

Course Description – summer 2025

Title	Numerical Heat Transfer Simulation
Faculty	Mechanical Engineering
Professor	Prof. Dr. Robert Pietzsch
ECTS	5
Level	Bachelor
Requirements	-
Add. Information	https://www.hs-schmalkalden.de/hochschule/fakultaeten/fakultaet-maschinenbau/internationales/englische-kurse.html
Content	<p>Upon completion of this course, students will be capable of independently calculating temperature fields in simple technical structures. They will be acquainted with the terms and physical quantities essential to the theory of heat transfer and will be adept at applying them. Mastery of the thermal calculation functionalities within the ANSYS software is a crucial skill to be developed. A key competency is selecting the appropriate finite element type for specific applications and understanding the various properties and degrees of shape functions. In a 120-minute examination, students are expected to showcase their ability to solve two heat transfer problems using the ANSYS simulation software. Exercises include:</p> <p>I) Understanding laws and terms of heat transfer, and the balance equation of internal energy. II) Manual computation of temperature fields and simple heat transfer problems. III) Basics of the Finite Element Method, including element formulation, shape functions, and time integration methods. Introduction to the ANSYS environment. IV) Analyzing the simple cooling behavior of a compact body. V) Steady-state heat conduction in a linear rod. VI) Transient heat conduction in a cooled rod. VII) Thermal contact between two straight rods (contact temperature). VIII) Transient heat exchange and temperature equalization in a planar structure. IX) Steady-state heat conduction and heat transfer performance of a flat fin. X) Thermomechanical coupling of structural and thermal calculations - thermal strains and stresses, thermal distortion. XI) Axisymmetric problems, solved in cross section. XII) Heat conduction in volumetric bodies.</p> <p>This course aims to provide a comprehensive understanding of heat transfer theory and its practical applications, particularly through the use of simulation software ANSYS, enhancing students' capabilities in thermal analysis and design.</p>