Study program: IT in Mechanical engineering

Type and level of studies: Undergraduate Academic Studies

Course unit: Fluid mechanics

Teacher in charge: Snežana Dragićević; Teaching assistant Milan Marjanović

Language of instruction: English

ECTS: 5

Prerequisites: -

Semester: Summer

Course unit objective:

Ensuring the necessary level of knowledge for understanding and solving various theoretical and practical problems in the field of fluid mechanics. Acquiring familiarity with the physical properties of fluids, the fundamental principles describing the behavior and movement of fluids in real fluid flow problems. Essential comprehension of the fundamental equations of fluid mechanics enabling successful application in practice to solve specific engineering problems.

Learning outcomes of Course unit:

On completing the course the student should be able to explain the fundamental physical properties of fluids, apply basic equations of hydrostatics; calculate pressure forces on plane and curved surfaces; determine pressure and forces in relative fluid rest; apply the continuity equation and Bernoulli's equation, calculate pressure drops due to friction and local resistance, average velocities, fluid flows, unit work, and pumping power in flows through pipeline; calculate fluid flows during discharge through openings and nozzles.

Course unit contents:

Theoretical classes

Introduction and physical properties of fluids. Fluid statics: hydrostatic pressure, Euler's equation, impact of Gravity on fluid in rest, incompressible fluid, Pascal's law, pressure forces on plane and curved surfaces, fluids in rigid body motion (translation and rotation); Fluid kinematics: basics of one-dimensional incompressible flows, fluid flow regimes, Bernoulli's equation, energy losses in fluid flow, piping systems, pumps, cavitation, liquid discharge through openings and nozzles.

Practical classes

Within practical exercises students apply theoretical knowledge to solve specific problems related to the rest and movement of fluids: determining hydrostatic pressure and pressure forces on plane and curved surfaces; applying Bernoulli's equation in the calculation of simple and complex pipelines parameters and fluid discharge. Laboratory exercises involve demonstration of the pipeline operation and analyzing parameters under various operating modes.

Literature:

1. Donald F. Elger, Barbara A. LeBret, Clayton T. Crowe, John A. Roberson, Engineering Fluid Mechanics, 12th Edition, ISBN 978-1-118-88068-5, John Wiley & Sons, 2019.

2. Marcel Escudier, Introduction to Engineering Fuid Mechanics, Oxford University Press, ISBN 978-0-19-871988-5 , USA, 2017. 3. Yasuki Nskayama, Robert B. FEng, Introduction to Fluid Mechanics, ISBN 0-340-67649-3, Butterworth-Heinemann Linacre House, Jordan Hill, Oxford, 2000. 4. Olivier Cleynen, Fluid Dynamics for Engineers, University of Magdeburg, Germany, 2022.

Number of active teaching hours: 4	**Lectures: 2**	**Practice: 2**

Teaching methods:

Verbal presentations using computers, presentations, demonstrations, and discussions.

Evaluation (maximum number of points 100)

Exam prerequisites:	No. of points:	**Final exam:**	No. of points:
Activities during teaching process	10	Final exam (written):	30
Practical teaching	40	Final exam (oral):	20