

Module – No	867		Compulsory module	
Module name	Numerical Methods in Heat and Mass Transfer			
Module coordinator	Dr.-Ing. Pascal Leibbrandt			
Title	Numerical Methods in Heat and Mass Transfer			
Title of examination	Numerical Methods in Heat and Mass Transfer			
Fachsemester	2			
Course type	Language	Lecture / Exercise	English	
SWS/ ECTS/ Workload	2 / 2	5	150	
Requirements for attendance	none			

1. Content and objectives

Content:

1. Introduction, applications
2. Basics on heat transfer
3. CFD-workflow, basic software components (CAD-modeller, mesher, physics, plots and reports)
4. Basics on CFD, mesh generation and diagnostics, physics models
5. Optimization of heat transfer problems, automation

Learning goals:

The students have knowledge about the phenomena of heat transfer and the simulation of heat transfer processes. They are able to use a commercial CFD software and interpret the simulation results. They understand the problems of residual and discretization convergence. The students can solve engineering problems like investigation and optimization of heat transfer problems.

2. Method(s) of instruction

The module consists of a lecture with integrated exercises.

3. Requirements for attendance

There are no formal requirements for participation. Basics in physics, mathematics and mechanics are recommended. Basic knowledge in renewable energies and heat transfer is useful.

Literature:

- [1] Baehr; Stephan: Wärme- und Stoffübertragung. 7. Auflage. Springer, Heidelberg, Dordrecht, London, New York (2010)
- [2] Duffie; Beckman: Solar Engineering of Thermal Processes. 4th Edition. Wiley & Sons, Hoboken (2013)
- [3] Kreith; Bohn: Principles of Heat Transfer. 6th Edition. Brooks/Cole, Pacific Grove (2001)
- [4] Polifke; Kopitz: Wärmeübertragung. 2. Auflage. Pearson Studium, München (2009)
- [5] Ferziger; Peric: Numerische Strömungsmechanik. 1. Auflage. Springer, Berlin, Heidelberg (2008)
- [6] Hirsch: Numerical Computation of Internal & External Flows. 2nd Edition. Butterworth-Heinemann, Burlington (2007)

4. Usability of this module

The module is offered as Compulsory module in the master study courses „Renewable Energy Systems“ (M.Eng.) and „Energiesysteme“

5. Requirements for assessment

Assessment is performed as written examination (120 minutes).

6. ECTS credits

The grade corresponds to the grading of the exam. When completing the unit successfully, students are granted 5 credit points (ECTS).

7. Frequency of offer

The module is lectured annually in the summer semester

8. work load

The total workload for this module is 150 hours; this corresponds to 5 ECTS credits. This workload results from the presence at the lectures with with integrated exercises (about 45 hours). As part of the self-study, the lecture material should be reworked (about 55 hours). The preparation and execution of the examination is about 50 hours.

9. Duration of module

The module is lectured in one semester.