POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematic

Course

Field of study	Year/Semester
Aerospace Engineering	1/2
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
First-cycle studies	
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30		
Tutorials	Projects/seminars	
30		

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

dr hab. Maciej Ciesielski

email: maciej.ciesielski@put.poznan.pl

tel. 61 6652839

Instytut Matematyki, Zakład Analizy Funkcjonalnej i Numerycznej

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

The student should have knowledge of complex numbers, matrix calculus and its application, differential and integral calculus of functions of one variable in terms of the first semester.

Course objective

Acquainting with problems of differential and integral calculus of functions of many variables and ordinary differential equations. Developing students' skills to solve simple mathematical problems by using different types of equations.

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Course-related learning outcomes

Knowledge

1. Has knowledge of indefinite and definite integrals and calculation methods.

2. Has knowledge of the calculation of partial derivatives of functions of many variables and the principle of determining the extremes of functions of many variables.

3. Has knowledge of the multiple integral and knows how to calculate it.

4. Has knowledge of non-directed and directed curvilinear integrals.

5. Has knowledge of the type of ordinary differential equations and methods for solving them.

Skills

1. Is able to calculate the definite integral, determine the area, curve arc length, volume and surface area of a rotational solid.

2. Is able to determine partial derivatives and local extremes of functions of many variables.

3. Is able to calculate multiple integrals and curvilinear integrals (non-directed and directed).

4. Recognize the type and solve the ordinary differential equation.

5. Is able to obtain the above information from literature and other sources. Is able to integrate obtained information, interpret and draw conclusions from it.

Social competences

1. Is aware of the level of its knowledge in the field of aviation engineering research.

2. Is aware of the deepening and expansion of knowledge in order to solve new technical problems.

3. Is able to properly set priorities for the implementation of tasks specified by himself or others, including is able to think and act strictly in the area of description of processes in technical and exact sciences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture: Knowledge acquired as part of the lecture is verified by a 60-minute exam conducted in the exam session. Assessment threshold: 50% of points and student activity in class. Lecture for grades. Exam issues, on the basis of which questions are developed. They will be sent via e-mail using the university e-mail system.

2. Knowledge acquired during the classes is verified by two tests carried out during 7 and 14 classes and activity during classes. Each test consists of the same number of points. Passing threshold: 50% of points obtained from tests.

Programme content

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DIFFERENT CALCULUS OF FUNCTIONS OF SEVERAL VARIABLES: definition of the function of two variables, partial derivative, Schwarz theorem, extrema of functions of two variables.

MULTIPLE INTEGRALS: normal area, double integral - evaluating, reversing the order of integration, exchange of variables in the double integral – polar coordinates, the use of a double integral in geometry and mechanics – Cartesian and polar coordinates.

LINE INTEGRALS: not-directed line integral and directed line integrals - applying them, directed line integral independent of the path, directed line integrals along simple closed curve, Green's theorem, the area and work using the line integrals.

ORDINARY DIFFERENTIAL EQUATIONS: definition of ordinary differential equation, general, particular and singular solution, differential equation with separated variables, first order linear differential equation, method of constant change, Bernoulli's differential equation, second order linear differential equation with real constant coefficients, the method of variation of parameters and undetermined coefficients.

PART - 66 (THEORY -30 hours)
MODULE 1. MATHEMATICS
1.2. Algebra
b) Linear equations and their solutions;
Logarithms; [1]
1.3 Geometry
a) Simple geometric structures; [1]
b) Graphic representation; nature and use of graphs, graphs of equations / functions; [2]
c) Simple trigonometry; trigonometric relationships, the use of tables and polar and rectangular coordinates. [2]

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board. Conducted in an interactive way with the formulation of questions to a group of students. Initiating discussions during the lecture.

2. Exercises: solving tasks given by the teacher on the board along with analyzing the next stages. The method of solving the task by students on the board is reviewed by the tutor. Completed with tasks for independent solution at home.

Bibliography

Basic

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T. 1-2, PWN, Warszawa 2011.

2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, T. 1-3, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.

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M. Gewert, Z. Skoczylas, Analiza matematyczna 2/Definicje, twierdzenia, wzory/ Oficyna Wydawnicza GiS, Wrocław 2011.

4. M. Gewert, Z. Skoczylas, Analiza matematyczna 2/Przykłady i zadania/ Oficyna Wydawnicza GiS, Wrocław 2011.

5. F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 2008.

Additional

1. W. Żakowski, Matematyka, T. 1-2, WNT, Warszawa 2003.

2. W. Stankiewicz, J. Wojtowicz, Zadania z matematyki dla wyższych uczelni technicznych, T. 1-2, PWN, Warszawa 2003.

3. M. Lassek, Matematyka dla studentów technicznych, T. 1-2, Wydawnictwo Wspierania procesu edukacji, Warszawa 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4
Classes requiring direct contact with the teacher	78	3
Student's own work (literature studies, preparation for exercises and lecture, preparation for passing the exercises and exam the lecture) [1]	26	1

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[1] delete or add other activities as appropriate