# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | Code |
|---|---|
| **Mathematical analysis and linear algebra** | **1010331511010344953** |

| Field of study | Profile of study (general academic, practical) | Year /Semester |
|---|---|---|
| **Information Engineering** | **(brak)** | **1 / 1** |
| Elective path/specialty | Subject offered in: | Course (compulsory, elective) |
| **-** | **Polish** | **obligatory** |

| Cycle of study: | Form of study (full-time,part-time) |
|---|---|
| **First-cycle studies** | **full-time** |

| No. of hours | No. of credits |
|---|---|
| Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **-** | **5** |

| Status of the course in the study program (Basic, major, other) | (university-wide, from another field) |
|---|---|
| **(brak)** | **(brak)** |

| Education areas and fields of science and art | ECTS distribution (number and %) |
|---|---|
| **the sciences** | **5 100%** |
| **Mathematical sciences** | **5 100%** |

## Responsible for subject / lecturer:

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## Prerequisites in terms of knowledge, skills and social competencies:

| | | |
|---|---|---|
| 1 | **Knowledge** | Student has basic knowledge of mathematics at the secondary level. |
| 2 | **Skills** | Student performs the elementary algebraic operations. Student solves simple equations and inequalities. |
| 3 | **Social competencies** | Student knows the limits of his own knowledge and understands the need for further education. |

## Assumptions and objectives of the course:

The main goal is to acquaint a student with the basic concepts of higher mathematics. After the course the student will be able to: perform algebraic operations on complex numbers, find the limit of a given sequence, examine the convergence of a given series, plot graphs of the elementary functions, determine the limit of a given function, find the derivative of a given function, use the methods of curve analysis.

## Study outcomes and reference to the educational results for a field of study

### Knowledge:

1. Student has basic knowledge in mathematics including selected sections of linear algebra and mathematical analysis. - [K_W01]

### Skills:

1. Student is able to obtain information from literature, databases and other sources of knowledge; student is able to: integrate the obtained information, make their interpretation, and draw conclusions as well as formulate and justify opinions. - [K_U01]
2. Student has the ability to self-education among others to improve professional competence. - [K_U05]

### Social competencies:

1. Student is aware of: the importance of behavior in a professional manner, the principles of professional ethics, the respect for the diversity of views and cultures. - [K_K03]

## Assessment methods of study outcomes

http://www.put.poznan.pl/

Classes:

- a written test - verification of the practical application of knowledge to solving mathematical problems.

Lectures:

- a written exam - verification of knowledge and skills of its application to solving mathematical problems.

## Course description

Complex numbers - algebraic form of a complex number, geometric interpretation of a complex number, elementary operations performed on complex numbers, modulus of a complex number, trigonometric form of a complex number, de Moivre's formula, roots of complex numbers.

Sequences of real numbers - boundedness of a sequence, monotonicity of a sequence, limit of a sequence, properties of sequences converging to finite and infinite limits, Euler's number.

Series of real numbers - convergence of a series, nth-term test for divergence, convergence tests (comparison test, D'Alembert's criterion, Cauchy's criterion), alternating series test (Leibniz criterion).

Elementary functions and limit of function - review of elementary functions, basic properties of functions, an inverse function, limit of a function, properties of functions converging to finite and infinite limits.

Derivative of a function - geometric interpretation of derivative, rules of differentiation, basic properties of derivative of a function, higher-order derivatives.

Application of derivatives to a curve analysis - local maxima and local minima of a function, monotonicity intervals, points of inflection, convexity and concavity intervals.

Applied methods of education:

- lectures - theory presented in connection with the current knowledge of students,
- classes - solving of exercises on the blackboard.

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## Basic bibliography:

1. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1: definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław, 2007.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 1: definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław, 2015.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2: definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław, 2012.
4. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach 1, Wydawnictwo Naukowe PWN, Warszawa, 2013.

## Additional bibliography:

1. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1: przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław, 2007.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 1: przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław, 2015.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2: przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2014.

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Participation in lectures | 30 |
| 2. Participation in classes | 15 |
| 3. Preparation for each classes | 30 |
| 4. Preparation for the written exam | 30 |
| 5. Assessment classes | 4 |
| 6. The written exam | 4 |
| 7. Consultations | 4 |

## Student’s workload

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 117 | 5 |
| Contact hours | 57 | 2 |
| Practical activities | 15 | 1 |

http://www.put.poznan.pl/