**Nazwa przedmiotu:**

Calculus I

**Koordynator przedmiotu:**

Andrzej Fryszkowski, Professor

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Aerospace Engineering

**Grupa przedmiotów:**

Wspólne

**Kod przedmiotu:**

MiNI

**Semestr nominalny:**

1 / rok ak. 2009/2010

**Liczba punktów ECTS:**

7

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

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

**Język prowadzenia zajęć:**

polski

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

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

|  |  |
| --- | --- |
| Wykład:  | 30h |
| Ćwiczenia:  | 45h |
| Laboratorium:  | 0h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

high school mathematics

**Limit liczby studentów:**

**Cel przedmiotu:**

 to convey and reinforce the knowledge on real number sequences, functions of one variable, the constant e, one-variable differential and integral calculus, definite and improper integrals, and their application, to acquire thorough understanding of basic concepts and computational processes, and to master skills of using them, to acquire the skill of correct mathematical reasoning and inference.

**Treści kształcenia:**

1. Real sequences . Definition of sequence limit - convergent and divergent sequences. Indeterminate forms. Squeezing theorem. The constant e. 2. Function domain and counterdomain. Inversion and composition of functions. Elementary functions - linear, quadratic and rational functions. Properties of the exponential and logarithmic functions. Even and odd functions. Periodic functions. Trigonometric and cyclometric functions and their properties. 3. Function limit at a given point and at infinity. Horizontal, vertical and oblique asymptotes. Function continuity at a point and in the interval. One-sided continuity. Properties of continuous functions. 4. Function increment. Definition of the derivative of a function at a given point and its geometric interpretation. Derivatives of some common functions. The derivative of a sum, a product and a quotient of functions. The derivative of a composition. Tangent and normal lines at a point to a curve f(x). 5. De l'Hospital's rule. Function differential. Higher order derivatives and differentials. Taylor and MacLaurin formulas - approximate values of expressions. 6. Function extrema, necessary and sufficient condition. Rolle's theorem. The Lagrange Mean Value theorem. And its implications. 7. Derivatives of higher order with the use to identify extrema. Inflection points. Concave and convex functions. Necessary and sufficient conditions for inflection points. Examining the function and plotting its graph. 8. Indefinite integral - definition; antiderivative; integral of some common functions; properties. Techniques of integration. 9. Properties of definite integrals. The Fundamental Theorem of Calculus. Integration by parts and by substitution for definite integrals. 10. Definite integrals: definition and geometrical interpretation. Improper integrals of the first and the second kind. Applications of integrals; computing areas of planar figures, arc length of the curves, surface areas, volumes of revolved solids. 11. Convergence of an R2 sequences. Functions of two variables. Heines definition for function limit. 12. Gradient of a function at a point. Higher order partial derivatives. Taylor formula with the second and higher order. 13. Differential. Computing approximate values of expressions. Local extrema and necessary condition for them. Sufficient condition for an extremum. Functions of three variables: partial and directional derivatives and differentials. Taylor formula with the second order differential. 14. Implicit functions of one variable. Implicit function derivatives of first and second order. Extrema of implicit functions. Conditional extrema of the functions of two and three variables. Parametric representation of the two and three dimensional curves. Some common surfaces: sphere, cylinder, cone, paraboloid, hyperboloid. Planar regions in polar coordinates. Frenet trihedron.

**Metody oceny:**

50% continuous assesment based on laboratory work and tests, 50% written final exam

**Egzamin:**

**Literatura:**

Recommended texts (reading): 1. Thomas “Calculus” 2. Robert A. Adams, Calculus. A complete course 3. Thomas G. Finney: Calculus, ed. Addison-Wesley

**Witryna www przedmiotu:**

**Uwagi:**

## Efekty przedmiotowe