



Number of module	Name of module	Lecturer
BIWE-08	Multiscale Mechanics	Prof. Zastrau
Content and qualification aim	<p>Content of the module:</p> <ul style="list-style-type: none">• Multiscale modeling of composites and materials with defects and cracks• Representative Volume Elements (RVE) and unit cells• Homogenization and localization (scale transition/scale bridging)• Hierarchical and simultaneous multiscale methods• Averaging techniques• Voigt/Reuss approximations and Hashin/Shtrikmann bounds• Micromechanical solution by Eshelby• Effective field and effective medium approximation• Introduction to numerical homogenization procedures with homogeneous, periodic, and mixed boundary conditions <p>After having finished the module successfully students know about the multiscale modeling of composite materials and materials with defects and cracks using analytical models and approximation approaches.</p>	
Type of course	2 hours of lectures, 1 hour of exercise per week, and self-study	
Requirements for study	Good knowledge of the content of module BIWO-02 (Continuum Mechanics, Tensor Calculus) and study competence from module BIWO-05	
Practical use of the module	The module is one of the elective modules in the Master's programme: Advanced Computational and Civil Engineering Structural Studies, of which seven have to be chosen.	
Requirements for the award of credits	<p>The credits are awarded if the module examination is successfully passed.</p> <p>Depending on a student's decision the module examination consists of either a written examination (90 min) or an oral examination (group examination of up to three students, 20 min per student).</p> <p>The module examination also consists of an ungraded assignment of subtasks (40 h).</p>	
Credits and grades	<p>4 credits can be acquired for this module.</p> <p>The grade is calculated by the weighted arithmetic mean of the partial examination results. The weighting factor of the assignment is one and the weighting factor of the written or oral examination is two.</p>	
Frequency of module	The module is offered every academic year (summer semester).	
Workload	The workload is 120 working hours.	
Duration of the module	1 semester	

Recommended literature

- H.J. Böhm: A Short Introduction to Basic Aspects of Continuum Micromechanics
- S. Nemat-Nasser, M. Hori: Micromechanics – Overall Properties of Heterogeneous Materials