COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected topics in mathematics I [S1AiR1E>WDMI]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of differentation and integration (first semester).

Course objective

The aim is to acquaint with some types of differential equations, to introduce the concept of Laplace transform and to teach how to use those concepts.

Course-related learning outcomes

Knowledge:
The graduates has an advanced knowledge and understanding of selected facts, objects and phenomena and the methods and theories relating to them that explain the complex relationships between them; he has a basic general knowledge of mathematics including algebra, geometry, analysis, probabilistic and elements of discrete mathematics and logic, including mathematical methods and numerical methods necessary to:
▪ describe and analyse the properties of linear and basic non-linear dynamic and static systems,
▪ the description and analysis of complex numbers,
▪ the description of random processes and uncertain quantities,

▪ the description and analysis of combinatorial and sequential logic systems,
▪ description of control algorithms and stability analysis of dynamic systems,
▪ the description, analysis and methods of signal processing in the time and frequency domain,
▪ numerical simulation of dynamic systems in the continuous and discrete time domain [K1_W1 (P6S_WG)].
Skills:
Is able to obtain information from literature, databases and other sources also in a chosen foreign language [K1_U1 (P6S_UW)].
Social competences:
Is ready to critically assess his/her knowledge; understands the need for and knows the possibilities of continuous training - improving professional, personal and social competence, is able to inspire and organize the learning process of others [K1_K1 (P6S_KK)].
Is aware of the responsibility for his/her own work and is ready to follow the rules of teamwork and take responsibility for jointly implemented tasks; is able to lead a small team, set goals and determine priorities leading to the realisation of the task; is ready toto play a responsible professional role. [K1_K3 (P6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lectures: test in the end of the semester to check theoretical knowledge consists of theoretical questiones scored differently. Test is passed if student gains 50% of all points.
Tutorials: 2 written tests during the semester.
Students have an opportunity to gain additional for their activity during
classes. The student passes the course if the student obtains 50% of the possible points (test plus activity).

Programme content

Lectures and tutorials
The program includes the Laplace transform, convolution and some types of the ordinary differential equations.

Course topics

Lectures and tutorials
1. The Laplace transform, its properties and application to differential equations
2. Convolution and its properties
3. The inverse Laplace transform - methods of finding
4. Some types of the first order differential equations - separable, homogeneous, exact, linear
5. The higher order linear differential equations with constant coefficients

Teaching methods

1. Interactive lecture with questions to the group of students which is supported by solving examples on board.
2. Classes during which students solve tasks on board.Teacher's detailed assessment of students' solutions followed by discussion and comments. Revision at home by solving tasks.

Bibliography

Basic
1. B. Sikora, E. Łobos, Advanced calculus : selected topics, Wydawnictwo Politechniki Śląskiej, Gliwice 2009.
2. D. Zill, Differential Equations with Boundary-Value Problems, Prindle, Weber & Schmidt, Boston 1986.
3. J. Morchało, Z. Ratajczak, J. Werbowski, Równania różniczkowe w zastosowaniach, Wydawnictwo Politechniki Poznańskiej, Poznań 2002.
4. D. Bobrowski, Z. Ratajczak, Przekształcenie Laplace"a i jego zastosowania, Wydawnictwo Politechniki Poznańskiej, Poznań 1994.
Additional
1. E. Łobos, B. Sikora, Calculus and differential equations in exercises , Wydawnictwo Politechniki Śląskiej, Gliwice 2004.
2. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne, Oficyna Wyd. GiS, Wrocław 2011.

3. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Część II, PWN, Warszawa 2012.
4. D. L. Powers, Elementary Differential Equations with Boundary Problems, Prindle, Weber & Schmidt, Boston 1985.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00