SYLLABUS

Mathematical Analysis I
(Differential calculus)

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Automation and Computer Science
1.3	Department	Mathematics
1.4	Field of study	Automation. Applied Informatics and Intelligent Systems
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Automation and Applied Informatics (English)
1.7	Form of education	Full time
1.8	Subject code	1.00

2. Data about the subject

2.1	Subject name					Mathematical Analysis I					
2.2	Subject area					Mathematics					
2.3	Course responsible/lecturer					Prof. dr. Dorian POPA					
2.4	Teachers in charge of applications					Sl. dr. Alina RAMONA BAIAS					
2.5	Year of study	I	2.6	Semester	1	2.7	Assessment	exam	2.8	Subject category	DF/OB

3. Estimated total time

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	18
Supplementary study in the library, online and in the field	15
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	21
Tutoring	30
Exams and tests	3
Other activities	3

3.7	Total hours of individual study	69
3.8	Total hours per semester	125
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic knowledge of Differential Calculus and Set Theory
4.2	Competence	Competences in elementary Differential Calculus: elements of set theory, limits, sequences and series, derivatives.

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

6. Specific competences

Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 –** Recognizing and describing concepts that are specific to the fields of calculability, complexity, programming paradigms, and modeling computational and communication systems **C1.3 –** Building models for various components of computing systems **C1.5 –** Providing a theoretical background for the characteristics of the designed systems
Cross competences	N/A

7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	A presentation of the concepts, notions, methods and fundamental techniques used in differential calculus.
7.2	Specific objectives	Use of the differential calculus in order to solve problems in engineering. Use of the differential calculus in modelling and solving practical problems concerning spatial forms.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Real numbers. Sequences of real numbers.	Explanation Demonstration Collaboration Interactive activities	
2	Series of real numbers. Definition, examples and properties.		
3	Tests of convergence for series of numbers..		
4	Sequences of functions. Series of functions. Pointwise and uniform convergence.		
5	Power series. Taylor formula and Taylor series.		
6	Trigonometric series. Fourier series.		
7	Metric spaces. Sequences in metric spaces.		
8	Topology of a metric space. Banach fixed point theorem.		
9.	Functions of several variables. Limit and continuity.		
10	Partial derivatives. Differential operators. Differential of functions of several variables. Taylor's formula for functions of several variables.		
11	Differential of functions of several variables. Taylor's formula for functions of several variables.		
12	Extrema for functions of several variables.		
13	Implicit functions.		
14.	Conditional extrema.		

Bibliography

1. Dorian Popa, Calculus – Mediamira Cluj-Napoca, 2006.
2. O. Stănăşilă, Analiză matematică, EDP Bucureşti, 1981
3. Dumitru Mircea Ivan. Calculus. Editura Mediamira, Cluj-Napoca, 2002.

8.2. Applications (Seminars)		Teaching methods	Notes
1	Exercises related to sequences of numbers.	Explanation Demonstration Collaboration Interactive activities	
2	Exercises related to series. Sums of series.		
3	Exercices related to the convergence of series with positive terms.		
4	Exercices related to the convergence of series with general terms		
5	Exercises concerning power series.		
6	Exercises related to power series.		
7	Exercises related to Fourier series.		
8.	Exercises related to metric spaces and Banach Fixed Point Theorem.		
9	Functions of of several variables. Limit and continuity.		
10	Partial derivatives and differential operators.		
11	Derivative of a composite function.		
12	Extrema for function of several variables.		
13	Exercises related to implicit functions.		
14	Exercises concerning conditional extrema.		

Bibliography

1. N. Vornicescu, D.M.Ivan, D. Popa, Calcul diferenţial, Editura Mediamira, 2004.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Collaboration with engineers in order to identify and solve problems raised by the market.

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		Abilities of understanding and using creatively the concepts and proofs		Written examination		20%
Applications		Abilities of solving problems and applying algorithms		Evaluation during the semester and final written paper		80%
10.4 Minimum standard of performance						
Ability to present coherently a theoretical subject and to solve problems with practical content.						

Date of filling in: 15.02.2025		Title NAME	Signature
	Course	Prof. Dorian POPA	
	Applications	SL. dr. Alina-Ramona BAIAS	

Date of approval by the Department Board	Head of Department of MATHEMATICS Prof.dr. Dorian POPA
Date of approval by the Faculty Council Automation and Computer Science	Dean Prof.dr.ing. Vlad MUREȘAN