tension/compression, torsion of shafts, deflection and elastic deformation of beams, multiaxial stress states, stress tensor, comparison stress, strength test with static loading and endurance limit
- Calculation with matrices

Literature

- Script
- Individual chapters from the relevant literature

Assessment

Certification requirements for final examinations (conditions for attestation)

None

Written module examination

• Duration of exam:	120 minutes
• Permissible aids:	Permitted: scripts, books, own summaries, pocket calculators Not permitted: electronic devices that permit wireless communication with third parties