

Faculty	Faculty 5: Nature and Engineering
Course Title	Applied Computational Fluid Dynamics
Number of ECTS credits	6
Hours per week (SWS)	4 + 8
Required Semester	3 rd year students from exchange partners (upon request and check) and master students
Time	Fall semesters
Course objective	<i>The objective of this modul is to impart the principles of application-oriented numerical flow simulation. A successful participation enables the participant to solve industrial problems numerically by application of. Computational Fluid Dynamics (CFD).</i>
Prerequisites	Experience with aerospace basics: math, physics, thermodynamics
Recommended reading	Will be given before the lectures.
Teaching methods	Seminars, Lab work and self-study (1/3 per module each)
Assessment methods	Examination according to examination regulations
Language of instruction	English
Name of lecturer	<u>Prof. Dr.-Ing. Olaf Frommann</u>
Email	Olaf.Frommann@hs-bremen.de
Link	http://www.fbm.hs-bremen.de/modul/beschreibung.aspx?modul_id=cb76a421-3b82-4a44-867d-c721cf292e0d
Course content	<ol style="list-style-type: none"> 1. <i>The theoretical principles of fluid mechanics will be deduced from simple examples. An introduction to the spatial discretization of differential equations using finite differences, finite volume and finite element methods, as well as the principles of time-step method provides the basis for the application of commercial CFD codes such as Fluent.</i> 2. <i>Introduction</i> <ul style="list-style-type: none"> ○ <i>Historical development</i> ○ <i>Economic importance</i> 3. <i>Conservation laws for mass, momentum and energy in fluid mechanics</i> <ul style="list-style-type: none"> ○ <i>Navier-Stokes equations</i> ○ <i>Euler equations</i> ○ <i>Simple model equations (convection, diffusion equations)</i> 4. <i>Time-step methods, stability and convergence</i> 5. <i>Spatial discretization</i> <ul style="list-style-type: none"> ○ <i>Finite differences</i> ○ <i>Finite volumes</i> ○ <i>Finite elements</i> 6. <i>Numerical integration of the Navier-Stokes equations</i> 7. <i>Application of CFD codes</i> <ul style="list-style-type: none"> ○ <i>Mesh generation for 2D and 3D geometries</i> ○ <i>Execution of numerical simulations using fluent</i> ○ <i>Post-processing</i>

8. Presentation of industrial CFD projects

- *Aerospace*
- *Nautical architecture*
- *Wind power*