SUBJECT DATA SHEET AND REQUIREMENTS

last modified: 5th December 2013

OPEN SOURCE COMPUTATIONAL FLUID DYNAMICS

NYÍLT FORRÁSKÓDÚ NUMERIKUS ÁRAMLÁSTAN

1	Code	Semester Nr. or fall/spring	Contact hours/week (lect.+semin.+lab.)	Requirements p / e / s	Credit	Language
	BMEGEÁTMW11	**4.(3.*)fall**	**1+1+0**	**p**	**3**	**English**

*: in case of enrolment in fall

2. Subject's responsible:

Name:	Title:	Affiliation (Department):
Dr. Gergely KRISTÓF	associate professor	Dept. of Fluid Mechanics

3. Lecturer:

Name:	Title:	Affiliation (Department):
Dr. Gergely KRISTÓF	associate professor	Dept. of Fluid Mechanics
Miklós BALOGH	assistant research fellow	Dept. of Fluid Mechanics
Zoltán HERNÁDI	invited lecturer	Furukawa Electric Institute of Technology Kft.

4. Thematic background of the subject: Basics of Fluid Mechanics

5. Compulsory / suggested prerequisites:
Compulsory: -
Suggested: Computational Fluid Dynamics BMEGEÁTMW02

6. Main aims and objectives, learning outcomes of the subject:
The main objective of the subject is to extend the knowledge in computational fluid dynamics (CFD) towards the open source tools.

7. Method of education: lecture 2h/w, seminar 0h/w, laboratory 0h/w.

8. Detailed thematic description of the subject:

Introduction to OpenFOAM including Linux basis, and other required software such as gnuplot and paraview.
Installation of OpenFOAM on several Linux distributions and virtual linux systems (Ubuntu, Opensuse, Fedora) from packages and on other systems from source.
Solution of simple 2D fluid dynamics problems using OpenFOAM (driven cavity flow, 2D boundary layer, Poiseuille flow) including the comparison with theoretical results.
Detailed introduction to OpenFOAM software components including meshing tools, solvers and post-processing tools.
Single phase stationary and transient flows, turbulence, compressible flows. Introduction to models, boundary conditions and solvers required for the simulation of these problems. Examples on these problems.
Multiphase and reactive flows, including the introduction to models, boundary conditions and solvers required for the simulation of these problems. Examples on these problems.
Extension of OpenFOAM capabilities by program code development in C++. Compiling code components, the implementation of boundary conditions, applications and models.

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http://www.ara.bme.hu

Personalized projects using OpenFOAM.
Further open source CFD tools (Code Saturn, Palabos).

9. Requirements and grading
a) in term-period :

The grading is based on 1 mid-term exam (50% in final grade) and an individual project (50% in final grade). The project work consists a personalized individual CFD problem (40% for the project documentation), and presentation of the project (10% in final grade).

mid-term exam 1.	11th week	max.50points (min.40% =min.20points)	50% in final grade
individual project (report)	12th+13th weeks	max.40points (min.40% =min.16points)	40% in final grade
project presentation	14th week	max.10points (min.40% =min.4points)	10% in final grade

Totally max. achievable 100 points equal to 100% as base of the final grading. Minimum 40 points (=40%) obtained out of the parts, for each item separately is obligatory.

Grading: 0%-39%: fail(1); 40%-54% pass(2), 55%-69%: satisfactory (3), 70%-84%: good(4), 85%-100%: excellent (5)

b) in examination period: -

c) The students are subject to disciplinary measures against the application of unauthorized means at mid-terms, term-end exams and homework and the application of the 1/2013. (I.30.) Dean's Order must be followed.

10. Retake and repeat
Retake of the mid-term exam 1.: on the 13th week.
On the 15th week for retakes is available for 2nd repeated mid-term exam, for late/repeated submission of project report and presentation.
Any further movements are due to the Code of Studies and Exams of BME.

11. Consulting opportunities:
Consultation hours: by email appointments and as it is indicated on the department's website.

12. Reference literature (compulsory, recommended):
- Downloadable materials, lecture notes, references:
  www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATMW11

13. Home study required to pass the subject:

Contact hours	28	h/semester
Home study for the courses	7	h/semester
Home study for the mid-semester checks	15	h/check
Preparation of mid-semester homework	28	h/homework
Home study of the allotted written notes	12	h/semester
Home study for the exam	-	h/semester
Totally:	**90**	**h/semester**

14. The data sheet and the requirements are prepared by:

Name:	Title:	Affiliation (Department):
Miklós BALOGH	assistant research fellow	Dept. of Fluid Mechanics