## Computational Fracture Mechanics

<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-WP19/CFM</td>
<td>6 CP</td>
<td>180 h</td>
<td>3rd Sem.</td>
<td>Winter term</td>
<td>1 Semester</td>
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### Courses
- Computational Fracture Mechanics
- Contact hours: 4 SWS (60 h)
- Self-Study: 120 h

### Prerequisites
- 

### Learning goals / Competences
After successfully completing the module, the students
- remember the different types of brittle fracture and ductile failure of materials,
- understand the theoretical background of the different types of fracture models,
- are able to study the relevant literature independently,
- are able to choose appropriate fracture models and to implement them in a finite element environment,
- are able to independently simulate fracture including plasticity for a wide range of materials and geometries,
- can assess situations where cracks in a structure or component can be tolerated or situations in which cracks are not admissible.

### Content
- Phenomenology and atomistic aspects of fracture
- Concepts of linear elastic fracture mechanics
- Concepts of elastic-plastic fracture mechanics
- \( R \) curve behavior of materials
- Concepts of cohesive zones (CZ), extended finite elements (XFEM) and damage mechanics
- Finite element based fracture simulations for static and dynamic cracks
- Application to brittle fracture & ductile failure for different geometries and loading situations

### Teaching methods / Language
- Lecture (2h / week), Exercises (2h / week) / Homework (60h) / English

### Mode of assessment
- Written examination (120 min, 100%), bonus points for homework

### Requirement for the award of credit points
- Passed final module examination and passed homework

### Module applicability
- MSc. Computational Engineering, MSc. Maschinenbau, MSc. Materials Science and Simulation

### Weight of the mark for the final score
- 6 %

### Module coordinator and lecturer(s)
- Prof. Dr. rer. nat. A. Hartmaier, Assistants

### Further information
- Master's program Computational Engineering - Module Handbook
- Last updated March 2022