

2.3.1 Mathematics 3

Mathematics 3

Module Summary
Module code: EEIB310
Module coordinator: Prof. Dr. Thomas Westermann
Credits (ECTS): 7 Points
Semester: 3. Semester
Pre-requisites with regard to content: Higher Mathematics 1 and 2, Electrical Engineering 1 and 2, Programming
Pre-requisites according to the examination regulations: Regarding to the examination regulations no pre-requisites are required
<p>Competencies:</p> <p>Participants will be able to recognize, formulate, and confidently solve higher order linear differential equations and systems of differential equations, and apply differential and integral calculus of several variables to multidimensional problems by</p> <ul style="list-style-type: none"> • formulating linear differential equations for electrical engineering problems • solving nth order linear differential equations • calculating principal vectors of a matrix • formulating and solve systems of differential equations • explaining and applying the concepts of differential calculus for functions of several variables • formulating extreme value problems for practical problems and solving them with and without constraints • calculating area integrals, line integrals and surface integrals and interpreting them in a technical context • interpreting and applying the concepts of vector analysis • applying integral theorems, interpreting the results, and applying them in electrostatics. <p>to be able to apply the mathematical tools learned in engineering subjects and in practice.</p>
<p>Assessment:</p> <p>Assessment: Exam, 120 minutes; Practical skills in handling simulation tasks are assessed by colloquia.</p>
<p>Usability:</p> <p>In this module, the lecture cycle "Higher Mathematics for Engineers" is completed. The students learn methods for simulation, which can be used generally for many advanced courses.</p>

Course: Mathematics 3
Module code: EEIB311

Lecturer: Prof. Dr. Thomas Westermann, Prof. Dr. Stefan Ritter
Scope of weekly semester hours (SWS): 4
Semester of delivery: Winter semester
Type/mode: Lecture, Compulsory subject
Language of instruction: English
Content: <ul style="list-style-type: none"> • Linear differential equations of nth order • Systems of linear differential equations • Differential calculus for functions of several real variables • Extreme value problems of several variables • Area integrals (plane, space), line integrals, surface integrals • Integral theorems and vector analysis
Recommended reading: <ul style="list-style-type: none"> • Westermann, T: Mathematics for Engineers (Part 2+3), iMath 2022, 1st Edition • Problems: iMath-Problems App, Apple App Store/Android PlayStore • Visualizations: www.home.hs-karlsruhe.de/weth0002 → Animations • Goebbels, S. und Ritter, S.: Mathematik verstehen und anwenden, Springer-Spektrum 2013, 2. Auflage • Westermann, T: Mathematik für Ingenieure, Springer 2020, 8. Auflage

Course: Modelling and Simulation
Module code: EEIB312
Lecturer: Prof. Dr. Thomas Westermann
Scope of weekly semester hours (SWS): 2
Semester of delivery: Wintersemester und Summer semester
Type/mode: Labor, Compulsory subject
Language of instruction: English
Content: <ul style="list-style-type: none"> • Introduction to the software tool and environment • Simulation tasks for setting up and solving linear ordinary differential equations (ODE) • Model creation in state form • Exercises for dealing with differential algebraic equations (DAE) in comparison to ODE • Dealing with discontinuities when solving ODE and DAE
Recommended reading: <ul style="list-style-type: none"> • Campbell, Chancelier, Nikoukhah: Modeling and Simulation, in: Scilab/ Scicos with Scicoslab 4.4, Springer Verlag