COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mathematics [S1Elmob1>Mat2]

Course

Field of study
Electromobility

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
45

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

6,00

Coordinators

dr Marian Liskowski
marian.liskowski@put.poznan.pl

Lecturers

dr Marian Liskowski
marian.liskowski@put.poznan.pl

Prerequisites

Student possesses knowledge of selected mathematic fields, including complex numbers, linear algebra, analytical geometry and single variable differential and integral calculus. Student has logical reasoning skills.

Course objective

The acquirement of knowledge and computational skills in multiple variables differentia and integral calculus and differential equations that are necessary to handle engineering problems.

Course-related learning outcomes

Knowledge:
1. Student has extended and in-depth knowledge of selected mathematic fields, including multiple variables differential and integral calculus and differential equations.
2. Student has a systematized knowledge in the field of mathematics, useful in formulating and solving complex problems in the area of electrical engineering.

Skills:

1. Student is able to obtain information from literature, databases and other properly selected sources, including information in English; is able to combine the obtained information, to interpret and critically assess it, to draw conclusions and to formulate opinions and provide exhaustive justifications for them
2. Student is able to use the known methods and mathematical models - and, if necessary, modify them - for the analysis and design of components of electronic systems.
3. Student is able to develop, evaluate and use existing analytical, simulational and experimental methods to solve complex engineering tasks in the field of electrical engineering, including non-typical tasks that contain a research component.
4. Student has the ability to learn independently, mainly in order to improve professional skills; is able to identify areas of detailed technical knowledge necessary to implement a specific engineering task and acquire them independently as well as present them

Social competences:
1. Student understands the need of lifelong learning
2. Student is able to cooperate and work in a team, and take different roles in it
3. Student is able to define priorities which serve the implementation of a task assigned by him-/herself or by others

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
assessment of knowledge and skills at the written exam checking knowledge of concepts and the ability to solve short practical tasks
passing threshold: 50% of points; exam issues, on the basis of which questions are prepared, will be sent to students by e-mail using the university e-mail system.
Tutorials:
assessment of knowledge and skills at the short written tests (at the beginning of every tutorial)
passing threshold: 50% of points

Programme content

MULTIPLE INTEGRAL
Definition of normal domain
Definition of double integral and its geometric interpretation
Evaluating double integral as iterated integral
Changing the order of integration in double integral
Polar coordinates in double integral + Jacobian
Cylindrical and spherical coordinates in triple integral +Jacobian
Application of the double integral
o The area of the region bounded by the curves
o The first and the second moments
o The mass and the center of mass
o The paralel axis theorem
Application of the triple integral
o The volume of solids
o The first and the second moments
o The mass and the center of mass
LINE INTEGRAL
Definition of line integral with respect to arc length
Definition of line integral on vector field
Independence of a line integral of path
Green’s theorem
Application of the line integral
o Length of an arc
o Area of a plane region
o Mass and center of mass of an arc
Physical interpretation of line integral (work)
ELEMENTS OF FIELD THEORY

Single variable vector function
Scalar field
Directional derivative
Gradient
Vector field
Potential functions, convervative vector field
Divergence of vector field, solenoidal vector field
Circulation and rotation of vector field, irrotational vector field
Nabla operator
Laplasian
FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS
Definition of the first order differential equations
General solution, particular solution
Initial value problem
Separable differential equations
Linear differential equations
Exact differential equations, integrating factor
SECOND-ORDER ORDINARY DIFFERENTIAL EQUATIONS
Linear differential equations with constant coefficients
Wronskian, linear independence of particular solutions
Nonhonogenous linear differential equations with constant coefficient (method:Undetermined coefficient, method of variation of parameters)
SYSTEMS OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS
Definition, matrix form
Fundamental set of solutions
Solution of systems of honogeneous first-order differential equations
LAPLACE TRANSFORM
Definition of the Laplace's transform
General properties
Examples of application

Teaching methods

Lectures:
lecture is conducted in an interactive way with formulating questions for a group of students or for selected students
student activity during classes is taken into account when the final grade is considered
Tutorials:
sample tasks are solved on the blackboard
detailed discussion of solved tasks

Bibliography

Basic:
1. W. Żakowski, Matematyka, T.1 i T.2, WNT, Warszawa 2003.
2. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Definicje, twierdzenia, wzory), GiS, Wrocław 2019.
3. M. Gewert, Z. Skoczylas, Analiza matematyczna 2 (Przykłady i zadania), GiS, Wrocław 2019.
4. M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne (Definicje, twierdzenia, wzory), GiS, Wrocław 2019.
5. M. Gewert, Z. Skoczylas, Elementy analizy wektorowej (Teoria, przykłady, zadania), GiS, Wrocław 2011.

Additional:
1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, T.1, T.2, PWN, Warszawa 2011.
2. I. Foltyńska, Z. Ratajczak, Z. Szafrański, Matematyka dla studentów uczelni technicznych, cz1., cz.2, Wydawnictwo PP, Poznań 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	152	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)	75	3,00