Course title: Computational Fluid Dynamics	**Neptun code: GEAHT404-a**

Course coordinator: Prof. László Baranyi, emeritus professor, Candidate of Technical Science, Dr. habil

type and number of lesson: lecture, **2 hrs / week**

method of accountability: colloquium

curriculum location of the subject: autumn

pre-study conditions: -

The task and purpose of the subject:

These days with the advance of computational power, a large part of the physical experiments are being replaced by computational experiments. That is why it is very important to motivate students to improve their computational skills in the field of Fluid Mechanics. The objective of the course is to make students familiar with Computational Fluid Dynamics (CFD) and to encourage students to explore the technical literature in this field.

Course description:

Fundamentals of Fluid Mechanics, governing equations for viscous and inviscid fluids. Flow around streamlined and bluff bodies. Navier-Stokes equations, primitive variable formulation, vorticity-stream function method. Convective and conservation forms. Reynolds-Averaged Navier-Stokes (RANS), turbulence models. Large Eddy Simulation (LES) and Direct Numerical Simulation.(DNS). Finite Difference, Finite Volume and Final Element Methods. Spatial and temporal discretizations. Explicit and implicit methods, Multilevel methods. Upwind differencing. Solution of linear systems of algebraic equations: direct and iterative methods.Grid generation; structured and unstructured grids.

Required literature:

1. Ferziger, J.H. and Perić, M.: Computational Methods for Fluid Dynamics. 3rd Edition Springer, Berlin, 2002.
2. Versteeg, H.K. and Malalasekera, W.: An Introduction to Computational Fluid Dynamics. The Finite Volume Method. Longman, Edinburgh, 1995.
3. Anderson, J.D, Jr: Computational Fluid Dynamics. The Basics with Applications. McGraw-Hill, New York, 1995.

Recommended literature:

1. Roache, P.J.: Fundamentals of Computational Fluid Dynamics. Hermosa, Albuquerque, 1998.
2. White, F.M.: Fluid Mechanics. McGraw-Hill, Boston, 1999.
3. Roberson, J.A. and Crowe, C.T.: Engineering Fluid Mechanics, Houghton Mifflin, Boston, 1985.
4. Hirsch, C.: Numerical Computation of Internal and External Flows, Vol. 1: Fundamentals of Numerical Discretisation. John Wiley & Sons, New York, 1988.