COURSE GUIDE

Dean, Prof.dr. Daniela Tărniceriu

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1. Program info

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iaşi
1.2 Faculty / Department	Electronics, Telecommunications and Information Technology
1.3 Department	Telecommunications and Information Technology
1.4 Field	Electronic Engineering, Telecommunications and Information Technology
1.5 Study level	Bachelor
1.6 Study program / Qualification	Telecommunication Systems and Technologies

2. Course info

2.1 Course name	SPECIAL MATHEMATICS I					Code:	EDIF 133
2.2 Course organizer (lecturer)	Lect. Dr. Roman Marcel						
2.3 Teaching assistants	Lect. Dr. Roman Marcel						
2.4 Year of study	1	2.5 Semester	2	2.6 Assessement	Exam	2.7 Category	DI

3. Estimated total time (hours per semester for teaching activities)

3.1 Number of hours per week	6	3.2 lecture	3	3.3 seminar/laboratory	3
3.4 Total number of hours in curricula	84	3.5 lecture	42	3.6 seminar/laboratory	42

Time distribution	hours
Textbook, course support, references and course notes study	28
Library, electronic platforms and on site documentation	14
Seminar/laboratory preparation, homework, reports, portfolios and essays	16
Tutoring	14
Assessment	4
Other activities	8

3.7 Total individual study hours	84
3.9 Total hours per semester	168
3. 10 Number of credit points	5

4. Prerequisites (where applicable)

4.1 curricula type	Mathematics, classes XI, XII, at least level M2, Calculus 1 (semester 1), Linear Algebra (semester 1)
4.2 competence type	To know and to be able to make computations in differential calculus and linear algebra.

5. Infrestructure (where applicable)

5.1. for lectures	• The classroom will be endowed with video projector, blackboard and specific materials. • The students will respect the Students Rights and Obligations Code and the regulations set out in the Charter of the "Gheorghe Asachi" Technical University of

	last.
5.2. for seminars	• The classroom will be endowed with video projector, blackboard and specific materials. • Time limits for tests are set by the course organizer.

6. Specific competences

Professional competences	• To know and to use properly the integral calculus, the solving of differential equations and systems of differential equations, the using of residue theory and their applications in integral calculus and in operational calculus (Laplace and Fourier transforms); • To operate with abstract concepts to make judgments from simple to complex, generalizations and customizations; • To understand the major issues related to the notion of Riemann integral, improper integral and parameter integrals and their applications in practice; • To understand the major issues related to the concept of differential equation and some elements of mathematical modelling; • To understand the major issues of Fourier series and Fourier and Laplace transforms; • To apply abstract concepts for solving practical problems and exercises; • To calculate various integrals; • To solve ordinary differential equations by direct methods and operational methods; • To expand the functions in Fourier series, to calculate the direct/inverse Fourier and Laplace transforms and to use them in operational calculus.
Transversal competence	• To prove concern for the professional development by training of critical thinking skills • To develop the skills of independent work. • It seeks the optimal creative potential and the improvement of their training and education during the entire course, the compliance of principles and rules of professional ethics.

7. Course targets (as resulting from **6.** Specific competences table)

7.1 Course main target	Acquirement of knowledge of integral calculus, differential equations and systems, elements of complex analysis, integral transformations which are fundamental for understanding of other disciplines.
7.2 Course specific targets	• Developing skills of the proper application of acquired knowledge for solving different classes of problems. • Developing ability to apply theoretical reasoning to solve practical problems. • Learning integral calculus formulas. • Application of integral calculus in solving of practical problems. • Solving practical problem using differential equations and systems of differential equations. • Solving differential and integral calculus problems using the residue theory and Laplace and Fourier transforms.

8. Contents

8. 1 Lectures	**Teaching methods**	**Notes**
Chapter I. Indefinite integral (antiderivative) and definite integral. Definitions, properties, Leibniz-Newton formula, integration by parts, change of variable, partial fraction for integration, Euler's substitutions and Cebyshev's substitutions. *Chapter II. Improper integrals* Improper integrals first type and improper integrals of second type (convergence, convergence criterions). Integrals with	Presentation, lecture, heuristic conversation, demonstration, connections with other disciplines.	Video projector, blackboard.

