COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fluid mechanics [S1Mech1>MP]

Course

Field of study
Mechatronics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Basic knowledge from the fields of mathematics and mechanics.

Course objective

To prepare students to understand the behaviour of the fluid.

Course-related learning outcomes

Knowledge:
The graduate has a knowledge of fluid mechanics including fluid statics, elements of fluid dynamics, Bernoulli's principle, laminar and turbulent flows, pipe flows and open channel flows, Navier-Stokes equations, flow phenomena similarities, potential flows and gas dynamics. This knowledge enables the graduate to understand what kinds of phenomena take place in fluid flows.

Skills:
The graduate can get information from the Internet, libraries and reading rooms and from other sources.
Student has the ability to self-education. Has an ability of learning unaided.
The graduate can apply the knowledge of fluid mechanics acquired in areas of mechatronics.
Student uses mathematics in technical problems.

The graduate can use analytical and numerical methods to formulate and solve fluid mechanics tasks, can interpret the results obtained and reach conclusions.

Social competences:
The graduate is aware of the importance and understanding non-technical aspects and results of the engineer’s job.
Student correctly identifies the technical issues.
Understands the need of lifelong learning.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: Credit on the basis of a test consisting of fluid mechanics exam problems (test).
Laboratory: Credit on the basis of a test consisting of 6 fluid mechanics tasks (3 for calculations with a calculator and 3 to solve by using a computer programs prepared in classes). Active participation in laboratory.
Assessment rules: credit on the basis on a obtained points; tests: satisfactory grade after collecting at least 50% of the points provided for each type of classes .

Programme content

Properties of a fluid: density, specific gravity, specific weight, viscosity, bulk modulus, surface tension.
Hydrostatics. General Manometer Equation. Archimedes" law. Hydrostatic forces on Plane Surfaces, Buoyancy and Stability.
Inviscid and Isothermal fluid dynamics. The continuity equation, The Euler equation. The Bernoulli equation. Applications of the Bernoulli equation.
Viscous fluid dynamics. Laminar and turbulent flow. Viscous flow in ducts. Open-channel flow. Flow past immersed bodies.
Elements of gas dynamics. Ideal gas law. Adiabatic and isothermal duct flow

Teaching methods

Lecture: multimedia presentation illustrated by examples, analysis and solving of tasks related to fluid mechanics, on-line classes that require internet access.
Laboratory: solving of tasks, programming, working unaided, discussion - online classes requiring access to the Internet and the installation of software that allows programming in python language.

Bibliography

Basic
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M. Ciałkowski, Mechanika płynów. Zbiór zadań z rozwiązaniami , 4., Wydawnictwo Politechniki Poznańskiej, Poznań 2008.
J. Kołodziej, M. Mierzwiczak, R. Starosta, Przewodnik do laboratorium komputerowego z mechaniki i biomechaniki płynów, Wydawnictwo Politechniki Poznańskiej, Poznań 2012.Dobrzański
Additional
T. White: Fluid Mechanics, McGraw Hill,New York 2011.
Y.A. Cengel, J.M. Cimb: Fluid Mechanics - Fundamentals and Applications, McGraw Hill, New York 2014.
J. Prywer , R. Zarzycki, Techniczna mechanika płynów, PWN Warszawa 2017.
Wybrane zagadnienia z mechaniki płynów w ujęciu komputerowym, J.A. Kołodziej, Wydawnictwo Politechniki Poznańskiej, 2003.
Podstawy mechaniki płynów, t. 1-2, 1. R. Gryboś, PWN, Warszawa 1998.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00