**Nazwa przedmiotu:**

Analysis II

**Koordynator przedmiotu:**

Piotr Figurny, M.Sc.

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Electric and Hybrid Vehicles Engineering

**Grupa przedmiotów:**

Matematyka

**Kod przedmiotu:**

1150-00000-ISA-0114

**Semestr nominalny:**

2 / rok ak. 2022/2023

**Liczba punktów ECTS:**

5

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

1) Number of contact hours- 66, including:
a) lecture - 30 h.;
b) practicals – 30 h
c) consultations - 4 h
d) exam -– 2 h
2) Student’s individual work 60 hours, including:
a) 30 h – student’s current preparation for practicals and lectures, literature study,
b) 20 h – student’s current preparation for tests,
c) 10 h - student’s current preparation for exam
3) TOTAL – sum of individual work and contact hours- 126 h.

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

2,6 ECTS points – number of contact hours - 66, including:
a) lecture - 30 h.;
b) practicals – 30 h
c) consultations - 4 h
d) exam -– 2 h

**Język prowadzenia zajęć:**

polski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

Brak

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład: | 30h |
| Ćwiczenia: | 30h |
| Laboratorium: | 0h |
| Projekt: | 0h |
| Lekcje komputerowe: | 0h |

**Wymagania wstępne:**

Knowledge of the notions and methods of the differential and integral calculus of functions of one variable (Analysis I), matrix and analytic geometry (Algebra)

**Limit liczby studentów:**

Brak

**Cel przedmiotu:**

Understanding the methods and concepts of the differential and integral calculus of functions of many variables and elements of the field theory necessary for studying directional subjects.

**Treści kształcenia:**

Vector spaces, linear transformations, base, transformation matrix, rotation matrix.
Norm, boundaries of sequences in normed spaces.
Functions in normed spaces, function limits, continuity.
Directional, partial derivative.
Derivative as a linear transformation, gradient, complete differential.
Derivative of a two-linear transformation, a complex function.
Multi-line forms (tensors), two-liner matrix, square form, square form sign.
Higher order derivative: partial derivatives, multilinear transformation.
Taylor's formula, local extrema, a necessary and sufficient condition.
Entangled function, smooth hyper surface.
Conditional extremes, Lagrange multipliers, global extremes.
Jordan's measure on the plane, double integral - definition, calculation.
Substitution: linear, polar coordinates.
Double integral incorrect.
Application of double integral.
Jordan's measure in space, triple integral - definition, calculation.
Substitution: linear, cylindrical, spherical coordinates.
The use of triple integral.
Curvilinear integral directed and unrecorded.
Surface integral oriented and unoriented.
Scalar fields, vector, gradient, divergence, rotation.
Potential, relation to the curved-line integral.
Green, Gauss, Stokes theorem.

**Metody oceny:**

Lecture: Exam, Credit is granted based on sum of points obtained from practicals and an exam.
Practicals: Tests and work during classes.

**Egzamin:**

tak

**Literatura:**

1. W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach.
2. W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych.
3. M. Gewert, Z. Skoczyla, Analiza Matematyczna 2.
4. Fichtencholz: Rachunek Różniczkowy i Całkowy.
5. W. Kołodziej: Analiza Matematyczna.

**Witryna www przedmiotu:**

Brak

**Uwagi:**

Brak

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt 1150-00000-ISA-0114\_W1:**

Has basic knowledge of the boundaries of sequences in vector spaces. Knowledge of the limits of functions of many variables and functions with vector values. Continuity of functions.
Knowledge of derivatives of vector functions, directional derivatives, partial derivatives, derivatives as linear transformation, higher derivatives. Knowledge of their property. Knowledge of local, global and conditional exotherms. Knowledge of entangled functions.
Knowledge of double and triple integrals, their properties and applications.
Knowledge of curved and surface integrals. Knowledge of their applications. Knowledge of the concept of potential. Knowledge of Green, Gauss and Stokes theorems.

Weryfikacja:

Obtaining the right number of points on the tests, exam, student's work on the practicals.

**Powiązane efekty kierunkowe:** K\_W01, K\_W03

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W07, T1A\_W01, T1A\_W02

### Profil ogólnoakademicki - umiejętności

**Efekt 1150-00000-ISA-0114\_U1:**

Student is able to calculate partial derivatives of functions of several variables. He can find a complete differential and a tangent plane. He can calculate the derivative of a complex and entangled function. He can find local, conditional, global extremes and entangled functions.
The student can calculate the double integrals by converting them into an iterated integral. He can use polar coordinates. Is able to calculate the area of flat and space, volume of a solid, static moment, inertia and the center of gravity of a flat area.
The student is able to calculate triple integrals by converting them into an iterated integral. He can apply cylindrical and spherical coordinates. He can calculate the volume of the solid, the static moment, the inertia and the center of gravity of the solid.
The student knows how to calculate the curved integral and unskinful integrals, converting them into integrals of the function of one variable. Can calculate the length of the curve, static moment, inertia and the center of gravity of the curve, work in the field of forces. .
Student is able to calculate surface integrals oriented and unoriented, converting them into double integrals. He can calculate the surface area in space, the static moment, the inertia and the center of gravity of the surface, the strings of the vector field. .
The student knows how to apply Green, Gauss and Stokes theorems.

Weryfikacja:

Obtaining the right number of points on the tests, exam, student's work on the practicals.

**Powiązane efekty kierunkowe:** K\_U01, K\_U03

**Powiązane efekty obszarowe:** T1A\_U01, T1A\_U03

### Profil ogólnoakademicki - kompetencje społeczne

**Efekt 1150-00000-ISA-0114\_K1:**

The student is aware of his qualifications in certain areas and their lack in others. Understands the need for systematic work on your development. He works in a group to solve problems more effectively

Weryfikacja:

Contact with the student during the lecture and exercises

**Powiązane efekty kierunkowe:** K\_K01

**Powiązane efekty obszarowe:** T1A\_K01