COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fluid Mechanics

Course

Field of study

Mechanical Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Roman Starosta

email: roman.starosta@put.poznan.pl

Faculty of mechanical Engineering

CMBiN, room 437

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of physics and mathematics, vector calculus, calculus

Course objective

Providing students with basic knowledge of fluid mechanics, in the field of statics, kinematics and dynamics, which will enable them to study further subjects

The student acquires the ability to solve basic problems of fluid mechanics

Course-related learning outcomes

Knowledge

Student has basic knowledge of fluid mechanics, covering issues of statics, kinematics and dynamics,

can recognize the phenomena in technic and environment dealing fluid mechanics,

is familiar with fluids statics and kinematics, Bernoulli's equation, laminar and turbulent flow, flow through open and closed channels, Navier-Stokes equations, similarities of flow phenomena, resistance forces of streamlined bodies, potential flow and gas dynamics.

Skills

Student has the ability to self-study using modern teaching tools, such as remote lectures, websites, databases, e-books, etc.,

is able to obtain information from literature, the internet, databases and other sources, is able to integrate obtained information, interpret and draw conclusions from it,

can solve the basic problems of fluid mechanics.

Social competences

Student is able to properly set priorities for implementation of the task specified by himself or others based on available knowledge,

understands the need for critical assessment of knowledge and continuous education

is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions made.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written test verifying proper understanding of the concepts of fluid mechanics (8 - 10 problems to solve)

Laboratory classes: tests and assessment of classroom activity

Programme content

Lectures:

- Fluid properties; density, specific gravity, viscosity, thermal expansion, elasticity, surface tension
- Equilibrium differential equation in the gravity field,
- Some integrals of the equilibrium equation

- Manometric formula, Archimedes law
- Pressure of fluid on the surface of rigid body; conditions of stable floating
- Continuity equation
- Bernoulli equation
- Laminar and turbulent flow
- Calculations concerning flow in the straight tube
- Drag force acting on the flowing bodies
- Elements of gas dynamics

Laboratory classes:

Solving exercises illustrating practical problems of fluid mechanics within the subjects discussed in lectures.

Teaching methods

Lecture: multimedia presentation illustrated by the examples given on the blackboard

Laboratory classes: creating computer programs, solving of the mechanical problems on the blackboard, discussion

Bibliography

Basic

1. K.Jeżowiecka-Kabsch, H.Szewczyk, Mechanika płynów, OWPW, Wrocław, 2001

2. E.S.Burka, T.J.Nałęcz, Mechanika płynów w przykładach: teoria, zadania, rozwiązania, PWN, Warszawa, 2002

3. R.Gryboś, Zbiór zadań z mechaniki płynów, WPŚ, Gliwice, 2000

4. J.A.Kołodziej, M.Mierzwiczak, R.Starosta, Przewodnik do laboratorium komputerowego z mechaniki i biomechaniki płynów, WPP, Poznań, 2012

5. Y.A.Cengel, J.M.Cimbala, Fluid mechanics: fundamentals and applications, McGraw Hill, Singapore, 2014

Additional

1. Z.Orzechowski, J.Prywer, Mechanika płynów w inżynierii i ochronie środowiska, WNT, Warszawa 2009

2. Z.Orzechowski, J.Prywer, Zadania z mechaniki płynów w inżynierii i środowiska, WNT, Warszawa 2001

3. J.Walczak, inżynierska mechanika płynów, WPP, Poznań, 2006

4. R.A.Duckworth, Mechanika płynów, WNT, Warszawa, 1983

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	4,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	2,0

[1] delete or add other activities as appropriate