SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System/ Engineering
1.7	Form of education	Full time
1.8	Subject code	9.00

2. Data about the subject

2.1	Subject name			Special Mathematics	
2.2	Course responsible/ lecturer			Conf. univ. dr. Otrocol Diana, Diana.Otrocol@math.utcluj.ro	
2.3	Teachers in charge of Seminars/ Laboratory/ Project			Conf. univ. dr. Otrocol Diana, Diana.Otrocol@math.utcluj.ro	
2.4 Year of study	1	2.5 Semester	2	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	E
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DF
	DI – compulsory, DO – elective, Dfac – optional				DI

3. Estimated total time

3.1 Number of hours per week:	4	of which	3.2 Course	2	3.3 Seminar	2	3.3 Laboratory	-	3.3 Project	-
3.2 Total hours per semester	56	of which	3.5 Course	28	3.6 Seminar	28	3.6 Laboratory	-	3.6 Project	-

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	20
(b) Supplementary study in the library, online and in the field	2
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	20
(d) Tutoring	
(e) Exams and tests	2
(f) Other activities	

3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	44
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	100
3.10 Number of credit points	4

4. Prerequisites (where applicable)

4.1	Curriculum	Mathematical Analysis, Linear Algebra
4.2	Competences	Operating with basic Mathematical, Engineering and Computer Science concepts

5. Requirements (where appropriate)

5.1	For the course	Basic knowledge of Integral Calculus for one variable and complex numbers
5.2	For the applications	Basic knowledge of Integral Calculus for one variable and complex numbers

6. Specific competences

Professional competences	C1.1. Professional communication using scientific concepts, theory and methods used in system engineering. C1.2. Presentation and motivation of solution to problems from system engineering using techniques, concepts and principles from mathematics, physics, etc. C1.3. solving usual problems in system engineering by identifying techniques, principles and methods from mathematics. C1.4. Identifying the potential, advantages and disadvantages of methods from system engineering, documentation of projects and using mathematical methods. C1.5.Use of mathematical methods in projects in system engineering.
Cross competences	

7. Expected learning outcomes

Knowledge	The student/graduate identifies and describes basic concepts, principles, and methods in mathematics, physics, chemistry, technical drawing, economics, and computer science.
Abilities	The student/graduate operates with basic concepts, principles, and methods from fundamental disciplines. The student/graduate solves problems of mathematics, physics and chemistry with applicability in engineering and validates the solution obtained.
Responsibility and autonomy	The student/graduate applies the values of ethics and deontology of the engineering profession. The student/graduate practices logical reasoning, evaluation and self-evaluation in decision-making.

8. Discipline objectives (based on specific competencies acquired)

8.1	General objective	A presentation of the concepts, notions, methods and fundamental techniques used in integral calculus and complex functions
8.2	Specific objectives	Use of the integral calculus and the complex functions in order to solve problems in engineering

9. Contents

9.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Differential equations of order 1	2	Explanation Demonstration Collaboration Interactive activities	
2	Existence and uniqueness theorem	2		
3	Differential equations of superior order	2		
4	Linear differential equations of order	2		
5	Integration of differential equations using power series. Bessel's equation	2		
6	Systems of differential equations	2		
7	Equations with partial derivatives of the 1st order	2		
8	Equations with partial derivatives of the 2st order	2		

9	Equations of mathematical physics	2		
10	Laplace transform	2		
11	Properties of Laplace transform	2		
12	Fourier transform	2		
13	Applications of the Fourier transform	2		
14	Exam problems	2		

Bibliography

1. S. Toader, G. Toader, Matematici speciale, vol 1, U. T. Press, Cluj-Napoca, 2009.
2. I. Crivei, Matematici speciale, Editura Fundatiei pentru Studii Europene, Cluj-Napoca, 2006.
3. I. Gavrea, Calcul integral si ecuatii diferentiale, Mediamira, Cluj-Napoca, 2006.
4. C. H. Edwards, D. E. Penney, Elementary differential equations, Pearson, 6 edition, 2007.
5. E. Rogai, Exercitii si probleme de ecuatii diferentiale si integrale, Editura Tehnica, Bucuresti, 1965
6. M. Krasnov, A. Kisselev, G. Makarenko, Recueil de problemes sur les equations diferentielles ordinaires, Edition Mir, Moscou, 1981.

9.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Differential equations with separable variables	2	Explanation Demonstration Collaboration Interactive activities	
2	Homogeneous differential equations	2		
3	Linear differential equations, Bernoullli's equations, Riccati's equations, Lagrange's equations	2		
4	Differential equations of superior order	2		
5	Linear differential equations of order	2		
6	Integration of differential equations using power series. Bessel's equation	2		
7	Systems of differential equations	2		
8	Equations with partial derivatives of the 1st order	2		
9	Equations with partial derivatives of the 2st order	2		
10	Equations of mathematical physics	2		
11	Laplace transform	2		
12	Properties of Laplace transform	2		
13	Fourier transform	2		
14	Summary problems	2		

Bibliography

1. S. Toader, G. Toader, Matematici speciale, vol 1, U. T. Press, Cluj-Napoca, 2009.
2. I. Crivei, Matematici speciale, Editura Fundatiei pentru Studii Europene, Cluj-Napoca, 2006.
3. I. Gavrea, Calcul integral si ecuatii diferentiale, Mediamira, Cluj-Napoca, 2006.
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6. M. Krasnov, A. Kisselev, G. Makarenko, Recueil de problemes sur les equations diferentielles ordinaires, Edition Mir, Moscou, 1981.

10. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job and the expectations of the national organization for quality assurance (ARACIS).

11. Assessment

Activity type	11.1 Assessment criteria	11.2 Assessment methods	11.3 Weight in the final grade (%)
11.4 Course	Abilities of understanding and using creatively the concepts and proofs	Written examination	85%
11.5 Applications	Abilities of solving problems and applying algorithms	Participation in activities, solving homework	15%
11.5 Project			
11.6 Minimum standard of performance: Five grade			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
September 2025	Course	Conf. univ. dr. Otrocol Diana	
	Applications Seminar/ Laboratory/ Project	Conf. univ. dr. Otrocol Diana	

Date of approval in the ETHM Department Council **January 2026**	**Head of Department:** Prof. Eng. MICU Dan Doru, PhD
Date of approval in the Faculty of Electrical Engineering Council **February 2026**	**Dean:** Assoc. Prof. Eng. CZIKER Andrei, PhD