COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1IFar2>Mat2]

Course

Field of study
Pharmaceutical 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
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Student has basic knowledge of elementary functions, algebraic operations, analytical geometry, trigonometry and mathematical analysis. Students should be able to solve simple rational equations and inequalities, to give domains of elementary functions and to know their curves. Students seriously treat the process of studying.

Course objective

The aim of subject is introduction to algebra and its some practical applications. Differential and integral calculus of two variables and methods oof solving differential equations are presented together with their applications in engiinering and chemical sciences.

Course-related learning outcomes

Knowledge:
1. After completing the first degree studies, the graduate has expanded and in-depth knowledge of various branches of higher mathematics and detailed knowledge on the application of mathematical methods and tools in engineering and chemical sciences [K_W2]

Skills:
After completing the first degree studies, the graduate:
1. Can use knowledge of higher mathematics; can build and analyse simple mathematical models; can use mathematical tools and methods, including numerical ones, to solve engineering problems [K_U13]
2. Is able to plan and implement self-education independently in order to raise and update their competences [K_U24]

Social competences:
After completing the first degree studies, the graduate:
1. Is aware of the deepening and expansion of knowledge to solve newly created technical problems [K_K1]
2. Understands and appreciates the importance of intellectual honesty in own and other people's actions; is ready to demonstrate reliability, impartiality, professionalism and an ethical attitude [K_K1]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - written exam during session.Tutorials - two tests + activity
Assessment criteria:
below 50% - 2,0; 50%-59% - 3,0; 60%-69% - 3,5; 70%-79% - 4,0; 80%-89% - 4,5; 90%-100% - 5,0

Programme content

1. Matrices. Arithmetic operations for matrices. Determinants of matrices (Laplace's expansions with respect to rows or columns). Properties of determinants. Inverse matrices.
2. Solutions of Cramer's systems of linear algebraic equations using determinants and inverse matrices.
3. Rank of matrices. Kronecker-Capelli theorem.
4. Gauss-Jordan elimination method of solving systems of linear algebraic equations (systems with one solution, with infinitely many solutions or without solutions). Inverse matrices obtained by Gauss-Jordan elimination procedure.
5. Vectors in space R3. Operations on vectors (also using their coordinates) . Dot product of two vectors and the criterium of orthogonality of two vectors. Cross product and the criterium of parallelity of two vectors. Triple product. Applications of products for calculating areas of parallelograms and triangles, and volumes of tetrahedrons and parallelepipeds.
6. Equations of planes in space R3 (vector, scalar, linear and parametric equations). Equations of line in space R3 (vector, parametric and symmetric equations).
7. Angles between vectors. Angles between planes. Angles between lines and planes. Angle between two lines. Distances between: two points; a point and a plane; a point and a line.
8. Definition of the function of many variables. Geometric interpretation of function of two variables. Domain of functions. Partial derivatives of I and II order of function of two and three variables. Schwarz's theorem about mixed derivatives. Direct derivative of functions. Gradient of functions. Differentials offunction - some applications.
9. Local extrema of functions of two variables. The smallest and the greatest values of functions on some regions.
10. Double integrals over rectangles. Iterated integrals.
11. Double integrals over regions normal with respect to: the axis OX, the axis OY. Change of variables in double integrals.
12. Geometric interpretation of double integrals.
13. Triple integrals over parallelepiped. Iterated integrals.
14. Triple integrals over normal regions. Change of variable in triple integrals.
15. Some applications of triple integrals.
16. Ordinary differential equations of I and II order: introduction. Solutions of ODE of I order with separated variables, homogeneous, linear nonhomogeneous (Lagrange's method and method of variation of parameters - undetermined coefficients), Bernoulli' equations and the exact equations. Solutions of ODE of II order which can be transformed to ODE of I order and equations of II order with constant coefficients.

Course topics

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Teaching methods

Lecture conducted on the blackboard or mulimedia presentation accompanied with examples
Tutorials: solving examples

Bibliography

Basic:
1. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Definicje, twierdzenia, wzory), GiS, Wrocław 2011.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Przykłady i zadania), GiS, Wrocław 2011.
3. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Definicje, twierdzenia, wzory), GiS, Wrocław 2007.
4. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Przykłady i zadania), GiS, Wrocław 2007.
5. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.

Additional:
1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.
2. M. Grzesiak, Liczby zespolone i algebra liniowa, Wydawnictwo PP, Poznań 1999.

Breakdown of average student's workload

	Hours	ECTS
Total workload	128	5,00
Classes requiring direct contact with the teacher	64	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	64	2,00