



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modelling and computer simulation

Course

Field of study

Mathematics in technology

Area of study (specialization)

Programming in technology

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Konrad Urbański

Responsible for the course/lecturer:

email: konrad.urbanski@put.poznan.pl

tel. 61 6652 810

WARiE

ul. Piotrowo 3A 60-965 Poznań

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:

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.

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	4,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	40	2,0

¹ delete or add other activities as appropriate