Object-oriented Modeling and Implementation of Structural Analysis Software

<table>
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<tr>
<th>Module-No./Abbreviation</th>
<th>Credits</th>
<th>Workload</th>
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<tr>
<td>CE-WP10/OOFEM</td>
<td>3 CP</td>
<td>90 h</td>
<td>2nd Sem.</td>
<td>Summer term</td>
<td>1 Semester</td>
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Courses
Object-oriented Modeling and Implementation of Structural Analysis Software
Contact hours: 2 SWS (30 h)
Self-Study: 60 h
Group Size: No Restrictions

Prerequisites
Finite Element Methods in Linear Structural Mechanics (CE-P05) and Modern Programming Concepts in Engineering (CE-P04)

Learning goals / Competences
The seminar connects the theory of finite element methods (FEM) and object-oriented programming. After successfully completing the module, the students
- can implement the theories and methods of the course ‘Finite Element Methods in Linear Structural Mechanics’ in an object-oriented finite element program and apply this program for the analysis of engineering structures,
- have developed a program for the computation of spatial truss structures,
- can verify the program using benchmark examples,
- gained deep insight into the most relevant aspects for the implementation within the FEM and possibilities of using object-oriented programming for numerical approaches.

Content
The main topics of the course are:
- short summary of the basics of FEM and project-oriented programming
- preparing a project with two parts
  - Part 1: students individually develop and verify an object-oriented finite element program for the linear analysis of spatial truss structures
  - Part 2: students can choose between different options, either, the application developed in the Part 1 is extended to more challenging problems (nonlinear analysis, other element types, etc.) or students switch to an existing object-oriented finite element package (e.g. Kratos) and develop an extension of that software (e.g. material models, element formulations)

Teaching methods
Block seminar / equiv. to 2h lecture

Mode of assessment
Project work and final student presentation (100 %)

Requirement for the award of credit points
Passed project work and final student presentation

Module applicability
MSc. Computational Engineering, MSc. Bauingenieurwesen

Weight of the mark for the final score
3 %

Module coordinator and lecturer(s)
Prof. Dr. techn. G. Meschke, Prof. Dr.-Ing. M. Baitsch, Assistants

Further information

last updated March 2022