



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics [S1ZiIP2>MAT2]

Course

Field of study

Management and Production 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

45

Projects/seminars

0

Number of credit points

6,00

Coordinators

dr inż. Kinga Cichoń

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Lecturers

Prerequisites

The student should have knowledge of complex numbers, differential functions of one and two variables in 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:

The student has knowledge of indefinite and definite integrals and calculation methods.

The student has knowledge of the multiple integral and knows how to calculate it.

The student has knowledge of the type of ordinary differential equations and methods of solving them.

The student has knowledge of the Laplace transform and its application to differential equations.

The student has knowledge of scalar, vector and mixed products.

Skills:

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

The student is able to calculate multiple integrals in Cartesian and polar coordinates.

The student can recognize the type and solve the ordinary differential equation.

The student can apply the Laplace transform in differential equations.

The student can apply products in space.

Social competences:

The student is aware of the level of its knowledge in the field of aviation engineering research.

The student is aware of the deepening and expansion of knowledge in order to solve new technical problems.

The student 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:

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified by a 60-minute exam conducted in the exam session. Passing threshold: 50% of exam points and student activity during classes. Lecture for the grade.

Exam topics on which the questions are based. They will be posted on e-courses.

Knowledge acquired during the exercises is verified by 4-5 tests and activity during classes. Passing threshold: 50% of points the sum of points obtained from tests.

Assignment of grades to percentage ranges of results: <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.

Programme content

Integral calculus of one variable functions. Defined integral. Multi-dimensional integral. Ordinary differential equations I and II order. Laplace transformation.

Course topics

LECTURE:

MATRIX ALGEBRA: operations on matrices, concept of inverse matrix - calculation, matrix determinant - properties and methods of determination, systems of linear equations, Kronecker-Capell theorem, solving systems of linear equations by Gauss elimination method.

INTEGRAL CALCULUS OF FUNCTIONS OF ONE VARIABLES: indefinite integral - basic methods of integration: integration by substitution, integration by parts, integration of rational, irrational, and trigonometric functions.

DEFINED INTEGRAL: Riemann integral and improper integrals. Application of the single integral.

MULTI-DIMENSIONAL INTEGRAL: calculating, exchanging the order of integration of two variables integral for polar coordinates, the use of double integral in Cartesian and polar coordinates.

ORDINARY DIFFERENTIAL EQUATIONS: definition of ordinary differential equation, general and special solution, with separated variables, 1st order linear differential equation, complete equation, Bernoulli equation, 2nd order linear differential equation with constant coefficients.

EXERCISES:

MATRIX ALGEBRA: operations on matrices, concept of inverse matrix - calculation, matrix determinant - properties and methods of determination, systems of linear equations, Kronecker-Capell theorem, solving systems of linear equations by Gauss elimination method.

INTEGRAL CALCULUS OF FUNCTIONS OF ONE VARIABLES: indefinite integral - basic methods of integration: integration by substitution, integration by parts, integration of rational.

DEFINED INTEGRAL: Riemann integral and improper integrals. Applications of the single integral. The area of a region bounded by curves, the arc length of a curve, the volume, and the surface area of a solid of revolution.

MULTI-DIMENSIONAL INTEGRAL: normal area, double integral—calculation, changing the order of integration, converting variables in a double integral to polar coordinates.

ORDINARY DIFFERENTIAL EQUATIONS: ordinary differential equations with separated variables,

homogeneous equation, ordinary heterogeneous 1st order linear differential equation, 2nd order ordinary differential heterogeneous equation with constant coefficients.

Teaching methods

Lecture: conducted using a visualizer, theory illustrated with examples. Conducted in an interactive way with the formulation of questions to a group of students. Initiating discussions during the lecture.

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. Fołtyńska, Z. Ratajczak, Z. Szafranski, Matematyka dla studentów uczelni technicznych, T. 1-3, Wydawnictwo Politechniki Poznańskiej, Poznań 2004.
3. 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.
6. G. M. Fichtenholz, Rachunek różniczkowy i całkowy, PWN, Warszawa, 1986.
7. J. Morchało, Z. Ratajczak, J. Werbowski, Równania różniczkowe w zastosowaniach, Wyd. Politechniki Poznańskiej, Poznań, 1995.

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	150	6,00
Classes requiring direct contact with the teacher	77	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	73	3,00