COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to programming of unmanned systems [S1Lot2-BSP>WdPSB]

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

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

7,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Basic knowledge of introduction to autonomous systems, electronics, mathematics, statistics and probability, construction of an unmanned aerial vehicle, Skills: Can analyze 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 unmanned systems programming.

Course-related learning outcomes

Knowledge:
1. has an extended and in-depth knowledge of mathematics and physics useful for formulating and solving complex technical tasks related to aviation and modeling real problems
2. has a structured and theoretically founded general knowledge in the field of key technical issues and detailed knowledge in the field of selected issues related to air transport
3. has detailed knowledge related to selected issues in the field of manned and

communication and registration systems, automation of individual systems
4. has basic knowledge of the generation and processing of signals in the form of currents, electric voltages and
electromagnetic fields

Skills:
1. can obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions and exhaustively justify their opinions
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 design means of transport with appropriate external requirements (e.g. regarding environmental protection)
5. can analyze facilities and technical solutions, can search in catalogs and on manufacturers' websites, ready components of machines and devices, including means and devices, assess their suitability for use in their own technical and organizational projects

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 serious loss of health and even life
3. is aware of the social role of a graduate of a technical university, in particular understands the need to formulate and convey to the society, in an appropriate form, 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
5.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

A) In terms of the lecture, verification of the assumed learning outcomes is carried out by conducting a credit. It is in the form of a test and consists of 31 questions drawn from the database of issues discussed during the lecture. To obtain a credit, 16 points are required. The test is single-choice and each correct answer to a question is 1 point.
B) In terms of the laboratory, current progress during classes will be assessed. Work during classes will be assessed by the instructor depending on the advancement of the content covered during classes. The final grade will be the total grade from all classes completed.
C) In terms 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 grade is determined based on current progress in the project, the introduction of each subsequent functionality designated for the project results in a higher grade.

Programme content

The curriculum covers basic issues related to the Introduction to Unmanned Systems Programming. Students are acquainted with basics programming systems used in UAV and project management.

Course topics

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 fragments of program code implementing selected content described during the lecture
B) Laboratory: classes will be conducted using an approach focused on solving problems. The student will receive an introduction to the laboratory, where the connection of the class topic to the lecture content will be described. Then, with the help of the instructor, the student will solve subsequent problems that will be presented to him/her.
C) Project: discussion of project tasks and requirements for project advancement for each of the assessment thresholds. Weekly project consultations, during which students receive support from the instructor, allowing them to continue working on the project, and the progress of the 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, Learning robotics with 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	7,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	100	4,00