



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Virtual prototyping in control engineering [N2AiR1-ISA>WPwAP]

Course

Field of study

Automatic Control and Robotics

Year/Semester

1/1

Area of study (specialization)

Intelligent Control Systems

Profile of study

general academic

Level of study

second-cycle

Course offered in

polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

20

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

4,00

Coordinators

dr hab. inż. Konrad Urbański

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Lecturers

Prerequisites

A student beginning this course should have knowledge of automation and robotics corresponding to level 6 of the Polish Qualification Framework, in particular knowledge of the basics of automation, the theory of linear dynamic systems and programming skills. They should also understand the need to broaden their competences and be ready to cooperate in a team.

Course objective

To familiarize students with different programming environments for modeling and simulating dynamic objects in the context of rapid prototyping of control systems. To present the basic functions and capabilities of selected programming environments. Presentation of how to use different object modeling methods in their own programs. Introduction to selected methods of simulation time optimization and parameter selection methods.

Course-related learning outcomes

Knowledge

has a structured and in-depth knowledge of modelling and systems identification; has knowledge of development trends and the most significant new achievements in the field of automation and robotics and

related scientific disciplines

Skills

can simulate and analyse the operation of complex automation and robotics systems and plan and perform experimental verification; can critically evaluate and select appropriate methods and tools to solve a task in automation and robotics; can use innovative and unconventional tools in automation and robotics;

Social competences

understands the need for and knows the opportunities of continuous learning - improving professional, personal and social competences, can inspire and organise the learning process of others;

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: mid-semester and end of semester colloquium

Laboratory: current checking of skills within the framework of realized tasks in the field of creating models of objects and control structures and the ability to select object parameters as a function of quality criterion

Programme content

The calculation and performance analysis functions of the Matlab environment, and selected Python packages

Selected methods of shortening simulation time in Matlab environment

Optimization tools in Matlab, and in selected Python packages

Using specialized toolboxes in Matlab

Implementation of artificial neural network calculations in various environments, transfer of ANN structures, shallow and deep networks

Basic operations and Python packages in modeling and simulation

Isolated virtualenv/virtualenvwrapper environment for Python

Teaching methods

Lecture with multimedia presentation (including: drawings, photos, animations, sound, films) supplemented by examples given on the board

Lecture conducted in an interactive way with formulation of questions to a group of students

Presentation of a new topic preceded by a reminder of related content known to students from other subjects

Laboratories:

- working in teams
- computational experiments

Bibliography

Basic

1. Online tutorials and the knowledge base of MathWorks ®
2. Modelowanie i symulacja układów i procesów dynamicznych, Stanisław Osowski, Warszawa 2007
3. Ćwiczenia z automatyki w Matlabie i Simulinku, Jerzy Brzózka, Wydawnictwo EDU-MIKOM, Warszawa 1997
4. Online tutorials for the current version of Python 3.x
5. Documentation of selected Python packages for version 3.x

Additional

1. Modelowanie matematyczne systemów, J. Gutenbaum, Wyd. 3 rozsz. i popr. Warszawa: Exit 2003
2. Język ANSI C, Kernighan B.W., Ritchie D.M., WNT, Warszawa, 2004
3. MATLAB The Language of Technical Computing, The Math Works, Inc., (wydanie od 2008r.)
4. Automate the Boring Stuff with Python, A. Sweigart, latest edition
5. Python: wprowadzenie, M. Lutz, Helion, wydanie jak najnowsze
6. Python dla każdego. Podstawy programowania, M. Dawson, wydanie jak najnowsze

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50