COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1IMat1>MAT2]

Course

Field of study
Materials 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
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr Marek Adamczak
marek.adamczak@put.poznan.pl

Lecturers

Prerequisites

A student has the knowledge in mathematics including selected sections of mathematical analysis, algebra and analytic geometry lectured at the mathematics course in the first semester of studies. The student has the following skills acquired at the mathematics course lectured in the first semester of studies: finding the derivative of a given function, drawing the graphs of elementary functions, finding the indefinite integral of a given function, finding the definite integral of a given function, performing the basic operations on matrices. The student is aware of the need for further education.

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 the knowledge in mathematics including selected sections of mathematical analysis, algebra, analytic geometry and theory of differential equations

Skills:
the student is aware of the need to deepen and expand knowledge.

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 issues, on the basis of which questions are developed.
The knowledge acquired in the exercises is verified through 4-5 tests lasting 30 minutes, as well as class activity. Passing threshold: 50% of the total points obtained from the tests.

Programme content

DIFFERENTIAL CALCULUS OF FUNCTIONS OF MANY VARIABLES. MULTI-DIMENSIONAL INTEGRAL. ORDINARY DIFFERENTIAL EQUATIONS I AND II ORDER. LAPLACE TRANSFORMATION.

Course topics

LECTURE:
DIFFERENTIAL CALCULUS OF FUNCTIONS OF MANY VARIABLES: definition of functions of two variables,
partial derivative, Schwarz"s theorem, extremum of functions 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 transformation and its application for solving differential equations and systems of differential equations.
EXERCISES:
DIFFERENTIAL CALCULUS OF FUNCTIONS OF MANY VARIABLES: definition of functions of two variables,
partial derivative, Schwarz"s theorem, extremum of functions of two variables.
MULTI-DIMENSIONAL INTEGRAL: normal area, double integral - calculation, conversion of integration order, conversion of variables in double integral to polar coordinates, use of double integral in Cartesian and 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. 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.
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	110	4,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50