COURSE DESCRIPTION CARD - SYLLABUS

Course name
Gas Dynamics

Course

Field of study
Aerospace Engineering

Year/Semester
3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes

Other (e.g. online)

Tutorials
30

Projects/seminars

Number of credit points

3

Lecturers

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

Piotrowo 3, PL60-965 Poznan

Responsible for the course/lecturer:

Prerequisites

Knowledge: mathematics, physics and fluid mechanics in the scope presented in the studies. Is able to apply the scientific method in solving problems. He knows the limits of his own knowledge and skills; can formulate questions precisely, understand the need for further education.

Course objective

To acquaint students with the basic theoretical knowledge related to the flow of gases.

Course-related learning outcomes

Knowledge

1. has knowledge in mathematics, including algebra, analysis, theory of differential equations,

probability, analytical geometry necessary to understand and describe the basic issues related to gas dynamics,

2. has expanded knowledge necessary to understand the dynamics of gas flow and specialist knowledge about the construction of equipment related to gas flow,

3. has ordered, theoretically founded general knowledge covering key issues in the field of fluid mechanics, in particular the dynamics of ideal gases, the theory of heat-flow machines.

Skills

1. has the ability to self-study with the use of modern teaching tools useful for gas flow analysis,

2. is able to use formulas and tables and to run a simple relational database for calculating gas flow,

3. is able to analyze objects and technical solutions in which gas flow occurs.

Social competences

1. is aware of the importance of maintaining the principles of professional ethics,

2. understands the need for critical assessment of knowledge and continuous education in gas dynamics,

3. is aware of the social role of a technical university graduate, and in particular understands the need for formulation and transfer to the public, in particular through mass media, information and opinions on the achievements of technology, including information related to the flow of gases.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified on the basis of a written exam carried out during the examination session. The exam consists of 6-10 questions, variously scored. Passing threshold: 50% of points. The exam issues on the basis of which these questions were developed are forwarded to students by e-mail with a supported university e-mail system.

Knowledge acquired as part of the exercises is verified by two 45-minute colloquia on 7 and 15 lessons. All of the tests consist of 3-5 tasks, variously scored depending on their level of difficulty. Passing threshold: 50% of points.

Programme content

Basic thermodynamic concepts. Speed of sound. Classification of gas flows. One-dimensional flow. Basic equations. Adiabatic and isentropic flows. Flow through the nozzle. Critical parameters and gas accumulation. Change of gas parameters in the flow through the conduit with variable cross-section, taking into account friction, heat exchange. Wave phenomena in one-dimensional flow. Normal shock wave. Two-dimensional flow. Supersonic flat flow. Oblique shock wave. Axial symmetrical flow.

PART - 66 (THEORY - 33.75 hours)

MODULE 8. BASICS OF AERODYNAMICS

8.2 Aerodynamics

Air flow around the body;

Boundary layer, flow stratified, turbulent, undisturbed, relative air flow, stream deflection, vortex, stagnation. [2]

Teaching methods

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

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

Bibliography

Basic

1. Zucker R, Biblarz O., Fundamentals of gas dynamics, Second Edition, John Wiley & Sons Inc., New Jersey, 2002

2. Rup K., Izentropowe i nieizentropowe przepływy gazu, PWN Warszawa, 2003

3. Genick Bar–Meir, Fundamentals of Compressible Fluid Mechanics, GNU Free Documentation License, 2013

Additional

1. Prosnak W.J., Mechnika płynów, t II PWN Warszawa, 1971

Breakdown of average student's workload

	Hours	ECTS
Total workload	78	3,0
Classes requiring direct contact with the teacher	52	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	26	1,0

[1] delete or add other activities as appropriate