Tantárgy adatlap és követelményrendszer | Subject data sheet and requirements

2009.01.05.

Budapesti Műszaki és Gazdaságtudományi Egyetem
Gépészmérnöki Kar
Áramlástan Tanszék
Mechanical Engineering Modelling (MSc)
Fluid Mechanics major (MSc)

Budapest University of Technology and Economics
Faculty of Mechanical Engineering
Department of Fluid Mechanics
Mechanical Engineering Modelling (MSc)
Fluid Mechanics major (MSc)

Computational Fluid Dynamics
(Numerikus áramlástan)

1.	*Code (kód)*	*Semester (szemeszter)*	*Requirements (követelmények)*	*Credit (kredit)*	*Language (nyelv)*
	BMEGEÁTMW02	2.	lect./sem./lab. (**e**xam / **p**ract. / **s**ignat.) 2/2/0 (p)	5	English

2. Responsible person and Department (Tantárgyfelelős személy és Tanszék):

Name (név):	*Status (beosztás):*	*Department (tanszék):*
Dr. Gergely KRISTÓF	associate professor	Dept. Fluid Mechanics

3. Lecturer (A tantárgy előadója):

Name (név):	*Status (beosztás):*	*Department (tanszék):*
Dr. Gergely KRISTÓF	associate professor	Dept. Fluid Mechanics
Máté Márton LOHÁSZ	assistant professor	Dept. Fluid Mechanics

4. Thematic background of the subject (A tantárgy az alábbi témakörök ismeretére épít):

– Fluid mechanics
– Basic level computational fluid dynamics (CFD)

5. Compulsory / suggested pre-requisites (Kötelező/ajánlott előtanulmányi rend):

	Subject name (tárgynév)	*Code (tárgykód)*
Compulsory pre-requisites:	-	-
Suggested pre-requisites:	Fluid mechanics	BMEGEÁTAG01 or BMEGEÁTAE01 or BMEGEÁTAM01 or BMEGEÁTMF03
	and	and
	Basic level CFD	BMEGEÁTAG03 or BMEGEÁTAM04 or BMEGEÁTAM05

6. Main objectives of the subject (A tantárgy célkitűzései):

Providing sufficient theoretical background and practical knowledge for professional CFD engineers.

7. Detailed thematic description of the subject (A tantárgy részletes tematikája):

- Derivation of differentiation and integration schemes; accuracy and stability.
- Approximation of surface integrals, divergence and gradient terms in finite volume method.
- Numerical fluxes, upwinding schemes.
- Solution methods for the pressure-velocity coupling: psi-omega method, pressure correction methods.
- Solution of linear systems of algebraic equations with special respect to the iterative Poisson solvers.
- Characteristics of the governing equations of compressible fluid flows. Method of characteristics. Finite volume method with explicit time marching scheme for compressible fluid flows.
- Numerical mesh: quality requirements and advanced meshing techniques.
- Main characteristics of the turbulence. Length scales. Overview of turbulent models: Reynolds-averaged models, transport equation of turbulent kinetic energy, two-equation models.

- Analyses of the sources of errors and uncertainties. Error estimation.
- Simulation exercises in computer laboratory. (3 small + 2 larger projects)

8. Mode of education of the subject (A tantárgy oktatásának módja):

Oral lectures (2 hours / week), and practices in computer laboratory (2 hours / week).

9. Requirements (Követelmények):

– Attendance at no less than 70% of the lectures and 70% of the practices.
– Timely completion of the simulation exercises and preparation of corresponding project reports in electronic format. (Maximum score is 50% of the total.)
– Completion the examination covering the lecture material. (Maximum score is 50% of the total.)

10. Consulting opportunities (Konzultációs lehetőségek):

Weekly consulting hours will be provided. The consultation time can be enquired at the department administration after the registration week of the active semester.

11. Reference literature (Jegyzet, tankönyv, felhasználható irodalom):

– Website of the subject: http://www.ara.bme.hu/oktatas/tantargy/NEPTUN/BMEGEATMW02

– Lecture handouts;
– Ferziger, J.H. & Peric, M.: Computational Methods for Fluid Dynamics, ISBN 3-540-42074-6, Springer-Verlag, Berlin, 2002.

12. Home study required to pass the subject (A tantárgy elvégzéséhez szükséges tanulmányi munka):

Estimated time for home studies: 2 hours/week.

13. The data sheet and the requirements are prepared by (A tantárgy tematikáját kidolgozta):

Budapest, 5th of January 2009

Name (név):	*Status (beosztás):*	*Department (Tanszék):*
Dr. Gergely KRISTÓF	associate professor	Department of Fluid Mechanics