COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1BZ1E>MAT1]

Course

Field of study
Sustainable Building Engineering

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
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 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 domain of functions, trigonometry, elements of geometry on the plane, arithmetic and geometric sequences, the notion 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

To deliver (at the university level) mathematical knowledge in the field of algebra, geometry and mathematical analysis, developing the ability to apply it in technical sciences and preparing the student to effectively study physics and other major subjects. Developing students" ability to solve problems in the above-mentioned fields. Developing students" general skills in logical concluding and precise thinking.

Course-related learning outcomes

Knowledge:
1. has knowledge of the basic concepts of analysis and algebra (number sequence, function, derivative, indefinite and definite integrals, matrix, system of linear equations, inverse matrix, vector in the space, striaght line and plane in the space).
2. knows the basic rules of calculating limits, derivatives, integrals, the method of Gaussian elimination for a system of linear equations, recognizes the equation of a straight line and a plane in the space.

Skills:
1. is able to calculate the limit, determine the derivative of a function, indefinite and definite integral, solve a system of linear equations using the Gaussian elimination method, determine the inverse matrix (basic examples).
2. knows how to determine the equation of a line and plane in space (basic examples).

Social competences:
1. is able to think and act in a mathematically correct way in the area of mathematical analysis, 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 (alternatively, one test at the end of the semester), consisting of several 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 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

Lecture 30 hours and tutorials 15 hours
1. Types of explicit functions. Functions of one variable (number sequences, monotonicity and limit, Euler number, limit and continuity of functions). Asymptotes of functions. Differential calculus of functions of one variable (derivative of the function - definition, interpretation, calculation, function differential, mean value theorems, function extrema, concavity and convexity, inflection points, de L"Hospital rule, function test), 10 h lecture and 4 hours tutorials.
2. Integral calculus of functions of one variable. Indefinite integral (antiderivative, sum and product integration, integration by substitutions and by parts, integration of rational functions). Definite integral (definition, interpretation and relationship with the field, properties, improper integrals, applications - calculation of flat areas, curve length, volume and surface areas of rotational solids). Functions in implicit form, parametric and polar coordinates, 8 hours lecture and 4 hours tutorials.
3. Matrix calculus - operations on matrices, inverse matrix, matrix rank. Determinants, systems of linear equations (Gaussian elimination method), 6 hours. lecture and 3 hours tutorials.
4. Vector calculus. Straight line in the space, 3 hours lecture, 1.5 hours tutorials.
5. Plane in space, 2 hours. lecture and 1 hour tutorials.
6. Tests during tutorials 1.5 hours, passing the lecture 1 hour.

Teaching methods

Lecture
1. a lecture in the form of a presentation using a projector, additional comments and figures on a blackboard with interactive questions to a group of students,
2. student activity (preparation of historical reports on mathematics related to the presented material, reports on the use of algebra and analysis 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,
Tutorials
1. providing a list of tasks to be solved for each subsequent meeting
2. problem solving on the board (using the presentation on the projector to recall the theory)
3. a detailed review of task solutions by the teacher and discussions on solutions.

Bibliography

Basic
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3. Fraleigh, John B., Calculus with analytic geometry, Addison-Wesley. Addison-Wesley, cop. 1980.
4. Bodewig, Ewald, Matrix calculus, North-Holland, 1956.
Additional
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2. Evar D., Linear algebra and matrix theory, John Wiley and Sons, Inc., 1963.
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Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	35	1,00