

Variational Calculus and Tensor Analysis					
Module-No./Abbreviation	Credits	Workload	Term	Frequency	Duration
CE-WP01/VCTA	5 CP	150 h	1 st Sem.	Winter term	1 Semester
Courses Variational Calculus and Tensor Analysis			Contact hours 3 SWS (45 h)	Self-Study 105 h	Group Size: No Restrictions
Prerequisites Basic knowledge in Mathematics and Mechanics					
Learning goals / Competences The objective of this course is to introduce students to the fundamentals of vector and tensor algebra and its application to continuum mechanics. Moreover, the course will address basic aspects of variational methods in engineering. After successfully completing the module, the students will be able <ul style="list-style-type: none"> • to read, write and interpret tensor expression in index and abstract notation, • to know and apply tools for formulating and manipulating the equations of continuum mechanics, • to understand and solve variational problems in mechanics. 					
Content Tensor Analysis: <ul style="list-style-type: none"> • Vector and tensor notation and algebra • Coordinates in Euclidean space, change of coordinates • Differential calculus • Scalar invariants and spectral analysis • Isotropic functions Variational Calculus: <ul style="list-style-type: none"> • First variation • Boundary conditions • PDEs: Weak and strong form • Constrained minimization problems, Lagrange multipliers • Applications to continuum mechanics 					
Teaching methods / Language Lecture (2h / week), Exercises (1h / week) / English					
Mode of assessment Written examination (90 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 5 %					
Module coordinator and lecturer(s) Prof. Dr. rer. nat. K. Hackl, Dr.-Ing. U. Hoppe					
Further information					