



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Construction and diagnostics of aircraft engines

### Course

Field of study

Aviation and Astronautics

Area of study (specialization)

Aircraft engines and airframes

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3 / 5

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

45

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

### Prerequisites

Basic knowledge of mathematics and physics, mechanics, metrology, material strength and machine construction. He can apply the scientific method in solving problems, carrying out experiments and inference. He knows the limits of his own knowledge and skills; can formulate questions precisely, understand the need for further education and has an ability for teamwork.

### Course objective

The aim of the course is to learn theoretical and practical issues related to construction, working principles of internal combustion engines and research and diagnostics of aircraft engines, including: the scope of engine tests and methods of diagnosis, diagnostic modeling and forecasting future states of aircraft engines.



## Course-related learning outcomes

### Knowledge

1. Has basic knowledge in the field of main departments of technical mechanics: kinematics and material point dynamics as well as rigid body and material strength has basic knowledge in the field of technical diagnostics as well as methods and methods of solving problems of technical condition assessment and forecasting, knows: conditions for diagnosing technical objects, the essence of technical diagnostics in aviation engineering, tasks and objectives of technical diagnostics
2. Has basic knowledge in the field of metrology, knows: measurement methods, characteristics of measuring instruments and their classification by purpose, principles of operation and metrological features, workshop metrology, sensors and transducers, recording of results, measurement systems, measurement errors
3. Has basic knowledge in the field of technical diagnostics of means of transport as well as methods and methods of solving problems of assessment of their technical condition and forecasting, knows: conditions of diagnosing technical objects, the essence of technical diagnostics applied to air transport means, tasks and objectives of technical diagnostics
4. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, i.e. the theory of thermodynamic changes, heat flow, heat and cooling machines
5. has detailed knowledge related to selected issues in the field of construction of aircraft propulsion systems and design of their components
6. has basic knowledge in the field of law, in particular civil aviation law, copyright law and the protection of industrial property and its impact on the development of technology, is able to use patent information resources

### Skills

1. Is able to use native and international languages to the extent that it is possible to understand technical texts and to write using technical dictionaries machine descriptions in the field of aviation and astronautics (knowledge of technical terminology)
2. Is able to create a system diagram, select elements and perform basic calculations of the electrical and electronic systems of aircraft machines or devices
3. Is able to organize and substantively direct the design and operation of an uncomplicated on-board device, machine or technical flying object from the group covered by the selected specialty
4. Can draw a diagram and a simple machine element in accordance with the principles of technical drawing
5. is able to communicate using various techniques in a professional environment and other environments using the formal record of construction, technical drawing, concepts and definitions of the field of study



6. can obtain information from literature, the Internet, databases and other sources. Is able to integrate the information obtained, interpret and draw conclusions from them as well as create and justify opinions

#### Social competences

1. Understands the need for lifelong learning; can inspire and organize the learning process of others
2. 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 taken
3. Is able to think and act in an entrepreneurial manner
4. 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 the mass media, information and opinions on the achievements of technology and other aspects of engineering activities; endeavors to provide such information and opinions in a generally understandable way

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Laboratory exercises: multimedia presentation illustrated with examples given on a blackboard and performance of tasks given by the teacher - practical exercises.

#### Programme content

Basic stages of engine testing. The role and scope of bench tests and during flight. Braking of aircraft engines and their capabilities. Technical measures in aircraft engine tests. Methods of bench tests and during flight of aircraft engines. Determination of operating parameters and characteristics of aircraft engines. Registration and processing of results from engine tests. Design and working principles of piston engines.

#### Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Exercises: multimedia presentation illustrated with examples given on a blackboard and performance of tasks given by the teacher - practical exercises.

#### Bibliography

Basic

1. Bukowski J., Łuczjanek W., Napęd śmigłowy. Teoria i konstrukcja, Wyd. MON, Warszawa 1986r
2. Mysłowski J., Doładowanie silników, Wyd. Komunikacji i Łączności, Warszawa 2006r
3. R.B. Randall: Vibration based condition monitoring, Wiley, 2011.



4. Niziński S. Michalski R.: Diagnostyka obiektów technicznych. Monograficzna seria wydawnicza Biblioteka Problemów Eksploatacji, Warszawa - Sulejówek - Olsztyn - Radom, 2002.
5. J. Marciniak: Diagnostyka techniczna kolejowych pojazdów szynowych. WKiŁ, Warszawa 1982.
6. B. Żółtowski: Podstawy diagnostyki maszyn. Wydawnictwo. Uczelniane Akademii Techniczno-Rolniczej w Bydgoszczy, Bydgoszcz 1996.
7. C. Cempel, F. Tomaszewski: Diagnostyka Maszyn. Zasady ogólne, przykłady zastosowań. M.C.N.E.M.T, Radom 1992.

Additional

### Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	85	3,4
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) <sup>1</sup>	65	2,6

<sup>1</sup> delete or add other activities as appropriate