Modul name: Numerical Heat Transfer Analysis with ANSYS

Prof. Dr.-Ing. R.Pietzsch , during winter semester
2 hours lectures + 2 hours exercises per week = 5Credits

Contents:

theoretical background

- · The laws of heat transfer
- · The balance equations of mass and inner energy
- · The temperature field equation and diff.formulations
- · Boundary and initial conditions and loads
- · Numerical approximation of temperature field equation
- · different finite elements
- · time integration methods

Introduction in ANSYS and simple 1d/2d-examples

- Introduction in ANSYS FE-analysis
- ANSYS element types
- ANSYS-programming language
- ANSYS- environment

Exercise 1: heat exchange between sphere and cup of water (thermocoupled mass-points)
Exercise 2: temperature equalizing between triangle and circle (animation)
Exercise 3: stationary heat conduction in a linear rod
Exercise 4: nonstationary heat conduction in a bar

advanced steady-state 2d-examples

- Steady-state and transient plane heat conduction and problems with moving fluids and rods

Exercise 5: stationary heat conduction in a rectangular fin
Exercise 6: wire temperature of electrical heater blok
Exercise 7: temperatures of a cylindrical nozzle in contact with fluid stream

solving nonlinear problems

- time-dependent boundary conditions
- temperature dependent material properties and phase changes
- temperature-dependent boundary conditions: Radiation

Exercise 8: simulation of a periodically heated solid
Exercise 9: freezing of water, using enthalpy method
Exercise 10: radiation heat transfer between two long profiles (radiation matrix method)

coupled problems and 3d-computations

- Temperature distribution in volume parts
- coupled thermical- structural computations

Exercise 11: temperature distribution in a 3d-solid
Exercise 12: distortion of an unsymmetric cooled rotational part

programming with APDLanguage

Exercise 13: automatical generation and compuation of plane problems with APDL-routine