Óbuda University Bánki Donát Faculty of Mechanical and Safety Engineering	Institute of Mechatronics and Vehicle Engineering Faculty of Mechanical and Safety Engineering

Lecture name and Neptun code: Heat and flow engineering **BMXHAE2MNF Credits: 4**
Course type: Full-time
Period: 2024/25 2nd semester

Master course: Mechanical Engineering

Lecturer:	Endre Ruszinkó, professor	**Practice:**	

Number of sessions/week/term: Weekly	Lecture: 2	Practice: 0

Exam/ course assignment: Midterm mark	**Language:** English

Course objective

Goal of the course: Designed to develop an understanding of the phenomena of our everyday life via the laws of physics. Includes topics in mechanics, flow- and thermodynamics, and other physics subfields.

Thematics: The first and second laws of thermodynamics.

	Subjects	
Weeks	**Lectures**	**Practices**
1	Introduction. Fluid properties: density and specific weight, viscosity, compressibility. Units.	
2	Conservation laws. Properties of an ideal gas. The first law of thermodynamics.	
3	Thermodynamic quantities: enthalpy, specific heat ratio. The second law of thermodynamics. Entropy.	
4	Isotropic, isochoric, isobaric, and adiabatic processes. p-V and T-s diagrams.	
5	Problem solutions.	
6	First Test	
7	Fluids in motion: Lagrangian and Eulerian description of motion. Fluids in motion: pathline, streamline, streamtube, streakline.	
8	The acceleration of a fluid particle (substantial and material derivative). Reynolds transport theorem.	
9	Fluids in motion: angular velocity and vorticity. Fluids in motion: the deformation of a particle; rate-of-strain tensor.	
10	10. Classification of fluid flows: one-, two-, and three-dimensional flows. Viscous and inviscid flows.	
11	Laminar and turbulent flows, Reynolds number. Incompressible and compressible flows. Darcy-Weisbach formula.	
12	11. The Bernoulli equation (along a streamline). Total head, static pressure, total pressure.	
13	12. Piezometer, Pitot probe, Pitot static probe. Summary.	
14	Second Test	

Semester week	Test
6th	First test
14th	Second test

Course assessments:
Week No. 6 and Week No. 14 tests in writing. You have to fulfill the requirements of the tests in writing in the 7th and 14th weeks (both tests need to be minimum pass marks) and participate in lecture and practice classes.

Evaluation happens by scoring. The tasks are theoretical and practical. Participation in the practices is mandatory.

The midterm mark is calculated using the average test results. Midterm mark=(Tes1+Test2)/2

Intervals of the grade:
under 50%: 1 (unsatisfying)
50-62,5 %: 2 (pass mark)
62,5-75 %: 3 (satisfactory mark)
75-87,5 % 4 (class)
87,5-100% 5 (Excellence)

In the case of an unsatisfying midterm mark, you can take a midterm grade replacement exam.

The supplement's method: You can take a midterm grade replacement exam only once, set out by the tutor, in the first 10 days of the exam period, with the payment of the examination fee. This is a writing exam covering the whole curriculum. The examination method is writing.

Compulsory literature

- Merle C. Potter, David C. Wiggert, Bassem Ramadan, Mechanics of Fluids, 2012, Cengage Learning.
- John R. Howell, Richard O. Buckius, Fundamentals of Engineering Thermodynamics, 1992.
- McGraw-Hill, Inc. Pijush K. Kundu, Ira M. Cohen, David R. Dowling, Fluid Mechanics, 2012. Elsevier.

Quality assurance methods of the subject:

- The standard of theoretical and practical education is annually overviewed at an institution's conference based on the feedback of the teachers and students. They assess the subject's success and make suggestions for necessary changes to maintain the interaction between theory and practical training.

Endre Ruszinkó
Subject Leader
Lecturer