COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

Course

Field of study

Pharmaceutical Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

Other (e.g. online)

Tutorials

30

Projects/seminars

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Dr hab. Małgorzata Migda

Institute of Mathematics

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phone: 61 665 2359

Responsible for the course/lecturer:

Prerequisites

1. Student has knowledge of mathematics in the field covered by teaching in the first semester and in the high school.

2. Student has the ability to think logically, associate facts, analyze problems and apply the right conclusions.

3. Students seriously treat the process of studying and understand that need to know mathematics thatto study various subjects in the field of pharmaceutical engineering.

Course objective

The aim of subject is getting comprehensive skills in the use of advanced mathematical apparatus and classical calculationmethods in practical applications, with emphasis on the close relationship between mathematics andvarious branches of technical sciences, and showing its wide range of applications, also by chemicalengineers and pharmaceutical technologists.

Course-related learning outcomes

Knowledge

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:

- 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

- 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:

- is aware of the deepening and expansion of knowledge to solve newly created technical problems - K_K1

- 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 long test + short tests (10 minutes) + 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. Equations of plane and line in space R3.

6. 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.

7. Schwarz's theorem about mixed derivatives. Direct derivative of functions. Gradient of functions. Differentials of function – some applications.

8. Local extrema of functions of two and three variables. The smallest and the greatest values of functions on some regions.

9. Double integrals over rectangles. Iterated integrals.

10. Double integrals over regions normal with respect to: the axis OX, the axis OY. Change of variables in double integrals. Geometric interpretation of double integrals

11. Some applications of double integrals.

12. 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),

13. Bernoulli equations and the exact equations.

14. Solutions of ODE of II order which can be transformed to ODE of I order.

15. Linear equations of II order with constant coefficients (the method of variation of parameters).

Teaching methods

Lecture - multimedial presentation + examples on the blackboard

Tutorials - solving problems; discussion about obtained results

Bibliography

Basic

1. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, cz. I, cz. II, Wydawnictwo Politechniki Poznańskiej, 2003.

2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Definicje, twierdzenia, wzory), GiS, Wrocław 2011.

3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Przykłady i zadania), GiS, Wrocław 2011.

4. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Definicje, twierdzenia, wzory), GiS, Wrocław 2007.

5. T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna 1, (Przykłady i zadania), GiS, Wrocław 2007.

6. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS, Wrocław 2011.

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.

3. J. Mikołajski, Z Sołtysiak, Zbior zadań z matematyki dla studentow wyższych szkoł technicznych, Część I, II i III, PWSZ, Kalisz 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	130	5,0
Classes requiring direct contact with the teacher	70	2,7
Student's own work (literature studies, preparation for tutorials, preparation for tests and the final exam) [1]	60	2,3

[1] delete or add other activities as appropriate