# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics 1 - Analysis

## Course

Field of study
Electronics and Telecommunications

Year/Semester
I/Sem. I

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
60

Laboratory classes

Other (e.g. online)

Tutorials
60

Projects/seminars

## Number of credit points

8

## Lecturers

Responsible for the course/lecturer:
dr Wiesława Nowakowska,
wieslawa.nowakowska@put.poznan.pl

Responsible for the course/lecturer:

## Prerequisites

Basic knowledge of mathematic (secondary school level).

## Course objective

The aim is:

- to recognize methods and applications of differential and integral calculus of single and double variable functions,

- to introduce the concepts of infinite series, power series and some differential equations,

- 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

Student:

1. understands the concept of limit of the sequence, convergence of the series,

2. knows the concept of derivative, methods of solving and its applications,

3. knows the idea of partial derivatives and knows how to calculate extrema for functions of two variables,

4. comprehends the concept of double integral and knows methods of calculation and its applications,

5. recognizes some types of differential equations and knows methods of solving them.

Skills

Student:

1. can calculate the derivative and find monotonicity, maxima, minima of functions of single variable,

2. is able to calculate indefinite and definite integrals, measures of areas, the length of curves, volumes and surface areas of solids of revolution,

3. can calculate partial derivatives, extrema for functions of two variables, total differential,

4. can calculate double integral,

5. is able to expand function into power series and Fourier series,

6. can solve some first order differential equations and second order differential equations with constant coeeficients.

Social competences

Student iIs aware of the need to continue increasing their knowledge.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written exam to check theoretical knowledge and the abillity of its practical use. Exam cosists 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.

Classes: 3 written tests during the semester. Range of notes:

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 collegues' questions).

## Programme content

Lecture amd classes:

Sequences -monotonocity nad limits, limits and continuity of functions. Derivative. Differentiation. Finding maxima, minima and points of inflection of functions. Determining monotonicity and concavity. Indefinite integral – methods of evaluation (integration by parts and by substitution, integration of rational functions). Definite integral. Applications of the definite integral: calculation of measure of areas, the length of curves, volumes and surface areas of solids of revolution. Differential calculus of functions of several variables. Double integrals and its applications. Infinite series and power series. Fourier series. First order differential equations – with separable variables, linear, exact . Second 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.

## 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 | 8,0 |
| Classes requiring direct contact with the teacher | 135 | 5,0 |
| Student's own work (literature studies, preparation for classes, preparation for tests/exam) [1] | 65 | 3 |

[1] delete or add other activities as appropriate