COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fluid mechanics

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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tel. 61 665 23 31

Faculty of Environmental and Energy Engineering

Piotrowo 3, PL60-965 Poznan

Responsible for the course/lecturer:
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Faculty of Environmental and Energy Engineering

Piotrowo 3, PL60-965 Poznan

Prerequisites

KNOWLEDGE: Basic knowledge of mathematics, physics and mechanics.

SKILLS: in-depth understanding and interpretation of the messages communicated and effective self-education in the field related to the selected field of study.

SOCIAL COMPETENCES: has an expanded awareness of the need to expand their competences, readiness to work individually and cooperate within a team.

Course objective

Has knowledge in the field of mathematics, including algebra, analysis, theory of differential equations,

probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems.

Has basic knowledge of the technical mechanics of fluids, i.e. ideal liquids and gases, Newtonian and non-Newtonian viscous liquids, theory of thermal-flow machines.

Has basic knowledge of technical thermodynamics, ie the theory of thermodynamic changes, heat flow, thermal machines and heating, drying and cooling devices.

Course-related learning outcomes

Knowledge

Can perform elementary technical calculations in the field of fluid mechanics and thermodynamics, such as heat and mass balances, pressure losses in pipelines, select parameters of blowers and fans for ventilation and transport systems, and calculate thermodynamic courses in thermal machines.

Can use learned mathematical theories to create and analyze simple mathematical models of machines and their elements, and simple technical systems.

Can obtain information from literature, the Internet, databases and other sources. Can integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.

Skills

Is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

Is ready to initiate actions for the public interest.

Is willing to think and act in an entrepreneurial manner.

Social competences

He is ready to critically assess his knowledge and received content.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified on the basis of a written exam carried out during the examination session. The exam consists of 6-10 questions, with different scores. Passing threshold: 50% of points. The issues for the exam, on the basis of which the questions are developed, will be sent to students by e-mail using the university's e-mail system.

The knowledge acquired during the exercises is verified by two 45-minute tests carried out during the 7th and 15th hours of the exercises. Each test consists of 3-7 tasks, with different scores. Passing threshold: 50% of points.

The skills acquired during the laboratory classes are verified on the basis of reports on the implementation of exercises and oral answers before the start of the classes.

Programme content

Subject of fluid mechanics. Continuous medium model. Some concepts and theorems of fluid kinematics. Stream line. Current surface. Fluid element path. Acceleration of the fluid element. Substantial, convective and local derivative. Circulation. Basic fluid dynamics equations. The principle of conservation of mass. The principle of conservation of momentum and angular momentum. Forces acting on the fluid. Navier and Stokes equations. General properties of the movement of non-sticky and non-conductive fluids. Euler equation. General integrals of Euler's equation. Fluid statics. Euler's equation of equilibrium. Determination of equipotential surfaces and pressure distribution. Pressure of fluid on the walls of solids. Swimming and stability of floating bodies. The reaction of the liquid stream.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

2. Exercises: performing the tasks given by the teacher.

3. Laboratory: practical exercises.

Bibliography

Basic

1. M.Ciałkowski – Mechanika płynów, Wyd. Politechniki Poznańskiej, P-ń 2000.

2. M.Ciałkowski – Mechanika płynów. Zbiór Zadań z rozwiązaniami, Wyd. Politechniki Poznańskiej, P-ń 2008.

3. Z. Orzechowski, P. Wiewiórski – Ćwiczenia audytoryjne z mechaniki płynów, Wyd. Politechniki Łódzkiej, Łódź 1993

4. W.J. Prosnak –Równania klasycznej mechaniki płynów, PWN 2006

Additional

1. J.A. Kołodziej – Podstawy mechaniki płynów, Wyd. Politechniki Poznańskiej, P-ń 1982.

2. J. Walczak –Inżynierska mechanika płynów, Wyd. Naukowo-Techniczne, 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	60	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) [1]	65	2,0

[1] delete or add other activities as appropriate