POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Virtual prototyping in control engineering

Course

Field of study	Year/Semester
automatic control and robotics	1 / 1
Area of study (specialization)	Profile of study
intelligent automation systems	general academic
Level of study	Course offered in
Second-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Konrad Urbański Ph.D.

email: Konrad.Urbanski@put.poznan.pl

tel. 48 61 665 2810

Faculty of Control, Robotics and Electrical Engineering

ul. Piotrowo 3A 60-965 Poznań

Responsible for the course/lecturer:

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

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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:

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/virtualenvwraper environment for Python

Teaching methods

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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

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Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	45	1,5

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[1] delete or add other activities as appropriate