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| FACULTY OF COMPUTER SCIENCE AND MANAGEMENT | |
| SUBJECT CARD | |
| Name in English: | MATHEMATICAL ANALYSIS II |
| Name in Polish: | ANALIZA MATEMATYCZNA II |
| Main field of study (if applicable): | COMPUTER SCIENCE |
| Specialization (if applicable): | |
| Level and form of studies: | I level, full time |
| Kind of subject: | obligatory |
| Subject code: | MAT001650 |
| Group of courses: | NO |

| | Lecture | Classes | Laboratory | Project | Seminar |
|---|---------|----------------------|------------|---------|---------|
| Number of hours of organized classes in University (ZZU) | 30 | 30 | | | |
| Number of hours of total student workload (CNPS) | 120 | 60 | | | |
| Form of crediting | exam | crediting with grade | | | |
| For group of courses mark (X) final course | | | | | |
| Number of ECTS points | 4 | 2 | | | |
| including number of ECTS points for practical (P) classes | | 2 | | | |
| including number of ECTS points for direct teacher-student contact (BK) classes | 2,4 | 1,2 | | | |

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| PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES |
| Student must complete Mathematical Analysis I with a passing grade. |

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| SUBJECT OBJECTIVES |
| <p>C1. Understanding the basic methods of analysis of the graph of functions of several variables.</p> <p>C2. Understanding the concept of the definite integral of a function of two and three variables.</p> <p>C3. Understanding the practical applications of mathematical methods for the analysis of functions of several variable.</p> <p>C4. Understanding the notion of infinite series and basic convergence tests.</p> |

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| SUBJECT EDUCATIONAL EFFECTS |
| <p>Relating to knowledge student:</p> <p>PEK_W1 knows basic definitions and theorems from Mathematical Analysis of functions of several variables</p> <p>PEK_W2 knows the notion of partial derivatives and the definite integral of a function of two or three variables and their basic applications</p> <p>PEK_W3 knows the notion of infinite series and basic convergence tests</p> |

Relating to skills student:

PEK_U1 can calculate partial derivatives of a function of several variables

PEK_U2 can calculate double and triple integrals

PEK_U3 can decide whether an infinite series is convergent or divergent

Relating to social competences student:

PEK_K1 understands how calculus affects on the development of technical civilization

| PROGRAM CONTENT | | |
|-----------------------------------|--|--------------|
| Form of classes - lectures | | Hours |
| Lec1 | The definite integral and its area interpretation. The Fundamental Theorem of Calculus. | 2 |
| Lec2 | Applications of Integration: Average value of a function, Areas, Arc length, Volume of a solid. | 2 |
| Lec3 | Improper integrals of type I and II. Comparison and Limit Comparison test. | 2 |
| Lec4 | Functions of several variables. Cross-sections and contour lines. Graphs of typical functions of two variables. | 2 |
| Lec5 | Limits and continuity. Algebra of limits and continuous functions. | 2 |
| Lec6 | The partial derivative. Interpretation of partial derivatives. Higher order partial derivatives. Schwarz's Theorem | 2 |
| Lec7 | The first-order differential and differentiability of a function. The gradient vector. | |
| Lec8 | Local and global extrema. The closed and bounded region method. Optimization problems. | 2 |
| Lec9 | The definite integral of a function of two variables. Itereted integrals | 2 |
| Lec10 | Double integrals over normal and regular regions. Double integrals in polar coordinates. | 2 |
| Lec11 | Applications of double integrals | 2 |
| Lec12 | Triple integrals. Itereted integrals. | 2 |
| Lec13 | Triple integrals in cylindrical and spherical coordinates | 2 |
| Lec14 | Infinite series. The partial sums. Convergence and divergence tests | 2 |
| Lec15 | Power series. Representations of functions as power series. | 2 |
| | Total hours | 30 |
| Form of classes - classes | | Hours |
| C11 | Definite integrals - interpretation and applications. | 4 |
| C12 | Improper integrals. | 2 |
| C13 | Functions of several variables. Continuity. | 4 |
| C14 | Partial derivatives and differentiability of a function of several variables. | 3 |
| C15 | Local and global extrema. | 2 |
| C16 | Double integrals over normal and regular regions. Double integrals in polar coordinates. | 5 |
| C17 | Triple integrals. Triple integrals in cylindrical and spherical coordinates. | 4 |
| C18 | Infinite series. | 2 |
| C19 | Power series. | 2 |
| C110 | Test. | 2 |
| | Total hours | 30 |

TEACHING TOOLS USED

N1. Lecture - traditional method

N2. Classes - traditional method

N3. Student's self work with the assistance of mathematical packages

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

| Evaluation (F-forming; P - concluding) | Educational effect number | Way of evaluating educational effect achievement |
|--|--------------------------------|--|
| F-CI | PEK_U1, PEK_U2, PEK_U3, PEK_K1 | quizzes, in class presentations |
| P-Lec | PEK_W1, PEK_W2, PEK_W3 | exam |

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] W.G. McCallum et al., Multivariable calculus, John Wiley & Sons, Inc.1997G. M. Fichtenholz, Rachunek Różniczkowy i Całkowy, T. I - II, PWN, Warszawa 2007
- [2] F. Leja, Rachunek Różniczkowy i Całkowy, Wydawnictwo Naukowe PWN, 2012
- [3] W. Kryszicki, L. Włodarski, Analiza Matematyczna w Zadaniach, Cz. I, PWN, Warszawa 2006

SECONDARY LITERATURE:

- [1] K. Kuratowski, Rachunek Różniczkowy i Całkowy. Funkcje Jednej Zmiennej, Wydawnictwo Naukowe PWN, 2012
- [2] M. Gewert, Z. Skoczylas, Analiza Matematyczna 2. Przykłady i Zadania, Oficyna Wydawnicza GiS, Wrocław 2011

SUBJECT SUPERVISORS

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CORRELATION MATRIX BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **MATHEMATICAL ANALYSIS MAT001650** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY AND SPECIALIZATION

| Subject educational effect | Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable) | Subject objectives | Programme content | Teaching tool number |
|----------------------------|---|--------------------|-------------------|----------------------|
| PEK_W1 | | C1 C2 C3 | Lec1-15, C11-10 | N1, N2, N3 |
| PEK_W2 | | C2 C3 | Lec11-15, C14-7 | N1, N2, N3 |
| PEK_W3 | | C4 | Lec14-15, C18-9 | N1, N2, N3 |
| PEK_U1 | | C1 | Lec6-9, C13-5 | N1, N2, N3 |
| PEK_U2 | | C1 C2 C3 | Lec10-13, C16-7 | N1, N2, N3 |
| PEK_U3 | | C4 | Lec14-15, C18-9 | N1, N2, N3 |
| PEK_K1 | | C1 C2 C3 C4 | Lec1-15, C11-10 | N1, N2, N3 |