

COURSE GUIDE

Dean, Prof.dr. Daniela Tămbulescu



1. Program info

1.1 Higher education institution	"Gheorghe Asachi" Technical University of Iași
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 2					Code: EDIF	284
2.2 Course organizer (lecturer)	Lect. Dr. Roman Marcel						
2.3 Teaching assistants	Lect. Dr. Roman Marcel						
2.4 Year of study	2	2.5 Semester	1	2.6 Assessment	Exam	2.7 Category	DI

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

3.1 Number of hours per week	5	3.2 lecture	3	3.3 seminar/laboratory	2
3.4 Total number of hours in curricula	70	3.5 lecture	42	3.6 seminar/laboratory	28
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					12
Tutoring					8
Assessment					4
Other activities					8
3.7 Total individual study hours	74				
3.9 Total hours per semester	144				
3.10 Number of credit points	6				

4. Prerequisites (where applicable)

4.1 curricula type	Mathematics, classes XI, XII, at least level M2, Calculus 1 (semester 1), Linear Algebra (semester 1), Special Mathematics 1 (semester 2).
4.2 competence type	To know and to be able to make computations in differential calculus, linear algebra, complex analysis and operational calculus.

5. Infrastructure (where applicable)

5.1. for lectures	<ul style="list-style-type: none"> The classroom will be endowed with video projector, blackboard and specific materials. The students will respect the Students Rights and Obligations Code and the
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	regulations set out in the Charter of the "Gheorghe Asachi" Technical University of Iasi.
5.2. for seminars	<ul style="list-style-type: none"> The classroom will be endowed with video projector, blackboard. Time limits for tests are set by the course organizer.

6. Specific competences

Professional competences	<ul style="list-style-type: none"> To know and to use properly the multiple integral calculus, solving partial differential equations (PDE), as well as the terminology of the theory of probabilities; To operate with abstract concepts to make judgments from simple to complex, generalizations and particularizations; To understand the major issues related to the double and volume integrals, the surface integrals and their applications in practice; To calculate various integrals; To understand the major issues related to the concept of partial differential equations (PDE) and some elements of mathematical modeling; To solve partial differential equations (PDE) by direct methods and operational methods; To understand the major issues related to discrete and continuous random variables; To apply abstract concepts for solving practical problems and exercises.
Transversal competence	<ul style="list-style-type: none"> 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 on multidimensional domains, solving of partial differential equations of order II and acquirement of knowledge about the theory of probabilities which are fundamental for understanding of other disciplines.
7.2 Course specific targets	<ul style="list-style-type: none"> 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 partial differential equations (PDE) of order I. Analysis and computations involving random variables. Acquirement of the formulas of the theory of probabilities.

8. Contents

8.1 Lectures	Teaching methods	Notes
<p><i>Chapter I. Multiple integrals</i></p> <p>The double integral. Change of variables. The triple integral (volume integral). Change of variables.</p> <p>The Green formula.</p> <p>Surface integrals of 1st and 2nd type.</p> <p>The Stokes formula. The Gauss-Ostrogradski formula.</p> <p><i>Chapter II. Partial differential equations of order II</i></p> <p>Definition. Canonical forms. Solving methods: separation of variables, change of variables.</p> <p>Hyperbolic PDEs: the wave equation (the vibrating string equation).</p>	<p>Presentation, lecture, heuristic conversation, demonstration, connections with other disciplines.</p>	<p>Video projector, blackboard.</p>

