Aktuelle Modulbeschreibung

Modul Number	**11111**
Modul Title	**Mathematics of Engineering II** Mathematik für Ingenieure II
Department	Faculty 1 - Mathematics, Computer Science, Physics, Electrical Engineering and Information Technology
Responsible Staff Member	Prof. Dr. rer. nat. habil. Fügenschuh, Armin
Language of Teaching / Examination	English
Duration	1 semester
Frequency of Offer	Every summer semester
Credits	6
Learning Outcome	The course provides an introduction into the basic principles and techniques of calculus of one and several variables. The presentation of the material is accompanied by problem sessions in which the students are taught to apply and to get routine with the learned methods. Objectives of the course are to enable the students to carry out simple mathematical arguments, to verify the validity of simple mathematical relations, and to perform and employ fundamental techniques in the area of calculus.
Contents	Calculus of functions of one variable: Sequences of real numbers (definition, limit, convergence and divergence, operations with limits, monotonic sequences, improper limits), series of real numbers (definition, limit, convergence and divergence, limits of functions (definition, operations), continuity of a function (definition, examples), properties of continuous functions (existence of minimizers and maximizers, monotonic function, inverse function), power series (definition and theorem on convergence and divergence, computation of convergence radius), elementary functions (definition and basic properties of polynomials, rational functions, exponential function and natural logarithm, general power function and general logarithm, trigonometric functions and their inverses, hyperbolic functions and their inverses), derivative of a function (definition, product rule, ratio rule, chain rule, differentiation rule for inverse function), applications of differentiation (rule of de l'Hospital, mean value theorem, relation with monotonicity, first and second order optimality conditions for local minimizers and maximizers, Taylor's theorem, Taylor's series, secant and Newton's method for the determination of a root of a function), integration of functions (definite integral with rules, mean value theorem of integration, indefinite integral, relation between definite and indefinite integral, partial integration, integration by substitution, improper integrals, integration and differentiation of power series). Calculus of functions of several variables: Sets in in the n-dimensional spaces (representation of elementary sets, definition of the interior, closure and boundary of sets), vector-valued mappings, graphical representation of functions of 2 and 3 variables, sequences, limits of

	functions, continuity of functions, differentiation of functions (partial derivatives, total differential, directional derivative, differentiation of vector-valued functions, chain rule), applications of differentiation (Taylor expansion, Newton's method for the solution of systems of nonlinear equations, first and second order optimality conditions for local minimizers and maximizers, application to least-squares approximation), integration, initial value problems theoretical results, one-step methods, explicit and implicit Runge-Kutta methods).
Recommended Prerequisites	Knowledge of the topics in Mathematics of Engineering 1
Mandatory Prerequisites	none
Forms of Teaching and Proportion	Lecture - 4 hours per week per semester Exercise - 2 hours per week per semester Self organised studies - 90 hours
Teaching Materials and Literature	• Finney, R. L., Weir, M. D., and Giordano, F. R.: Thomas's Calculus, 10th ed., Addison Wesley, Boston 2001 • Salas, S., Hille, E., Etgen, G.: Calculus. One and Several Variables, 8th ed., John Wiley & Sons, New York, 1999
Module Examination	Final Module Examination (MAP)
Assessment Mode for Module Examination	• Written examination, 90 minutes
Evaluation of Module Examination	Performance Verification – graded
Limited Number of Participants	none
Part of the Study Programme	B.Sc. / Environmental and Resource Management (research-oriented profile) / Prüfungsordnung 2005 B.Sc. / Environmental and Resource Management (research-oriented profile) / Prüfungsordnung 2015 Abschluss im Ausland / Bauingenieurwesen / keine Prüfungsordnung Abschluss im Ausland / Maschinenbau / keine Prüfungsordnung Abschluss im Ausland / Environmental and Resource Management / keine Prüfungsordnung Abschluss im Ausland / eBusiness / keine Prüfungsordnung
Remarks	• Study programme Environmental and Resource Management B. Sc.: Mandatory module "B3".
Module Components	lecture: Mathematics of Engineering II accompanying exercises
Components to be offered in the Current Semester	**130710** Lecture Mathematics of Engineering II - 4 Hours per Term **130711** Exercise Mathematics of Engineering II - 2 Hours per Term **130712** Tutorial Mathematics of Engineering II - 2 Hours per Term **130713** Examination

Aktuelle Modulbeschreibung

Mathematics of Engineering II
130715 Examination
Mathematics of Engineering II - Wiederholung