**Nazwa przedmiotu:**

Mathematics I - Calculus II

**Koordynator przedmiotu:**

dr Agnieszka Zimnicka, mgr Anna Zalewska

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Civil Engineering

**Grupa przedmiotów:**

Obligatory

**Kod przedmiotu:**

1120-BU000-ISA-9002

**Semestr nominalny:**

2 / rok ak. 2021/2022

**Liczba punktów ECTS:**

6

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

Lectures 30 h, tutorials 30 h, preparation for classes 20 h, reading the literature 10 h, preparation for tests 30 h, preparation for the exam and the exam 30 h.
Total 150 hours = 6 ECTS.

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

Lectures 30 h, tutorials 30 h, tests 4 h, exams 5 h, office hours 6 h.
Total: 75 hours = 3 ECTS.

**Język prowadzenia zajęć:**

angielski

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

Tutorials attendance 30 h, preparation for tests 26 h, preparation for the exam 25 h.
Total: 81 hours = 3 ECTS.

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

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

**Wymagania wstępne:**

Advanced knowledge of mathematics from secondary school and Calculus 1.

**Limit liczby studentów:**

bez limitu

**Cel przedmiotu:**

1. Making the students familiar with elements of modern mathematical analysis.
2. Making the students use mathematical analysis in practice.

**Treści kształcenia:**

1. Ordinary differential equations of the first order. Separable equations, homogeneous equations, linear equations, Bernoulli's equations. Linear differential equations with constant coefficients of order n. Linear differential equations of higher order with constant coefficients. The methods of undetermined coefficients and variation of parameters.
2. Definite integral. Properties of the definite integral. The fundamental theorems of calculus. Geometric and physical applications of the definite integral. Line integral of a scalar function. Arc length, first moments and moments of inertia, centre of mass of a curve. Improper integrals - convergent and divergent.
3. Infinite series. Sufficient conditions for convergence of series with nonnegative terms: the comparison test, the ratio test, the root test, the integral test. Alternating series - absolute and conditional convergence. The Leibniz test. Function sequences and function series. The set of convergence of a function series. Power series. Radius, interval and set of convergence of a power series. Taylor and Maclaurin series. Maclaurin series of elementary functions. Fourier series. The Dirichlet theorem. Half-range expansions.
4. Riemann integral over n-dimensional regions and its properties. Double and triple integral over normal regions. The Fubini theorem. Change of variables in the multiple integral. Polar coordinates. Cylindrical and spherical coordinates. Applications of double and triple integral in mechanics.
5. Surface integral of a scalar function. The surface area. First moments and moments of inertia of a surface.
6. Line integral of a vector field. The Green’s theorem. Surface integral of a vector field. The Gauss-Green-Ostrogradsky theorem. The Stokes’ theorem. Gradient field. Divergence and curl of a vector field.

**Metody oceny:**

The subject is assessed on the basis of the sum of points obtained on tutorials (four written tests and student's activity during classes) and on the written exam, consisting of two parts: theoretical questions and practical problems similar to those solved on tutorials.

**Egzamin:**

tak

**Literatura:**

[1] G. B. Thomas, M. D. Weir, J. R. Hass, "Thomas' Calculus", Pearson Addison Wesley;
[2] R. A. Adams, C. Essex, "Calculus. A complete course", Pearson Addison Wesley;
[3] S. K. Stein, "Calculus and Analytic Geometry", McGraw-Hill Book Company;
[4] J. Marsden, A. Weinstein, "Calculus 2", Springer (available on the Springer’s website);
[5] Auxiliary materials. The set of problems for tutorials.

**Witryna www przedmiotu:**

https://moodle.usos.pw.edu.pl/

**Uwagi:**

## Charakterystyki przedmiotowe

### Profil ogólnoakademicki - wiedza

**Charakterystyka K1\_W01:**

The graduates have knowledge of mathematics and physics enabling them to describe and understand basic phenomena in the field of civil engineering.

Weryfikacja:

Tests during the semester and the exam.

**Powiązane charakterystyki kierunkowe:** K1\_W01

**Powiązane charakterystyki obszarowe:** P6U\_W, I.P6S\_WG.o

### Profil ogólnoakademicki - umiejętności

**Charakterystyka K1\_U01:**

The graduates can apply mathematical methods of algebra and calculus for the analysis of basic physical and technical problems, use the rules of mathematical logics, and can use computational methods in engineering calculations.

Weryfikacja:

Written tests and the exam.

**Powiązane charakterystyki kierunkowe:** K1\_U01

**Powiązane charakterystyki obszarowe:** P6U\_U, I.P6S\_UW.o