# POZNAN UNIVERSITY OF TECHNOLOGY



#### EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

## **COURSE DESCRIPTION CARD - SYLLABUS**

#### Course name Mathematics [S1Energ2>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 classe 0	es	Other 0
Tutorials 30	Projects/seminars 0	3	
Number of credit points 5,00			
Coordinators		Lecturers	
dr inż. Jolanta Pozorska jolanta.pozorska@put.poznan.pl			

#### **Prerequisites**

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

#### **Course objective**

Familiarization with the issues of differential and integral calculus of functions of many variables and ordinary differential equations. Developing students' simple solving skills math problems by using different types of equations.

## Course-related learning outcomes

none

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Lecture: Knowledge acquired during the lecture is verified by a 90 minute exam consisting theoretical and tasks.

Assessment threshold: 50% of points obtained from an exam. The exam issues will be sent via e-mail at least two weeks before the exam.

2. Knowledge acquired during the exercises is verified by two tests carried out during 7 and 15 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

Definite integral. Differential calculus of functions of several variables. Double integral. Ordinary differential equations. Laplace transform. Functional series. Geometry of space.

## **Course topics**

Lecture

1-2. DEFINITE INTEGRAL: Riemann integral and its application and improper integrals.

3-4. DIFFERENTIAL CALCULUS OF FUNCTIONS OF MULTIPLE VARIABLES: definition of a function of two variables, partial derivative, Schwarz theorems, extremum of a function of two variables.

5-6. MULTI-DIMENSIONAL INTEGRAL: normal area, double integral - calculation, changing the order of integration, converting variables in the double integral to polar coordinates, applying the double integral to Cartesian and polar coordinates.

7-9. ORDINARY DIFFERENTIAL EQUATIONS: definition of ordinary differential equation, solution general and special, with separated variables, first-order linear differential equation, complete equation, Bernoulli equation, second-order linear differential equation with constant coefficients.

10-12. LAPLACE TRANSFORM: definition of the Laplace transform and its application to solving differential equations.

13. FUNCTION SERIES: power series - convergence intervals, Fourier series - methods of calculation.

14. SPACE GEOMETRY: definition of scalar, vector and mixed products and their applications.

15. Revision of the material.

Tutorials

1-2. DEFINITE Integral: Riemann integral and its application and improper integrals.

3-4. DIFFERENTIAL CALCULUS OF FUNCTIONS OF MULTIPLE VARIABLES: definition of a function of two variables, partial derivative, Schwarz's theorems, extremum of a function of two variables.

5-6. MULTI-DIMENSIONAL INTEGRAL: normal area, double integral - calculation, changing the order of integration, converting variables in the double integral to polar coordinates, applying the double integral to Cartesian and polar coordinates.

7. Test I

8-10. ORDINARY DIFFERENTIAL EQUATIONS: definition of ordinary differential equation, solution general and special, with separated variables, first-order linear differential equation, complete equation, Bernoulli equation, second-order linear differential equation with constant coefficients.

11-12. LAPLACE TRANSFORM: definition of the Laplace transform and its application to solving differential equations.

13. FUNCTION SERIES: power series - convergence intervals, Fourier series - methods of calculation.

14. SPACE GEOMETRY: definition of scalar, vector and mixed products and their applications. 15. Test II

## **Teaching methods**

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

2. Exercises: solving tasks given by the teacher on the board along with analysis next stages. The way students solve the task on the board is reviewed by the leader of the exercises. Supplemented with tasks to solve on your own 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.

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	132	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50