SYLLABUS FOR 2023/2024 ENROLMENT
FORM OF STUDY: FULL-TIME PROGRAMME

GENERAL INFORMATION

1. **Course** Mathematical analysis

2. **Field of study** Computer Science

3. **Level of acquired education** first-cycle programme

4. **Number of ECTScredits 5**

5. **Number of hours persemester**

semester	lecture	classes	laboratory/foreign language course	project/practical classes	self-study	internship
I	30	30				

6. **Language of instruction: English**

7. **Lecturer dr hab. Józef Waniurski, prof. ABNS, mgr Magda Konieczna**

DETAILED INFORMATION

8. Preliminary requirements

Knowledge within the high school mathematics curriculum.

9. Course objectives

C1 Master the tools and methods of differential and integral calculus.

C2 Develop the ability to apply the tools and methods of mathematical analysis to model and solve tasks and problems of practical significance.

10. Field-specific learning outcomes in terms of knowledge, skills and social competences

A student who completed the course:	reference to field-specific learning outcomes
KNOWLEDGE	
EU01 Knows and understands the concepts of mathematical analysis useful in formulating problems and solving tasks related to the subject matter.	K_W01
EU02 Knows and understands methods, techniques and tools of mathematical analysis used in solving optimization problems and practical tasks.	K_W01
SKILLS	
EU03 Can apply the knowledge and methods acquired to formulate and solve tasks of practical significance	K_U04
SOCIAL COMPETENCES	
EU04 Is ready for continuous learning - improving his competences.	K_K01

11. Course content

Course delivery method – lectures/classes

Lecture:
1) The set of real numbers, intervals, limits of sets.
2) Number sequences. Arithmetic and geometric sequences.
3) The limit of a sequence, the number e. Partial sequences.
4) Number series, convergence criteria, sum of a series.
5) Functions of one variable. Differentiable functions, periodic functions, cyclometric functions.
6) Limit and continuity of functions. Asymptotes, properties of continuous functions.

7) Derivative of functions, geometric and physical interpretation. Basic formulae.
8) Theorems of differential calculus. De Hospital's rule.
9) Higher order derivatives, Taylor's formula.
10) Local and global extremes of functions, the course of variation.
11) Indeterminate integrals, basic formulae. Integration by parts and by substitution.
12) Riemann integral. Newton-Leibniz formula.
13) Mean value theorems. Improper integrals.
14) Applications of integrals. Area of a plane set, volume of a rotating solid, length of a curve.

Classes:
1) Operations on measurable and incommensurable numbers. Determining the limits of sets.
2) Properties of number sequences, monotonicity and boundedness.
3) Determination of limits of sequences, application of the theorem about three sequences.
4) Investigating convergence of series and determining sums.
5) Examples of elementary functions, inverse functions, complex functions.
6) Determination of limits of functions. Study of continuity, discontinuity points.
7) Calculating the derivative of a function. The derivative of a complex function.
8) Application of mean value theorems, testing monotonicity of functions.
9) Expanding functions into Taylor-Maclaurin series.
10) Determining the local and global extremum of a function, studying the variation of a function.
11) Calculating integrals of elementary functions. Integration by parts and by substitution, integration by decomposition of a measurable function into simple fractions.
12) Calculating the integral of a function, changing variables and integration limits. Inequalities for integrals. The integral formula for the mean value of a function.
13) Integral formulas for area of a plane set, volume of a revolving solid, length of a curve.

12. Teachingtools and methods
1. Lecture in the form of a multimedia presentation, board, chalk, projector
2.Task solving and discussion

13. Assessment method (component, final)
1. Test
2. Evaluation of class participation
3. Examination

14. Student workload	
Form of activity	Number of hours
1. Classes with direct participation of the teacher and office hours	70
2.Student workload	55
Sum	125
Number of ECTS credits	5

15. Reference books

Primary:
1) W. Rudin, Podstawy analizy matematycznej, PWN, Warszawa 2009

2) M. Gewert, Z. Skoczylas, Analiza matematyczna 1,2. Oficyna Wydawnicza G i S, Wrocław 2000
3) W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, cz. I, PWN, Warszawa 2011
4) F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 1979 lub nowsze
Secondary:
1) R. Rudnicki, Wykłady z analizy matematycznej, PWN, Warszawa 2001
2) W Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych. Cz. 1, Cz. 2, PWN, Warszawa 2009
3) K. Kuratowski, Rachunek różniczkowy i całkowy, funkcje jednej zmiennej, PWN, Warszawa 1970

16. Assessment form - details
Conditions for obtaining course credit: the course ends with a written exam Classes Three written tests checking student's knowledge and skills Duration 45 minutes The condition to obtain a positive grade from each test is to obtain at least 50% of points. Scoring: 0 - 49% - insufficient (2,0) 50%-59% satisfactory (3.0) 60%-69% sufficient (3.5) 70% - 79% good (4.0) 80% - 89% very good (4.5) 90%-100% excellent (5.0) Students will receive a passing grade if they receive at least a sufficient grade from each test and show 85% attendance in class. The student may receive a higher mark if he/she actively participates in the classes. Written examination Time 90 minutes 4-5 tasks to be solved Marking as above

17. Other details concerning the course
1. Direct information about the issues of classes and a program content is provided by the teacher during classes and during office hours.
2. Classes will be held at AB in Biała Podlaska
3. Classes will be held in accordance with the current schedule
4. Office hours will be held in accordance with the applicable schedule