COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematical Analysis and Linear Algebra [S1Bioinf1>ANAM]

Course

Field of study
Bioinformatics

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

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Prerequisites

The student starting this module should have basic mathematical knowledge at the basic secondary school level, be familiar with concepts such as: natural numbers, rational, real, operations on numbers, root, absolute value, powers, logarithms, algebraic expressions, polynomials, solving equations and linear, quadratic and (simple) rational inequalities, the concept of function, graph of functions, domain and range of functions, trigonometry, elements of geometry on the plane, arithmetic and geometric sequences, the concept of set, operations on sets. Should have the ability to solve basic mathematical problems in the above-mentioned range. In addition, in the field of social competences, students must present attitudes such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, and respect for other people.

Course objective

1. To provide students with basic knowledge of mathematics in mathematical analysis and linear algebra.
2. To familiarize students with the basic concepts of mathematical analysis and linear algebra, such as: sequences and number series, limit of the sequence, limit of the function, differential calculus of one variable function, integral calculus: indefinite and definite integral, introduction to differential equations, groups, rings and modular arithmetic, complex numbers, matrices, determinants, systems of linear equations and Gauss elimination, elements of analytical geometry. 3. Developing students" ability to solve problems in the above-mentioned fields. Developing students" general skills in logical concluding and proper mathematical thinking.

Course-related learning outcomes

Knowledge:
Has knowledge of mathematics useful in formulating and solving simple bioinformatic tasks, including mathematical analysis and linear algebra.

Skills:
1. Has the ability to calculate determinants, knows how to use the matrix calculus (Gauss method) to solve systems of linear equations, can perform operations on matrices (including operations on vectors in Euclidean space), perform the simplest operations on complex numbers.
2. Is able to determine the limits of a sequence, limits of functions, calculate derivatives and integrals, apply differential and integral calculus to ordinary linear differential equations of the 1st order (the simplest examples).
3. Is able to think in the area of basic concepts of group theory (the simplest issues).

Social competences:
1. Is able to think and act in a mathematically correct way in the field of linear algebra and analytical geometry.
2. Knows the limits of their own knowledge and understands the need for further education, understands the need for systematic work.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Tutorials
- continuous assessment - rewarding for the activity manifested in the discussion and cooperation in solving practical tasks,
- continuous assessment - rewarding the increase in the ability to use learned techniques,
- obtaining additional points for activity in classes (applies to lectures and tutorials), including the presentation of reports discussing additional aspects of issues, in particular the application of theory in other sciences or a reference to a place in the history of mathematics.

Skills acquired as part of the tutorials are verified on the basis of 2 tests carried out during approximately 7 and 15 weeks, consisting of 5-7 tasks with possible variable scores depending on their level of difficulty. Assessment threshold: 50% of all points.
Lecture
Knowledge gained during the lecture is verified by passing the lecture in writing form on the theoretical part of the subject with possible examples and practical tasks. A written test is a set of questions that are expected to be descriptively answered (using precise language of theory). Credit threshold: 50% of points. The final list of issues on the basis of which questions are prepared will be sent to students via e-mail via the university"s e-mail system.

Programme content

The lecture program includes the following issues in the field of mathematical analysis and linear algebra: sequences and number series, limit of sequence, limit of function, differential calculus of functions of one variable with applications (de l"Hospital rule, testing the monotonicity of functions,
searching for minima and maxima, Taylor"s formula), Integral calculus: indefinite and definite integral with applications in geometry, introduction to differential equations, groups, rings and modular arithmetic, complex numbers, matrices, determinants, systems of linear equations and Gauss elimination, elements of

analytical geometry.
Tutorials are conducted in the form of fifteen two-hour classes. The tutorials program includes solving tasks related to previously delivered lectures.

Teaching methods

1. A lecture on a blackboard with interactive questions for a group of students,
2. student activity (preparation of historical reports on mathematics related to the presented material, reports on the use of algebra in engineering sciences) during classes will be taken into account when issuing the final grade,
3. initiating discussions during the lecture,
4. theory presented in relation to the current knowledge of students from previous lectures,
5. presentations using the projector during some lectures.

Tutorials
1. problem solving on the blackboard,
2. a detailed review of task solutions by the teacher and discussions on solutions.

Bibliography

Basic
1. M. Gewert, Z. Skoczylas: Analiza matematyczna 1, Oficyna Wydawnicza GiS, Wrocław 2012.
2. M. Gewert, Z. Skoczylas: Równania różniczkowe zwyczajne. Oficyna Wydawnicza GiS, Wrocław 2011
3. T. Jurlewicz, Z. Skoczylas: Algebra liniowa 1, Oficyna Wydawnicza GiS, Wrocław 2003.
4. T. Jurlewicz, Z. Skoczylas: Algebra i geometria analityczna. Oficyna Wydawnicza GiS, Wrocław 2011.
5. J. Klukowski, I. Nabiałek: Algebra dla studentów. WNT, Warszawa 2004.
6. W. Krysicki, L. Włodarski: Analiza matematyczna w zadaniach, t. 1. PWN, Warszawa 2012.
7. I. Nabiałek: Zadania z algebry liniowej. WNT, Warszawa 2006.

Additional
1. G.M. Fichtenholz: Rachunek różniczkowy i całkowy, t. 1 i 2. PWN, Warszawa 2011.
2. Foltyńska, Z. Ratajczak, Z. Szafrański: Matematyka dla studentów uczelni technicznych, cz. I, II, III. Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
3. H. Arodź, K. Rościszewski, Algebra i geometria analityczna w zadaniach, Wydawnictwo Znak, Kraków 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50