COURSE DESCRIPTION CARD - SYLLABUS

Course name
High speed aerodynamics and flight dynamics

Course

Field of study
Aerospace Engineering

Year/Semester
1/1

Area of study (specialization)
Aeronautical Engineering

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
15

Laboratory classes

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
phd. Eng. Bartosz Ziegler

email: bartosz.ziegler@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of gas dynamics, thermodynamics and fluid dynamics

Understanding of the formal mathematical language and technical drawing

Being able to self-educate using tools like internet sources, remote lectures etc.

Being able to find and interpret literature data and integrate it into own work

Understanding of the need for constant education

Readiness to critically assess one's own knowledge and level of understanding, readiness to seek professional opinions to enhance own competence

Course objective

Objectives of the course are giving understanding of high Mach number aerodynamics, dynamics of hypersonic flight and physical phenomena typical for high speed flows.

Course-related learning outcomes

Knowledge

Range of physical phenomena occurring during high-speed flights (normal, oblique and offset shock waves, shock waves interaction with boundary layers, etc.) as well as the problems of designing flying machines at high speeds (thermal shields, wave buffeting, inlet systems stability) and basics of hypersonic aerodynamics

Extended knowledge of gas dynamics, thermodynamics and flight mechanics, in particular regarding phenomena occurring during transonic and supersonic flights. Knowledge of engineering methods of designing the geometry of vehicles moving in the atmosphere at high Mach numbers

Skills

Knowing the basic nomenclature of flight mechanics and aerodynamics in Polish and English. He can interpret numerical and experimental data in the field of aerodynamics and flight mechanics

Being able to extend his/her knowledge using available teaching materials such as internet lectures, webinars, etc.

Being able to use available literature data in the field of reading aerodynamic characteristics and implementing them in engineering calculations

Being able to carry out engineering calculations aimed, for example, to estimate the consumption of propellants, structural and thermal loads

Social competences

Understanding the need to learn throughout life; organizing the learning process of other people,

being ready to critically evaluate the knowledge and content received, recognize the importance of knowledge in solving cognitive and practical problems and consult experts in the event of difficulties in solving engineering problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written exam

Programme content

- Reminder of content regarding gas dynamics (isentropic relationships, shockwaves and their types, method of characteristics)

- Viscous compressible flows, interaction of boundary layers and wave phenomena

- Methods of designing transonic vehicles

- The dynamics of flight of orbital vehicles

- Hypersonic Aerodynamics

Teaching methods

auditorial lecture, computational tutorials

Bibliography

Basic

J.D. Anderson "Modern Compressible Flow"

Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	53	2,0
Classes requiring direct contact with the teacher	34	1,4
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	19	0,6

[1] delete or add other activities as appropriate