Computer-based Analyses of Steel Structures

Module-No./Abbreviation	Credits	Workload	Term	Frequency	Duration
CE-P03/CbASS	6 CP	180 h	1st Sem.	Winter term	1 Semester

Courses	Contact hours	Self-Study	Group Size:
a) Basics of Analysis and Design, Numerical simulations in Steel Design, Fundamentals for computer-oriented Structural Analysis and Design assisted by Finite Element Analysis b) Stability Behavior – Members and Plated Structural Elements c) Structural Durability	4 SWS (60 h)	120 h	No Restrictions

Prerequisites

Fundamental knowledge in mechanics and strength of materials

Learning goals / competences:

This course will introduce students to the fundamental structural and fatigue behavior of steel structures, numerical solution procedures and modeling details. The course aims to achieve a basic understanding of applied mechanics approaches to modeling member behavior in steel structure problems. The course is addressed to young engineers, who will face the necessity of numerical analysis and applied mechanics more often in their design practice.

The purpose of this course is to bridge the gap between applied mechanics and structural steel design using state-of-the-art tools. The students shall become familiar with computer-oriented analyses and assessment methods by using the example of steel constructions. The course will also convey to students the ability to use numerical tools and software packages for the solution of practical problems in engineering.

After successfully completing the module, the students

- have fundamental knowledge on structural and fatigue behavior of steel structures with the application of numerical procedures and modeling,
- should be familiarized with basic principles of design and computer-oriented procedures in assessing steel structures, their stability behavior and durability,
- will have gained experience in undertaking new concepts on their own and participate in in-class collaborative learning through the Inverted-classroom format,
- will have gained skills in working on a problem individually and in groups, presenting their findings in interactive presentations as well as assessing the findings of their peers.

Content

This course is introductory – by no means does it claim completeness in such dynamically developing fields as numerical analysis of slender steel structures and structural durability. The course intends to achieve a basic understanding of applied mechanics approaches to slender steel structure modeling and structural durability, which can serve as a foundation for the exploration of more advanced theories and analyses of different kind of structures.

Basics of the Analysis, Design and Fundamentals for Computer-Based Calculations

- Basic principles of structural design
- Beam theory and torsion
- Finite elements for beams and plates
- Software for analyses

Stability Behavior of Slender Structures and Second Order Theory

- Geometric non-linear design of structures - second order analysis
- Buckling of linear members and frames
- Lateral buckling and lateral torsional buckling
- Eigenvalues and –shapes
- Numerical methods for plate buckling

Structural Durability

- Fatigue
- Modern Concepts of Fatigue Strength Design
- Local Strain Concept
- Crack Propagation Concept

Teaching methods / Language

Lecture (2h / week), Exercises (2h / week) / English
The course is partially conducted in the Blended Learning and Inverted-Classroom formats.

Mode of assessment

Written examination (180 min, 100%)

Requirement for the award of credit points

Passed final module examination

Module applicability

MSc. Computational Engineering

Weight of the mark for the final score

4 %

Module coordinator and lecturer(s)

Prof. Dr. M. Knobloch, Assistants

Further information