Title of module: **Numerical Heat Transfer Simulation**

Lecturer: Prof. Dr.-Ing. Robert Pietzsch

Qualification aim: The students should be able to calculate independently temperature fields in simple technical structures. They should know the terms and physical quantities of the theory of heat transfer and they should be able to apply them. The thermal module of the ANSYS program to be safely used. One important competence is to select the right finite element type for a given application and to understand the different prperties and degree of shape function. During the exam (120min) the students should demonstrate their skills to solve two heat transfer problems using ANSYS.

Content:

1. laws and terms of heat transfer, balance equation of internal energy
2. manual calculation of temperature fields and simple heat transfer problems
3. fundamentals of the Finite Elements Method, elements formulation, shape functions, time integration methods, Introduction in ANSYS environment
4. simple cooling behaviour of a compact body
5. steady heat conduction in a linear rod
6. transient heat conduction in a cooled slab
7. thermal contact of two linear slabs at the face side (contact temperature)
8. transient heat exchange and temperature equalization in a plane structure
9. steady heat conduction and heat transfer capacity of a flat fin
10. thermomechanical coupling of structural and thermal calculation- thermal strains and stresses, thermal distortion
11. axissymmetric problems, solved in a cross section
12. heat conduction in volumetric bodies
13. radiation heat transfer as boundary condition
14. time-dependent thermal boundary conditions

Teaching methods:	computer exercise with partial lecture character (4SWS)
Necessary knowledges:	fundamentals of thermodynamics and heat transfer
Usability:	Renewable Resources Engineering (B.Eng.)
Preconditions for the granting of credits:	preparing exam: individually solved exercises practical examination at the computer: 120min
Credits:	5 ECTS- Credits
Frequency:	annually in the winter semester
Workload:	150 hours (present time: 60h + self study 90h)
Duration of one unit*:*	90 min
Supporting documents:	scriptum with solved and explained examples
Recommended publications:	ANSYS theory manual and elements documentation