COURSE DESCRIPTION CARD - SYLLABUS

Course name

Przetwarzanie i prezentacja wyników badań

Course

Field of study

Aviation

Year/Semester

3/6

Area of study (specialization)

Unmanned aerial vehicles

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

30

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

dr inż. Tomasz Nowakowski

tomasz.nowakowski@put.poznan.pl

Faculty of Civil Engineering and Transportation

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: Basic knowledge of physics, construction and principles of air transport operation.

Skills: Is able to analyze the interdependencies between the effects and causes of phenomena and events resulting from the laws of physics. Has basic soft skills.

Social competences: Prepared for teamwork.

Course objective

Acquaintance with methods of service of technical objects according to predictive strategy based on assessment of technical condition and minimization of potential damage. Learning methods of diagnosing technical objects on the basis of analysis of processes accompanying vibroacoustic phenomena. Acquiring skills of operating the measuring apparatus and knowing the measurement techniques of vibroacoustic signals aimed at gaining knowledge about the technical condition.

Course-related learning outcomes

Knowledge

1. Has a structured and theoretically grounded general knowledge in the field of technology and various means of air transport, about the life cycle of the means of transport, both hardware and software, and in particular about the key processes occurring in them.

2. Has a structured and theoretically supported general knowledge of the key issues of technology and a detailed knowledge of selected topics related to air transport, knows the basic techniques, methods and tools used in the process of solving tasks related to air transport, mainly of an engineering nature.

3. Has detailed knowledge of selected issues related to the construction of manned and unmanned aircraft, in terms of on-board equipment, control systems, communications and recording systems, automation of individual systems, has a basic knowledge of flight simulation training devices and simulation methods used to solve air transport issues.

4. Has knowledge of how to present test results in tabular and graph form, perform measurement uncertainty analysis.

5. Has a structured, theoretically based knowledge of data processing for FEM and CFD, numerical simulations, quantitative and qualitative data analysis, data visualization

Skills

1. Iis able to acquire information from various sources, including literature and databases, both in Polish and English, to integrate them properly, to interpret and critically evaluate them, to draw conclusions and to justify his/her opinions in a comprehensive manner.

2. Can properly plan and perform experiments, including measurements and computer simulations, interpret the results obtained, and correctly draw conclusions.

3. Can analyze objects and technical solutions, can search for ready-made components of machines and devices, including means and devices in catalogs and on manufacturers' websites, assess their usefulness to use in own technical and organizational projects.

4. Is able, while formulating and solving tasks concerning civil aviation, to apply appropriately selected methods, including analytical, simulation or experimental methods.

Social competences

1. understands that in engineering, knowledge and skills become obsolete very quickly.

2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of malfunctioning engineering designs that have led to serious financial or social losses or to serious loss of health or even life.

3. he/she is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and communicate to the society, in an appropriate form, information and opinions on

engineering activities, achievements of technology, as well as achievements and traditions of the engineering profession.

4. correctly identifies and solves dilemmas related to the profession of aerospace engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

To pass the lecture you must receive at least 51% of positive responses in the final test. In addition, above-average activity during the class, such as the substantive discussion and current preparation for classes are awarded.

A credit of the laboratory classes on the basis of a final test and reports from work on individual classes. The credit of the project on the basis of the written work describing the practical task.

Programme content

1. Maintenance strategies of technical objects and the essence of technical diagnostics

2. Characteristics of vibration and acoustic phenomena

3. Vibroacoustic phenomena as a carrier of diagnostic information

4. Quantitative methods of vibroacoustic signal analysis

5. Qualitative methods of vibroacoustic signal analysis 5.

6. Methods of determining limit values of the diagnostic parameter 6.

7. Forecasting the time of correct operation on the basis of information about technical condition 7.

8. Selection of diagnostic parameters with respect to their sensitivity

Teaching methods

1. Lecture - multimedia presentation, transmission of information in a systematic way with discussion 2. 2. Laboratory classes - implementation of the experimental tasks of practical character on the measurement technology and methods of signal analysis, work in groups

3. Project classes - implementation of the group tasks on the implementation of the selected diagnostic task on the objects

Bibliography

Basic

1. Fidali M., Metody diagnostyki maszyn i urządzeń w predykcyjnym utrzymaniu ruchu, Elamed Media Group, Kraków, 2020

2. Blata J., Juraszek J.: Metody diagnostyki technicznej teoria i praktyka, VŠB - Technická univerzita Ostrava Fakulta strojní, online, 2013

2. Żółtowski B., Podstawy diagnostyki maszyn. Wydawnictwo Uczelniane Akademii Techniczno-Rolniczej, Bydgoszcz 1996

4. Randall R. B., Vibration-based Condition Monitoring, Wiley, Sydney, 2021

Additional

1. Radkowski S., Szulim P., Analysis of vibration of rotors in unmanned aircraft, Advances in Intelligent Systems and Computing 317:363-371, DOI: 10.1007/978-3-319-10990-9_34

2. Iannace G., Ciaburro G., Trematerra A., Fault diagnosis for UAV Blades Using Artifical Neural Network, Robotics, 1-17, 2019, http://dx.doi.org/10.3390/robotics8030059

3. Banerjee P., Około W.A., Moore A. J., In-flight detection of vibration anomalies in unmanned aerial vehicles, Journal of Nondestructive Evaluation, Diagnostics and Prognostics of Engineering Systems. vol. 3, issue 4, DOI: 10.1115/1.4047468

4. Tokars R.P., Lekki J.D., "Self diagnostic accelerometer ground testing on a C-17 aircraft engine," 2013 IEEE Aerospace Conference, 2013, pp. 1-8, doi: 10.1109/AERO.2013.6497402.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for classes, preparation for tests,) [1]	90	3,5

[1] delete or add other activities as appropriate