## Object-oriented Modeling and Implementation of Structural Analysis Software

<table>
<thead>
<tr>
<th>Module-No./Abbreviation</th>
<th>Credits</th>
<th>Workload</th>
<th>Term</th>
<th>Frequency</th>
<th>Duration</th>
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<tbody>
<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,
- Develop a program for the computation of spatial truss structures,
- Verify the program using benchmark examples,
- Gain 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