

## Courses in English Course Description

<b>Department</b>	03 Mechanical, Automotive and Aeronautical Engineering
<b>Course title</b>	<b>Computational Fluid Dynamics, CFD</b>
<b>Course number</b>	TBM 2.5
<b>Hours per week (SWS)</b>	4
<b>Number of ECTS credits</b>	5
<b>Course objective</b>	Become competent in using modern CFD software
<b>Prerequisites</b>	Engineering Mathematics, Fluidmechanics, Thermodynamics and Heat Transfer
<b>Recommended reading</b>	H. K. Versteeg, W. Malalasekera, An Introduction to Computational Fluid Dynamics, Pearson Prentice Hall; J. H. Ferziger, M. Peric, Computational Methods for Fluid Dynamics, Springer Verlag.
<b>Teaching methods</b>	seminar-based teaching, computer exercises and computer projects
<b>Assessment methods</b>	Term paper: Examination in accordance with the study and examination regulations and the curriculum; permitted aids as specified in the examination announcement.
<b>Language of instruction</b>	English
<b>Name of lecturer</b>	Prof. Dr. Andreas Gubner
<b>Email</b>	<a href="mailto:andreas.gubner@hm.edu">andreas.gubner@hm.edu</a>
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<b>Course content</b>	<p>The course provides an overview to the functionality and application of modern CFD software. This includes:</p> <p>Introduction and presentation of the basic equations of fluid mechanics (Navier-Stokes, Euler, etc.)</p> <p>Turbulence modeling (DNS, LES, RANS, hybrid) with a focus on eddy viscosity models and wall treatment</p> <p>Introduction to numerical solution methods: meshing, numerical grids, discretization methods (FDM, FVM) with a focus on the finite volume method (steady and unsteady), transient flows: explicit and implicit schemes, properties of numerical methods (consistency, boundedness, stability)</p> <p>Advanced modeling: conjugate heat transfer, compressible flow, combustion</p> <p>After the course, students should be able to apply typical industrially used CFD software and to independently set up a typical technical problem as a CFD case</p> <p>Critical evaluation of the results obtained and derivation of verification experiments</p> <p>Understanding and application of modeling and simulation of fluid mechanics processes and their significance in the context of virtual testing and development</p> <p>Knowledge of Navier-Stokes equations and mathematical classification of flows (hyperbolic, parabolic, elliptical, and mixed flow types)</p> <p>Formulation of a CFD problem consisting of calculation domain (geometry), discretization (meshing), flow simulation, and post-processing</p>
<b>Remarks</b>	This course is not to be confused with Fundamentals of Computational Fluid Mechanics (CFM), which is a Bachelor-level course