COURSE DESCRIPTION CARD - SYLLABUS

Course name

Introduction to programming of unmanned systems

Course

Field of study

Aviation

Year/Semester

2/3

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

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

30

Number of credit points

7

Lecturers

Responsible for the course/lecturer:

dr inż. Krzysztof Walas; dr inż. Marek Kraft; dr inż. Michał Nowicki

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Wydział Automatyki, Robotyki i Elektrotechniki

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Responsible for the course/lecturer:

Prerequisites

Knowledge: Basic introduction to autonomous systems, electronics, mathematics, statistics and probabilistics, construction of an unmanned aerial vehicle.

Skills: Can analyze the interdependencies between the effects and causes of phenomena and events resulting from the laws of physics.

Social competences: Prepared for teamwork.

Course objective

Familiarization with the linux operating system and basic issues related to the programming of unmanned systems.

Course-related learning outcomes

Knowledge

1. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of differential equations, probability, analytical geometry as well as physics covering the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to engineering aeronautical and modeling

2. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues 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 related to selected issues in the field of manned and unmanned aircraft construction, in the field of on-board equipment, control systems, communication and recording systems, automation of individual systems, has basic knowledge of flight simulation training devices and simulation methods used to solve air transport issues

4. has basic knowledge of the generation and processing of signals in the form of currents, electric voltages and electromagnetic fields

Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate

2. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

3. can assess - at least in a basic scope - various aspects of the risk associated with a logistics undertaking in air transport

4. is able to properly select materials for simple aviation structures, and can indicate the differences between the fuels used in aviation

Social competences

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

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

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

engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession

4. correctly identifies and resolves dilemmas related to the profession of an aerospace engineer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

A) As far as the lecture is concerned, the assumed learning outcomes are verified by carrying out a test. It has a test form and consists of 31 questions drawn from the database of issues discussed during the lecture. A score of 16 is required to pass. The test is single-choice and each correct answer to a question is worth 1 point.

B) In the scope of the laboratory, current progress during classes will be assessed. Work in class will be assessed by the teacher depending on the progress made in class. The final grade will be the total grade for all completed classes.

C) Within the scope of the project, a group of students develops an autonomous system on a scale. The development process will be carried out in a simulator and then on a real platform. The rating is determined on the basis of the current progress in the project, the introduction of each subsequent functionality designated for the project results in a higher rating.

Programme content

1. Introduction to Linux, 2. Basic tools in Linux systems 3. Git and version control, selected aspects of project management 4. Python I 5. Python II 6. Python III 7. Python IV 8. ROS I 9. ROS II 10.ROS III 11. Computer Vision I 12. Computer vision II 13. Computer Vision III 14. Machine Learning I 15. Machine learning II

Teaching methods

A) Lecture: multimedia presentations (slides) illustrated with examples analyzed on the board and program code fragments implementing selected content described during the lecture

B) Laboratory: classes will be conducted using a problem-solving approach. The student will receive an introduction to the laboratory, where the link between the subject of the classes and the content of the lectures will be described. Then, with the help of the teacher, he will solve the next problems that will be put before him.

C) Project: discussion of project tasks and project advancement requirements for each grade level. Weekly project consultations, during which students receive the tutor's support allowing them to continue working on the project and the progress of work is assessed.

Bibliography

Basic

1. Lentin Joseph, ROS Robotics Projects, Packt Publishing, 2017

2. Computer Vision: Algorithms and Applications (Texts in Computer Science) 2nd ed. 2022 Edition

3. Lentin Joseph, Nauka robotyki z językiem Python, Helion 2016

Additional

1. Linux : wprowadzenie do wiersza poleceń / William Shotts ; przekład: Joanna Zatorska, Przemysław Szeremiota. Gliwice : Helion, 2021.

Breakdown of average student's workload

	Hours	ECTS
Total workload	175	7,0
Classes requiring direct contact with the teacher	90	3,5
Student's own work (literature studies, preparation for classes, preparation for tests,) [1]	85	3,5

[1] delete or add other activities as appropriate