Continuum Mechanics

<table>
<thead>
<tr>
<th>Module-No./Abbreviation</th>
<th>Credits</th>
<th>Workload</th>
<th>Term</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE-P07/CM</td>
<td>6 CP</td>
<td>180 h</td>
<td>2nd Sem.</td>
<td>Summer term</td>
<td>1 Semester</td>
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</tbody>
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Courses
- Continuum Mechanics

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Self-Study</th>
<th>Group Size:</th>
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<tbody>
<tr>
<td>4 SWS (60 h)</td>
<td>120 h</td>
<td>No Restrictions</td>
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Prerequisites
Mathematical Aspects of Differential Equations and Numerical Methods (CE-P01), Mechanical Modeling of Materials (CE-P02)

Learning goals / Competences
Extended knowledge in continuum-mechanical modeling and solution techniques as a prerequisite for computer-oriented structural analysis.
After successfully completing the module, the students
- will possess extended knowledge of continuum mechanics
- will be able to formulate problems of structural and material mechanics within the framework of continuum mechanics
- will have mastered solution techniques for mechanical problems as a prerequisite for computer-oriented analysis
- will be able to create mathematical models for engineering systems and processes
- will be able to interpret modeling results and revise models accordingly

Content
The course starts with an introduction to the advanced analytical techniques of linear elasticity theory, then moves on to the continuum-mechanical concepts of nonlinear elasticity and ends with the discussion of material instabilities and microstructures.
Numerous examples and applications will be given:
- Advanced Linear Elasticity
- Beltrami equation
- Navier equation
- Stress-functions
- Scalar- and vector potentials
- Galerkin-vector
- Love-function
- Solution of Papkovich - Neuber
- Nonlinear Deformation
- Strain tensor
- Polar descomposition
- Stress-tensors
- Equilibrium
- Strain-rates
- Nonlinear Elastic Materials
- Covariance and isotropy
- Hyperelastic materials
- Constrained materials
- Hypoelastic materials
- Objective rates
- Material stability
- Microstructures

**Teaching methods / Language**
Lecture (2h / week), Exercises (2h / week) / English

**Mode of assessment**
Written examination (120 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. rer. nat. K. Hackl, Assistants

**Further information**