COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics I [S1AiR1E>MatI]

Course

Field of study
Automatic Control and Robotics

Year/Semester
1/1

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
60

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

8,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematic (high school level).

Course objective

The aim is: - to acquaint with methods and applications of differential and integral calculus of single and double variable functions - to introduce the concepts of infinite series and power series - to teach how to use those concepts, to make proper transformations and to use appropriate mathematical methods and tools to solve typical engineering tasks

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)].
DETAILED EFFECTS
Knowledge:
The student has knowledge of the limit of the sequence, convergence of the series.
The student has knowledge of derivative, methods of solving and its applications.
The student has knowledge of partial derivatives and how to calculate extrema for functions of two variables.
The student has knowledge of double integral and methods of calculating it and its applications.
The student has kwowledge of infinite series and power series.
Skills:
Is able to obtain information from bibliography, databases and other sources.
Has the ability to self-educate in order to improve and update professional competences.
Can calculate the derivative and find monotonicity, maxima, minima of functions of single variable.
Is able to calculate indefinite and definite integrals, measures of areas, the length of curves, volumes and surface areas of solids of revolution.
Can calculate partial derivatives, extrema for functions of two variables, total differential.
Can calculate double integral.
Is able to expand function into power series and Fourier series.
Social competences:
The graduate is ready to critically evaluate his or her knowledge. The graduate understands the need for and knows the possibilities of continuous learning - improving professional, personal and social competences, the graduate is able to inspire and organize the learning process of others.
The graduate is aware of responsibility for own work and willingness to conform to the principles of teamwork.

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: written exam to check theoretical knowledge and the abillity of its practical use. Exam consists of 3-5 theoretical questions and 3-5 practical tasks. Point range differs for each task. Exam is passed if student gains 50% of all points.
Tutorials: 2 written tests during the semester. Range of grades:
60% - 3.0
68% - 3,5
76% - 4,0
84% - 4,5
92% - 5,0
Students have an opportunity to gain additional points (10% from the total) for their activity during classes(e.g. giving correct answers to teacher's or colleagues' questions).

Programme content

Lecture
The program includes differential and integral calculus for one and two variable functions, infinite series,

power series
Tutorials
The program includes differential and integral calculus for one variable function

Course topics

Lecture and tutorials:
1. Sequences – monotonocity and limits
2. Limits and continuity of functions
3. Derivative - definition, interpretation and differentiation
4. Finding maxima, minima and points of inflection of functions. Determining monotonicity and concavity
5. Indefinite integral – methods of evaluation (integration by parts and by substitution, integration of rational functions)
6. Definite integral - definition, interpretation, improper integral
7. Applications of the definite integral - calculation of measure of areas, the length of curves, volumes and surface areas of solids of revolution
Tutorials
1. Differential calculus for functions of several variables
2. Double integral and its applications
3. Infinite series and power series - tests for convergence. Fourier series

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, A first course in calculus, Wydawnictwo Politechniki Śląskiej, Gliwice 2007.
2. B. Sikora, E. Łobos, Advanced calculus : selected topics, Wydawnictwo Politechniki Śląskiej, Gliwice 2009.
3. E. W. Swokowski, Calculus, Brooks/Cole, Boston 1983.
4.D. G. Zill, Calculus with analytic geometry, PWS Publishers, Boston 1985.

Additional
1. E. Łobos, B. Sikora, Calculus and differential equations in exercises, Wydawnictwo Politechniki Śląskiej, Gliwice 2004.
2. W. Trench, “Introduction to Real Analysis” (digitalcommons.trinity.edu/mono/7/)
3.M. Gewert, Z. Skoczylas, Analiza matematyczna 1 i 2, Oficyna Wyd. GiS, Wrocław 2012.

Breakdown of average student's workload

	Hours	ECTS
Total workload	200	8,00
Classes requiring direct contact with the teacher	90	3,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	110	4,50