COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Energ1>Mat2]

Course

Field of study
Power 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 (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

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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 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. the student has knowledge of indefinite and definite integrals and calculation methods.
2. the student 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. the student has knowledge of the multiple integral and knows how to calculate it.
4. the student has knowledge of the type of ordinary differential equations and methods of solving them.
5. the student has knowledge of the laplace transform and its application to differential equations.
6. the student has knowledge of selected functional series and fourier series.
7. the student has knowledge of scalar, vector and mixed products.

Skills:
1. the student is able to calculate the definite integral, determine the area, curve arc length, volume and surface area of a rotational solid.
2. the student is able to determine partial derivatives and local extremes of functions of many variables.
3. the student is able to calculate multiple integrals in cartesian and polar coordinates.
4. the student recognize the type and solve the ordinary differential equation.
5. the student apply the laplace transform in differential equations.
6. the student can designate convergence intervals in power series and determine fourier series in the range [-,].
7. the student can apply products in space.
8. the student 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. the student is aware of the level of its knowledge in the field of aviation engineering research.
2. the student is aware of the deepening and expansion of knowledge in order to solve new technical problems.
3. 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:
1. Lecture: 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 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 exercises 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 the sum of points obtained from tests and activity during classes.

Programme content

Lecture:
DETERMINED ENTIRE: Riemann integral and its application and improper integrals.
DIFFERENTIAL ACCOUNT OF MULTIPLE VARIABLE FUNCTIONS: definition of the function of two variables, partial derivative, Schwarz theorems, extremes of the function of two variables.
MULTI-DIMENSIONAL INTEGRAL: calculating, exchanging the order of integration of variables double 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.
LAPLACE TRANSFORMATION: definition of the Laplace transform and its application for solving differential equations.
FUNCTIONAL SERIES: power series - convergence intervals, Fourier series - calculation methods.
SPACE GEOMETRY: scalar, vector and mixed product definition and their application.
Exercises:
DETERMINED ENTIRE: Riemann integral and its application and improper integrals.
DIFFERENTIAL ACCOUNT OF MULTIPLE VARIABLE FUNCTIONS: partial derivative, Schwarz theorems, extremes of the function of two variables.
MULTI-DIMENSIONAL INTEGRAL: exchanging the order of integration of variables double integral for

polar coordinates, the use of double integral in Cartesian and polar coordinates.
ORDINARY DIFFERENTIAL EQUATIONS: differential equation with separated variables, 1st order linear differential equation, complete equation, Bernoulli equation, 2nd order linear differential equation with constant coefficients.
LAPLACE TRANSFORMATION: the Laplace transform and its application for solving differential equations.
FUNCTIONAL SERIES: power series - convergence intervals, Fourier series - calculation methods.
SPACE GEOMETRY: scalar, vector and mixed product their application

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.
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.
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	5,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	2,00