COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Bud1>MAT2]

Course

Field of study
Civil Engineering

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
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge of mathematics in the extended high school area and the first semester .

Course objective

To acquaint students with extended mathematical knowledge in the field of algebra, geometry and differential and integral calculus of functions of two variables, to develop the ability to apply it in engineering and to prepare them for effective study.

Course-related learning outcomes

Knowledge:
Student
1. Has basic knowledge of complex numbers, linear algebra and geometry in three dimentions.
2. Knows the idea of partial derivatives and knows how to calculate extrema for functions of two variables.
3. Comprehends the concept of double integral and is able to solve it.

Skills:

Student
1. Can perform operations on complex numbers and solve quadratic equations in complex domain.
2. Is able to calculate determinants of different orders, to perform operations on matrices, to solve the systems of linear equations using the Gaussian elimination method.
3. Can perform operations on vectors in three dimentions, is able to determine equations of lines and planes in three dimentions.
4. Can calculate partial derivatives, extrema for functions of two variables.
5. Can calculate double integral.

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 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 is passed if student gains 50% of all points.
Tutorials: 2 written tests during the semester and activity during tutorials. Students have an opportunity to gain additional points (10% from the total) for their activity (e.g. giving correct answers to teacher"s or colleagues" questions).
Range of grades:
50% - 3.0
60% - 3,5
70% - 4,0
80% - 4,5
90% - 5,0

Programme content

Algebra and differential and integral calculus of functions of many variables.

Course topics

Lecture:
1. Matrices – basic definitions, matrix operations, determinant.
2. Inverse matrix, matrix equations. Systems of linear equations (Cramer's rule, Gaussian elimination method).
3. Complex numbers – algebraic, trigonometric and exponential forms; operations on complex numbers, including powers.
4. Roots of complex numbers, equations involving complex numbers.
5. Vectors and vector operations (dot product, cross product, scalar triple product).
6. Applications of vectors in computing angles, areas and volumes.
7. Plane. Line in space.
8. Functions of several variables – basic definitions. Continuity and graphs of functions of two variables.
9. Partial derivatives and total differential.
10. Local extrema of functions of two variables.
11. Double integral.
12. Double integral – polar coordinates.
13. Applications of the double integral in geometry (areas and volumes).

Classes (Tutorials):
1. Matrix operations, determinants.
2. Systems of linear equations – Gaussian elimination method.
3. Algebraic and trigonometric forms of complex numbers. Operations on complex numbers, including powers and roots.
4. Vector operations and applications of vectors in computing angles, areas and volumes.

5. Plane and line in space.
6. Partial derivatives. Extrema of functions of two variables.
7. Double integral – applications in geometry.

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

1) T. Jurlewicz, Z. Skoczylas , Algebra liniowa 1, Definicje, twierdzenia, wzory.

2) T. Jurlewicz, Z. Skoczylas , Algebra liniowa 1, Przykłady i zadania.

3) M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Definicje, twierdzenia, wzory.

4) M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Przykłady i zadania.

5) J. Mikołajski, Z. Sołtysiak, Zbiór zadań z matematyki dla studentów wyższych szkół technicznych, Część I, Algebra i geometria.

6) J. Mikołajski, Z. Sołtysiak, Zbiór zadań z matematyki dla studentów wyższych szkół technicznych, Część III, Rachunek różniczkowy i całkowy funkcji wielu zmiennych.

Breakdown of average student's workload

	Hours	ECTS
Total workload	92	3,00
Classes requiring direct contact with the teacher	47	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50