parameter. Euler's integrals: the functions Gamma and Beta.		
Chapter III. Line integrals (curve integrals) Line integrals of first type and line integrals of second type. Path independence. Aplications.		
Chapter IV. Differential equations Ordinary differential equations (ODE): differential equations with separable variables, homogeneous differential equations and reducible to homogeneous equations, first order linear differential equations, Bernoulli equation, exact differential equations, Riccati equation, Lagrange equation, Clairaut equation. Linear differential equations of order n with constant coefficients. Linear systems of differential equations. *Chapter V. The theory of functions of a complex variable* Complex numbers, holomorphic functions, the Cauchy-Riemann equations, elementary complex functions. The complex integral, the Cauchy's integral theorem and related topics. Methods for expanding functions in power series (Taylor series and Laurent series). The residues theorem and the computation of complex integrals using residue theory. *Chapter VI. Fourier series* Definition of Fourier series; Fourier sine and cosine series. *Chapter VII. Fourier transform* Definition of Fourier transform, properties. Sine and cosine transforms. *Chapter VIII. Laplace transform* Definition of the Laplace transform. Inverse Laplace transforms (Mellin-Fourier formula). Solving differential equations using Laplace transform.	Presentation, lecture, heuristic conversation, demonstration, connections with other disciplines.	Video projector, blackboard.
References		

8. 2 Laboratory	**Teaching methods**	**Notes**
1. Indefinite integral (antiderivative) and definite integral.	Discussions, solving exercises.	Video projector, blackboard.
2. Improper integrals. Integrals with parameter.		
3. Line integrals (curve integrals).		
4. Differential equations.		
5. The theory of functions of a complex variable.		
6. Fourier series.		
7. Fourier transform.		
8. Laplace transform.		

References

1. V. Brînzănescu, O. Stănăşilă. Matematici speciale, teorie, exemple, aplicaţii, Ed. All, Bucureşti, 1998.
2. G. Ciobanu, G. Chiorescu, V. Savu, Capitole de matematici speciale. Univ.Tehnică „Gh.Asachi" Iaşi, 1999.
3. S. Chiriţă, Probleme de matematici superioare, Ed. Didactică şi Pedagogică, Bucureşti, 1989;
4. N. Donciu, D. Flondor, Analiză matematică culegere de probleme, Ed. All, Bucureşti, 2 vol, 1998;
5. R. Luca-Tudorache, Probleme de analiză matematică. Calcul integral. Casa de editura Venus, Iaşi, 2007;
6. C. Meghea, I. Meghea, Tratat de calcul diferenţial şi calcul integral pentru învăţământul politehnic, Ed. Tehnică, 1997;
7. L.Popa, D. Roşu, Matematici speciale. Culegere de probleme, Ed. Dosoftei, Iaşi, 2003.
8. L.Popa, Matematici speciale, Ed. CERMI, 2009

9. I Şabac, Matematici speciale. vol. I, II. Ed. Didactică şi Pedagogică, Bucureşti, 1965.
10. D.W.Jordan & P.Smith. „Mathematical Techniques" (third edition). Oxford University Press, ISBN:0 19 924972 5, (2002).
11. Advanced Engineering Mathematics-UPTI, http://ocw.upt.ro/courses/index.php?subjectId=111105035

9. Course contents corroboration with the expectations of the epistemic community representatives, professional associations and relevant employers in the field of the program

In determining the course content were considered the curriculum used in other faculties of the University "Gh. Asachi " and those used in other universities. The knowledge gained in this course are mathematical curriculum for most courses in the undergraduate program. Course objectives are in perfect agreement with the curriculum, transmitting information and forming skills necessary for future engineers.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Percentage of final grade
10.4 Lectures	- Accuracy and completeness of knowledge; - Consistency of logical expression and appropriate use of learned concepts; -The level of assimilation of the subjects taught.	Exam (6 problems) Test during semester (3 problems)	60% (minimum 5) 20%
10.5 Seminar/laboratory	The assessment is based on: - the frequency and relevance of oral interventions; - the quality of solutions of the problems and exercises performed at the seminar.	Assessment of oral answers	(minimum 5) 20%
10.6 Minimum performance standard			
Students will be able to: • to determine primitives of a (simple) function using the table of primitives, to determine primitives using integration by parts, simple substitution or integration of rational functions; • to calculate integrals of the first and second kind; • to solve differential equations with constant coefficients; • to calculate complex integrals using the residue theory; • to determine the Fourier series expansion of real functions; • to solve differential equations using Laplace transform.			

Completion date:
15.09.2019

Course organizer signature,
Lect.dr. Marcel Roman

Teaching assistant signature,
Lect.dr. Marcel Roman

Department approval date,

Head of Department signature,
Lect.dr. Marcel Roman