

SYLLABUS

1. Data about the program of study

1. 1	Institution	Technical University of Cluj-Napoca
1. 2	Faculty	Faculty of Civil Engineering
1. 3	Department	Mathematics
1. 4	Field of study	Civil Engineering
1. 5	Cycle of study	Bachelor of Science
1. 6	Program of study/Qualification	CCIA english/Engineer
1. 7	Form of education	Full time
1. 8	Subject code	1.00

2. Data about the subject

2.1	Subject name	Mathematical Analysis (Analiza Matematica)					
2.2	Subject area	Mathematics					
2.3	Course responsible/lecturer	Conf. dr. Daniela Inoan					
2.4	Teachers in charge of seminars	Conf. dr. Adela Capata					
2.5 Year of study	1	2.6 Semester	1	2.7 Assessment	E	2.8 Subject category	DOB/DF

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 curriculum	125	3.5 of which, course:	28	3.6 applications:	28
Individual study					69 hours
Manual, lecture material and notes, bibliography					15
Supplementary study in the library, online and in the field					15
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					34
Tutoring					2
Exams and tests					3
Other activities					-
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	
4.2	Competence	Knowledge of elementary mathematics acquired in high-school

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	-

6. Specific competences

Professional competences	Using knowledge of mathematics in civil engineering.
Cross competences	N/A

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

7.1	General objective	Acquiring the ability to use fundamental mathematical concepts, methods and models that are applied in civil engineering.
7.2	Specific objectives	<p>Ability to use differential calculus in the study of functions of several real variables (points of extremum, implicit functions, changes of variables)</p> <p>Ability to use integral calculus, especially in applications</p>

	connected with civil engineering.
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8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	<u>Real functions of one real variable</u> : differential calculus, definition of the derivative, geometric meaning of the derivative, properties	Exposition, presenting examples, debate.	
2.	<u>Real functions of several real variables</u> : definition and properties of partial derivatives of order one and of higher order, Schwarz theorem, differential of a function		
3.	<u>Differentiation of composite functions</u> : exposure of various cases, deduction of the formulas for derivatives of order one and two		
4.	<u>Local extrema</u> : Taylor's formula for functions of several real variables, definition of local extrema, critical points, algorithms to determine the local extrema		
5.	<u>Implicit functions</u> : definition, existence theorem, derivatives of the implicit functions		
6.	<u>Differential operators</u> : gradient, divergence, laplacean, curl operator, jacobian		
7.	Changes of variables in differential expressions		
8.	<u>Definite integrals</u> : definition, geometric meaning, integration by parts, changes of variables		
9.	<u>Line integrals with respect to arc length</u> : definition, method of calculus, applications		
10.	<u>Line integrals with respect to coordinates</u> : definition, method of calculus, applications, path independence		
11.	<u>Double integrals</u> : definition, calculus by iteration, examples		
12.	<u>Changes of variables in double integrals</u> : general formula, the particular case of polar coordinates		
13.	<u>Applications of double integrals</u> : calculus of area, mass, mass center, inertia momentum		
14.	<u>Triple integrals</u> : definition, calculus by iteration, change of variables, applications		
Bibliography			
1. D. Inoan, <i>Elemente de calcul integral</i> , Ed. UTPres Cluj-Napoca, Cluj-Napoca, 2006			
2. M. Ivan, <i>Calculus</i> , Ed. Mediamira, 2002			
3. V. Mureşan, <i>Analiză matematică</i> , Casa de editură Transilvania Press, Cluj-Napoca, 2000.			
4. M. Nikolsky, <i>A course of Mathematical Analysis</i> , vol.I, MIR, 1990.			
8.2. Applications/Seminars		Teaching methods	Notes
1.	Derivatives and partial derivatives of first and second order: exercises	Exercise, debate, interactive methods.	
2.	Partial derivatives of composite functions: exercises		
3.	Local extrema for functions of two variables: exercises		
4.	Derivatives of implicit functions: exercises		
5.	Applications of calculus in physical sciences: exercises		
6.	Differential operators: exercises		
7.	Riemann integrals on a real interval: exercises		
8.	Improper integral		
9.	Line integrals: exercises		
10.	Applications of line integrals: exercises		
11.	Double integrals: exercises		
12.	Applications of double integrals: exercises		

13.	Applications of triple integrals: exercises		
14.	Surface integrals		
Bibliography <ol style="list-style-type: none"> 1. D. Inoan, <i>Problems in differential and integral calculus</i>, Ed. Mediamira, Cluj-Napoca, 2007 2. N. Vornicescu, colectiv, <i>Calcul diferencial</i>, Ed. Mediamira, 2004 3. D. Inoan, A. Novac, D. Popa, <i>Probleme de analiza matematica</i>, Ed. Mega, 2011 4. D. Marian, <i>Mathematical Analysis</i>, Ed. Mega, 2012 			

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

Mathematical contents with a large applicability in technical and engineering sciences are included.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Knowledge of notions and properties specific to differential calculus and integral calculus.	Theoretical questions (written paper)	20.00%
Applications	Capacity of solving problems and applications of mathematical analysis, differential and integral calculus.	Solving exercises and problems (written paper)	80.00%
10.4 Minimum standard of performance			
Solving at least 40% of the proposed subjects.			

Date of filling in
01.06.2025

Teachers in charge of courses
Prof. Dr. Daniela Inoan

Teachers in charge of seminars
Conf. Dr. Adela Capata

Date of approval in the department
05.06.2025

Head of department
Prof. Dr. Dorian Popa

Date of approval in the Faculty

Dean,
Prof. Dr. Ing. Daniela Manea

12.07.2025