SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Automation
1.4 Field of study	System Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics/ Engineer
1.7 Form of education	Full time
1.8 Subject code	9.00

2. Data about the subject

2.1 Subject name				***Special Mathematics in Engineering***	
2.2 Course responsible/lecturer				Prof.dr. Ioan Rasa Ioan.Rasa@math.utcluj.ro	
2.3 Teachers in charge of seminars/ laboratory/ project				Assoc.prof.dr. Daniela Inoan - Daniela.Inoan@math.utcluj.ro Lecturer dr. Diana Otrocol	
2.4 Year of study	I	2.5 Semester	2	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DF
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars	2	Laboratory		Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars	28	Laboratory		Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										20
(b) Supplementary study in the library, online and in the field										20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										26
(d) Tutoring										
(e) Exams and tests										3
(f) Other activities:										

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Elementary knowledge of complex numbers. Elements of calculus.
4.2 Competence	Competences in using complex numbers (in algebraic and trigonometric form). Ability to calculate derivatives and real integrals.

5. Requirements (where appropriate)

5.1. For the course	Blackboard, videoprojector
5.2. For the applications	Blackboard, videoprojector

6. Specific competence

6.1 Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 -** Recognizing and describing specific concepts to calculability, complexity, programming paradigms and modeling of computing and communication systems **C1.2 -** Using specific theories and tools (algorithms, schemes, models, protocols, etc.) for explaining the structure and the functioning of hardware,

	software and communication systems **C1.3 -** Building models for various components of computing systems **C1.4 -** Formal evaluation of the functional and non-functional characteristics of computing systems **C1.5 -** Providing theoretical background for the characteristics of the designed systems
6.2 Cross competences	N/A

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

7.1 General objective	A presentation of the concepts, notions, methods and fundamental techniques used in complex functions theory and integral transforms theory.
7.2 Specific objectives	Use of the complex functions theory and integral transforms theory for solving problems in engineering.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Complex numbers. Operations, topology in C.	2	Explanation Demonstration Collaboration Interactive activities (if necessary, on-line in Microsoft Teams)	
Continuity. Monogenic functions. The Cauchy-Riemann conditions. Holomorphic functions.	2		
The complex integral. Definition. Cauchy's integral theorem. Cauchy's integral formula.	2		
Taylor and Laurent series. Singular points, classification.	2		
Residues. The Residue Theorem.	2		
Applications of the Residue Theorem.	2		
Real integrals calculated with complex methods.	2		
The Fourier transform. Definition, properties.	2		
Applications of the Fourier transform.	2		
The Laplace transform. Definition and properties.	2		
The inverse Laplace transform.	2		
Applications of the Laplace transform.	2		
The z transform. Applications.	2		
Difference equations. The z transform applied to solving difference equations.	2		
Bibliography 1. A.I. Mitrea, Analiza matematica in complex (curs+culegere de probleme), Ed. Mediamira, Cluj-Napoca, 2005. 2. A.I. Mitrea, Transformari integrale si discrete (curs + culegere de probleme) Ed. Mediamira, Cluj-Napoca, 2004. 3. M.L. Krasnov, A.I. Kiselev, G.I. Makarenko, Functions of a Complex Variable, Operational Calculus and Stability Theory, Mir Publishers, Moscow, 1984.			

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Operations in C. Geometric interpretations.	2	Explanation Demonstration Collaboration Interactive activities (if necessary, on-line in Microsoft Teams)	
The Cauchy-Riemann conditions. Holomorphic functions.	2		
Elementary functions, equations in the complex domain.	2		
The complex integral.	2		
Series of functions.	2		
Residues. The Residue Theorem.	2		
Computing real integrals by using the Residue Theorem.	2		
The Fourier transform.	2		
Properties and apploications of the Fourier transform	2		
The Laplace transform.	2		
The inverse Laplace transform.	2		
Applications of the Laplace transform.	2		
The z transform.	2		
Difference equations solved with the z transform.	2		
Bibliography 1. A.I. Mitrea, Analiza matematica in complex (curs+culegere de probleme), Ed. Mediamira, Cluj-Napoca, 2005.			

2. A.I. Mitrea, Transformari integrale si discrete (curs + culegere de probleme) Ed. Mediamira, Cluj-Napoca, 2004.
3. M.L. Krasnov, A.I. Kiselev, G.I. Makarenko, Functions of a Complex Variable, Operational Calculus and Stability Theory, Mir Publishers, Moscow, 1984.

*Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.

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	Assessment criteria	Assessment methods	Weight in the final grade
Course	Abilities of understanding and using creatively the concepts and proofs	Written examination (if necessary, on-line in Microsoft Teams)	30%
Seminar	Abilities of solving problems and applying algorithms	Written examination (if necessary, on-line in Microsoft Teams)	70%
Laboratory			
Project			
Minimum standard of performance: Ability to present coherently a theoretical subject and to solve problems with practical content.			

Date of filling in:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
01.09.2022	Course	Prof. dr. Ioan Raşa	
	Applications	Assoc.prof.dr. Daniela Inoan	
		Lecturer dr. Diana Otrocol	

Date of approval in the department **02.09.2022**	Head of department Prof.dr. Dorian Popa
Date of approval in the Faculty Council **15.09.2022**	Dean Prof.dr.ing. Liviu Miclea