SYLLABUS
Mathematical analysis II
(Integral calculus and differential equations)

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Automation and Computer Science
1.3	Department	Mathematics
1.4	Field of study	Systems Engineering
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	9.00

2. Data about the subject

2.1	Subject name					Mathematical analysis II (Integral calculus and differential equations)					
2.2	Subject area					Mathematics					
2.3	Course responsible/lecturer					Prof. dr. Dumitru Mircea IVAN					
2.4	Teachers in charge of applications					Assoc. Prof. Mircea RUS					
2.5	Year of Study	I	2.6	Semester	2	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	154	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	40
Supplementary study in the library, online, and in the field	4
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	41
Tutoring	0
Exams and tests	3
Other activities	0

3.7	Total hours of individual study	98
3.8	Total hours per semester	154
3.9	Number of credit points	6

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic knowledge of Integral Calculus
4.2	Competence	Competences in elementary Integral Calculus: primitives, definite integrals.

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 competencies gained*)

7.1	General objective	A presentation of the concepts, notions, methods, and fundamental techniques used in integral calculus.
7.2	Specific objectives	Use of integral calculus in order to solve problems in engineering.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Ordinary differential equations (ODE) of order one	Explanation Demonstration Collaboration Interactive activities	
2	Linear homogeneous ODE with constant coefficients		
3	Linear non-homogeneous ODE with constant coefficients		
4	Positive and linear functionals.		
5	Riemann-Stieltjes integral. Primitives.		
6	Improper integrals.		
7	Integrals depending on a parameter.		
8	Special functions		
9	Paths. Vector fields. Line integrals with respect to the coordinates. Circulation.		
10	Differential Forms. Exact differential forms. Path-independence. Work.		
11	Line integrals with respect to the arc length. Total mass, the center of mass.		
12	Double integral. Green-Riemann formula.		
13	Surface integral. Flux of vector field across a surface. Stokes' Theorem.		
14	Volume integral. Gauss-Ostrogradsky Theorem. MATHEMATICA capabilities.		

Bibliography

1. Mircea Ivan. Elemente de calcul integral. Mediamira, Cluj-Napoca, 2003. ISBN 973-9357-40-7.
2. Dumitru Mircea Ivan. Calculus. Editura Mediamira, Cluj-Napoca, 2002. ISBN 973-9358-88-8.

8.2. Applications (Seminars)		Teaching methods	Notes
1	Ordinary differential equations (ODE) of order one (Exercises)	Explanation Demonstration Collaboration Interactive activities	
2	Linear homogeneous ODE with constant coefficients (Exercises)		
3	Linear non-homogeneous ODE with constant coefficients (Exercises)		
4	Positive and linear functionals (Exercises)		
5	Riemann-Stieltjes integral. Primitives (Exercises)		
6	Improper integrals (Exercises)		
7	Integrals depending on parameters(Exercises)		
8	Special functions (Exercises)		
9	Line integrals with respect to the coordinates(Exercises)		
10	Differential Forms (Exercises)		
11	Line integrals with respect to the arc length. (Exercises)		
12	Double integral. Green-Riemann formula. (Exercises)		
13	Surface integral. (Exercises)		
14	Volume integrals. MATHEMATICA-related capabilities. (Exercises)		

Bibliography

1. Mircea Ivan, Elemente de calcul integral, 2003
2. Dumitru Mircea Ivan, et al. Analiză matematică - Culegere de probleme pentru seminarii, examene şi concursuri. Editura Mediamira, Cluj-Napoca, 2002. ISBN 973-9357-20-2.
3. Mircea Ivan et al. Culegere de Probleme Pentru Seminarii, Examene şi Concursuri. UT Press, Cluj-Napoca, 2000.

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		Ability to understand and use the concepts and proofs creatively.		Written examination		30%
Applications		Ability to solve problems and apply algorithms		Written examination		70%
10.4 Minimum standard of performance						
Ability to present a theoretical subject coherently and to solve problems with practical content.						

Date of filling in:		Title First name NAME	Signature
28.03.2023	Course	Prof. PhD. Mircea IVAN	
	Applications	Assoc. Prof. Mircea RUS	

Date of approval by the Department Board	Head of Department of MATHEMATICS Prof. PhD. Dorian POPA
Date of approval by the Faculty Council _____	Dean Prof. PhD. Eng. Liviu Cristian MICLEA