COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fluid mechanics [S2MiBP1E>MP]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
1/2

Area of study (specialization)
Product Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr inż. Łukasz Semkło
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Lecturers

Prerequisites

KNOWLEDGE: has basic knowledge in the field of mathematics, physics, fluid mechanics. SKILLS: in-depth understanding and interpretation of the messages conveyed and effective self education in the field related to the selected field of study. SOCIAL COMPETENCES: has an increased awareness of the need to expand their competences, readiness to work individually and cooperate within a team.

Course objective

Understanding selected theoretical results in the field of fluid mechanics. Getting to know different fluid models (Newtonian and non-Newtonian) and their behavior in flow.

Course-related learning outcomes

Knowledge
Has extended knowledge of mathematics in the field of numerical methods used in optimization tasks, computer simulation, linear algebra, interpolation and approximation.
Has extended knowledge of thermodynamics and fluid mechanics to the extent necessary to understand the principle of operation and calculations of thermodynamic and flow processes occurring in working machines such as heating, cooling, drying, thermal and pressure agglomeration, etc., pneumatic

transport, energy conversion, etc.
He has in-depth knowledge of the construction, principles of operation and classification of machines from a selected group.
Skills
Can formulate and test hypotheses related to simple research problems.
Can plan and carry out experimental research of specific processes taking place in machines and routine tests of a working machine or a vehicle from a selected group of machines.
Is able to use the acquired knowledge in the field of thermodynamics and fluid mechanics to simulate thermodynamic processes in technological systems of machines, using specialized computer programs.
Social competences
He is ready to critically assess his knowledge and received content.
Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.
Is ready to fulfill professional roles responsibly, taking into account changing social needs, including:
- developing the professional achievements,
- maintaining the ethos of the profession,
- observing and developing the rules of professional ethics and acting towards the observance of these rules.

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

Programme content

The theory of similarity. The torque acting on the rotor. Steady plane motion. Complex potential. The principle of flow superposition. The reaction and the moment exerted by the liquid on the profile. Dynamics of a viscous liquid. Some solutions to the analytical Navier and Stokes equations. The boundary layer concept. Karman integral formula. Selected issues of viscous fluid flow. Floating the plate with even fluid suction. Breakdown of a potential vortex in a viscous fluid. Rayleigh-Stokes flow. Non Newtonian fluids.

Course topics

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Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Exercises: performing the tasks given by the teacher

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	50	2,00
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)	20	1,00