GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2016-2017

Computional Fluid Dynamics (E040520)

Course size *(nominal values; actual values may depend on programme)*

Credits 3.0	**Study time 90 h**	**Contact hrs**	30.0 h

Course offerings and teaching methods in academic year 2017-2018

A (semester 1)	lecture	15.0 h
	seminar: practical PC room classes	15.0 h

Lecturers in academic year 2017-2018

Degroote, Joris	TW03	lecturer-in-charge

Offered in the following programmes in 2017-2018	crdts	offering
Bridging Programme Master of Science in Fire Safety Engineering	3	A
Master of Science in Electrical Engineering Technology (main subject Automation)	3	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	3	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	3	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	3	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	3	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	3	A
Master of Science in Electromechanical Engineering Technology	3	A
Master of Science in Biomedical Engineering	3	A
International Master of Science in Biomedical Engineering	3	A
Master of Science in Biomedical Engineering	3	A
International Master of Science in Fire Safety Engineering	3	A
Master of Science in Fire Safety Engineering	3	A

Teaching languages

English

Keywords

Computational Fluid Dynamics, CFD, Fluent

Position of the course

An introduction to computational techniques in fluid dynamics

Contents

- Flow equations: conservation equations and state equations, mathematical character of flow equations
- Finite volume methods for diffusion and convection-diffusion: steady state diffusion, steady state convection-diffusion, central and upwind discretisations
- Higher order discretisation of convection-diffusion: quadratic upwind discretisation, non-linear upwind discretisation: TVD-schemes
- Pressure-velocity coupling: pressure oscillations, momentum interpolation, pressure correction algorithms.
- Turbulence models for viscous flows: Reynolds averaging, turbulent viscosity, two-equation eddy viscosity models, RSM and ASM, introduction to LES and DNS
- Grid generation and spatial discretisation: structured and unstructured grids, cell-

centred and vertex-based finite volume methods
- Solution methods for systems of equations: direct methods, iterative methods, multigrid formulation
- Unsteady flows: implicit and explicit time stepping schemes

Initial competences

Transport Phenomena

Final competences

1 Analyse a flow problem with a commercial computational fluid dynamics package.
2 Argue selected models, discretisation techniques, solution techniques, grid and time step size.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: practical PC room classes

Extra information on the teaching methods

Exercises in the PC room using a commercial package, no programming.

Learning materials and price

Slides and course notes

References

[1] An Introduction to Computational Fluid Dynamics: The Finite Volume Method (2nd edition), H. Versteeg and W. Malalasekra, Pearson Prentice Hall, 2007.

Course content-related study coaching

Evaluation methods

continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Examination methods in case of periodic evaluation during the second examination period

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Report on an exercise which has to be performed autonomously.

Calculation of the examination mark