

2011. 05. 23.

Budapesti Műszaki és Gazdaságtudományi Egyetem
Gépészmérnöki Kar
Hidrodinamikai Rendszerek Tanszék
Mechanical Engineering Modelling (MSc)

Budapest University of Technology and Economics
Faculty of Mechanical Engineering
Department of Hydrodynamic Systems
Mechanical Engineering Modelling (MSc)

Flow stability

I.	<i>Code (kód)</i>	<i>Semester (szemeszter)</i>	<i>Requirements (követelmények)</i>	<i>Credit (kredit)</i>	<i>Language (nyelv)</i>
	BMEGEVGMW07	s3/a3	lect./sem./lab. (exam / pract. / signat.) 2/0/0 (p)	2	English

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

<i>Name (név):</i>	<i>Status (beosztás):</i>	<i>Department (tanszék):</i>
Dr. György Paál	associate professor	Dept. Hydrodynamic Systems

3. Lecturer (A tantárgy előadója):

<i>Name (név):</i>	<i>Status (beosztás):</i>	<i>Department (tanszék):</i>
Dr. György Paál	associate professor	Dept. Hydrodynamic Systems
Dr. Csaba Hős	assistant professor	Dept. Hydrodynamic Systems

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

– Mathematics, mechanics, fluid mechanics

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

	<i>Subject name (tárgynév)</i>	<i>Code (tárgykód)</i>
Compulsory pre-requisites	Advanced Fluid Dynamics	BMEGEATMW01
Recommended pre-requisites	none	

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

To teach mathematical methods describing the typical mechanisms of stability loss of fluid flows.

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

- Mechanisms of stability loss, basics of stability theory;
- Kelvin-Helmholz instability;
- Rayleigh and Orr-Sommerfeld equations;
- Instability of free jets;
- Instability of liquid jets and liquid sheets;
- Instability of duct flows;
- Centrifugal instabilities;
- Stability of discretisation method, Euler and Runge-Kutta methods;
- Linear stability analysis of surge in turbomachines;
- The Hopf bifurcation theorem with application to turbomachinery;
- Lorenz equations derivation and interpretation of the bifurcation diagram;
- Rayleigh and Bénard convection;
- Summary, presentations;

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

Lectures (2 hours / week), consultation of homeworks;

9. Requirements (Követelmények):

Passing a test and preparing a homework with presentation.

10. Consulting opportunities (Konzultációs lehetőségek):

The lecturers are available for consultations in personally agreed times.

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

1. P. G. Drazin: Introduction to Hydrodynamic Stability. Cambridge University Press, 2002
2. P. G. Drazin, W. H. Reid: Hydrodynamic Stability. Cambridge University Press, 2004
3. J. Guckenheimer, P. Holmes: Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields. Applied Mathematical Sciences, Vol. 42, Springer-Verlag, New York, 1983, ISBN 0-3879-0819-6

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):

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