COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modelling and computer simulation [S2MwT1-PwT>MiSK]

Course

Field of study
Mathematics in Technology

Year/Semester
1/2

Area of study (specialization)
Programming in Technology

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

He has a structured knowledge of the theory of linear dynamic systems, including selected modelling methods; he knows and understands the basic properties of linear dynamic elements in the time and frequency domain and the properties of selected non-linear elements; he knows and understands techniques of designing linear control systems using the description in state space. Can make critical use of literature, databases and other sources; has the ability to self-learn to improve and update professional competence. Understands the need for and knows the possibilities of continuous learning, raising professional, personal and social competences, and is able to inspire and organise the learning process of others.

Course objective

To familiarize students with different programming environments for modeling and simulating dynamic objects and methods of object identification. To present basic functions and capabilities of selected programming environments. Presentation of ways to use different object modeling methods in their own programs.

Course-related learning outcomes

Knowledge:
has expanded and in-depth knowledge of mathematical modelling in engineering and technical sciences and verification of hypotheses;
has advanced knowledge of engineering graphics and computer-aided design;
has advanced knowledge of the principles of ergonomics, health and safety at work and hazards in industry, etc.;

Skills:
is able to construct and analyse complex mathematical models, in particular to formulate and justify their properties using various forms of mathematical reasoning;
can formulate and test hypotheses related to engineering tasks or simple research problems, integrate knowledge in the field of exact and natural sciences and engineering and technical sciences, carry out detailed research using analytical or simulation or experimental methods, interpret the results obtained and draw conclusions;
is able to select the appropriate sources of knowledge and obtain the necessary information from them, make a critical analysis and assessment of solutions to complex and unusual engineering tasks or simple research problems and propose their improvement;
is able to use equipment and tools, in accordance with general requirements and technical documentation; knows how to apply the principles of health and safety at work;
can use the detailed knowledge and appropriate methods and tools to solve typical engineering tasks or simple research problems;
is aware of the importance of team effort for the success of various ventures, is able to interact with other people as part of team work and manage team work; is able to develop and implement a work schedule to ensure that the deadline is met;
is able to independently acquire knowledge and develop professional skills, independently designs the path of education and consistently strives to implement it, as well as is able to orient others in this regard.

Social competences:
is ready to think and act in a creative and entrepreneurial way, taking into account safety, work ergonomics and its economic aspects; is aware of the need to inspire and organize actions for the public interest and responsibility for the work of the team and its individual participants; shows readiness to fulfil social obligations resulting from the nature of work typical for graduates of the faculty;
is aware of the social role as a graduate of a technical university, is ready to pass on popular science content to the public and to identify and resolve basic problems related to the field of study.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture: exam
Laboratory: testing of model programming skills and analysis and synthesis of dynamic objects

Programme content

Lecture: selected languages and environments for dynamic model programming, model testing methods, specialized tools for object analysis, non-linear static and dynamic modeling using computational intelligence systems. Identification and synthesis of dynamic objects. Methods of principal component analysis (PCA). Selected structures of observers and estimators.
Laboratory: using scripts for data modification and analysis, modeling complex dynamic objects, combining graphic and text programming techniques, creating algorithms generating specific data sets, examining object properties.

Course topics

none

Teaching methods

The training methods used:
- a lecture with a multimedia presentation (including: drawings, photos, animations, sound, films)

supplemented by examples given on the board
- a 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
Web-based tutorials and knowledge base by MathWorks ®
Modelowanie i symulacja układów i procesów dynamicznych, Stanisław Osowski, Warszawa 2007
Additional
Modelowanie Matematyczne Systemów, J. Gutenbaum, Wyd. 3 rozsz. i popr. Warszawa: Exit 2003
MATLAB The Language of Technical Computing, The Math Works, Inc., (wydanie od 2008r.)

Breakdown of average student's workload

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