



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematic

Course

Field of study

Aviation

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

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

Other (e.g. online)

Tutorials

20

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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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.

Course-related learning outcomes

Knowledge

1. has extended and in-depth knowledge of mathematics including algebra, analysis, theory of



differential equations, probability, analytical geometry as well as physics covering the basics of classical mechanics, optics, electricity and magnetism, solid state physics, thermodynamics, useful for formulating and solving complex technical tasks related to engineering aeronautical and modeling

2. has ordered and theoretically founded general knowledge in the field of key technical issues and detailed knowledge of selected issues related to air transport, knows the basic techniques, methods and tools used in the process of solving tasks related to air transport, mainly of an engineering nature

3. has the ability to self-study with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books

Skills

1. is able to obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret them and make a critical evaluation, draw conclusions and exhaustively justify the opinions they formulate

2. is able to properly use information and communication techniques, applicable at various stages of the implementation of aviation projects

3. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

4. can, when formulating and solving tasks related to civil aviation, apply appropriately selected methods, including analytical, simulation or experimental methods

5. can solve tasks using the rules of air traffic and design a runway in accordance with the applicable ICAO requirements

6. can solve tasks using basic knowledge of aerodynamics, flight mechanics and body flow

7. is able to design means of transport with appropriate external requirements (e.g. regarding environmental protection)

8. student can use theoretical probability distributions. Student is able to analyze and interpret statistical data. Student is able to use the methods and tools of mathematical statistics in engineering practice

9. is able to prepare a short research paper while maintaining the basic editorial rules. He can choose appropriate methods for the conducted research and is able to carry out a basic analysis of the results.

10. is able to organize, cooperate and work in a group, assuming various roles in it, and is able to properly define priorities for the implementation of a task set by himself or others

11. is able to plan and implement the process of own permanent learning and knows the possibilities of further education (2nd and 3rd degree studies, postgraduate studies, courses and exams conducted by universities, companies and professional organizations)



Social competences

1. understands that in technology, knowledge and skills very quickly become obsolete
2. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life
3. is aware of the social role of a technical university graduate, in particular understands the need to formulate and provide the society, in an appropriate form, with information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the engineer profession
4. correctly identifies and resolves dilemmas related to the profession of an aerospace engineer

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

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. Kryszicki, L. Włodarski, *Analiza matematyczna w zadaniach*, T. 1-2, PWN, Warszawa 2011.

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

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	75	3,0
Classes requiring direct contact with the teacher	40	2,0
Student's own work (literature studies, preparation for exercises and lecture, preparation for passing the exercises and exam the lecture) ¹	35	1,0

¹ delete or add other activities as appropriate