<p>Elliptic PDEs: Laplace equation. Parabolic PDEs: the heat equation.</p> <p><i>Chapter III. Theory of probability</i> Sample space, events and probability. Definition of probability. Conditional probability. Total probability theorem and Bayes's theorem. Independence and conditional independence. Random variables. Discrete random variables. Probability distributions. Bernoulli trials, binomial distribution, Poisson distribution, geometric distribution. Continuous random variables. Probability density function (pdf) and cumulative distribution function (cdf). Mean and variance of continuous random variables. Classic distributions: uniform distribution, normal distribution, Weibull distribution, χ^2-distribution, Fischer distribution, student distribution. The law of large numbers. Moivre-Laplace theorem. The central limit theorem.</p>		
<p>References</p> <ol style="list-style-type: none"> 1. V. Brînzănescu, O. Stănișilă, <i>Matematici speciale, teorie, exemple, aplicații</i>, Ed. All, București, 1998. 2. G. Ciobanu, G. Chiorescu, V. Sava, <i>Capitole de matematici speciale</i>, Univ.Tehnică „Gh.Asachi” Iași, 1999. 3. G. Ciucu, V. Craiu, I. Săcuiu, <i>Probleme de teoria probabilităților</i>, Ed. Tehnică, București, 1974. 4. I. Cuculescu, <i>Teoria probabilităților</i>, Ed. All, București, 1998. 5. S. Chiriță, <i>Probleme de matematici superioare</i>, Ed. Didactică și Pedagogică, București, 1989. 6. N. Donciu, D. Flondor, <i>Analiză matematică: culegere de probleme</i>, Ed. All, București, 2 vol, 1998. 7. R. Luca-Tudorache, <i>Probleme de analiză matematică. Calcul integral</i>, Casa de editura Venus, Iași, 2007. 8. C. Meghea, I. Meghea, <i>Tratat de calcul diferențial și calcul integral pentru învățământul politehnic</i>, Ed. Tehnică, București, 1997. 9. A. Pletea, L. Popa, <i>Teoria probabilităților</i>, Univ. Tehnică, Iași, 1998. 10. L.Popa, <i>Matematici speciale</i>, Ed. CERM, 2004. 11. L.Popa, D. Roșu, <i>Matematici speciale. Culegere de probleme</i>, Ed. Dosoftei, Iași, 2003. 12. L. Popa, D. Roșu, <i>Modele probabilistice în inginerie</i>, Ed. Politehniun, Iași, 2007. 13. I. Șabac, <i>Matematici speciale</i>, vol. I, II, Ed. Didactică și Pedagogică, București, 1965. 14. P. Talpalaru, L. Popa, E. Popovici, <i>Probleme de teoria probabilităților și statistică matematică</i>, Univ.Tehnică, Iași, 1995. 15. D.W.Jordan & P.Smith, „Mathematical Techniques”(third edition), Oxford University Press, ISBN:0 19 924972 5, (2002). 16. Advanced Engineering Mathematics-NPTTEL, http://nptel.ac.in/courses/index.php?subjectId=111105035 		
8. 2 Laboratory/seminar	Teaching methods	Notes
<p><i>Chapter I. Multiple integrals</i> The double integral. Change of variables The triple integral (volume integral). Change of variables. The Green formula. Surface integrals of 1st and 2nd type. The Stokes formula. The Gauss-Ostrogradski formula.</p> <p><i>Chapter II. Partial differential equations of order 1</i> Definition. Canonical forms. Solving methods: separation of variables, change of variables. Hyperbolic PDEs: the wave equation (the vibrating string equation). Elliptic PDEs: Laplace equation. Parabolic PDEs: the heat equation.</p>	<p>Discussions, solving exercises.</p>	<p>Video projector, blackboard.</p>

<p><i>Chapter III. Theory of probability</i></p> <p>Sample space, events and probability. Definition of probability. Conditional probability. Total probability theorem and Bayes's theorem. Independence and conditional independence.</p> <p>Random variables.</p> <p>Discrete random variables. Probability distributions. Bernoulli trials, binomial distribution, Poisson distribution, geometric distribution.</p> <p>Continuous random variables. Probability density function (pdf) and cumulative distribution function (cdf). Mean and variance of continuous random variables. Classic distributions: uniform distribution, normal distribution, Weibull distribution, χ^2-distribution, Fischer distribution, student-distribution.</p> <p>The law of large numbers. Moivre-Laplace theorem. The central limit theorem.</p>		
<p>References</p> <ol style="list-style-type: none"> 1. V. Brînzănescu, O. Stănăşilă, <i>Matematici speciale, teorie, exemple, aplicații</i>, Ed. All, București, 1998. 2. G. Ciobanu, G. Chiorescu, V. Sava, <i>Capitole de matematici speciale</i>, Univ.Tehnică „Gh.Asachi” Iași, 1999. 3. G. Ciucu, V. Craiu, I. Săcuiu, <i>Probleme de teoria probabilităților</i>, Ed. Tehnică, București, 1974. 4. I. Cuculescu, <i>Teoria probabilităților</i>, Ed. All, București, 1998. 5. S. Chiriță, <i>Probleme de matematici superioare. Ec. Didactică și Pedagogică</i>, București, 1989. 6. N. Donciu, D. Flondor, <i>Analiză matematică: culegere de probleme</i>, Ed. All, București, 2 vol, 1998. 7. R. Luca-Tudorache, <i>Probleme de analiză matematică. Calcul integral</i>; Casa de editura Venus, Iași, 2007. 8. C. Meghea, I. Meghea, <i>Tratat de calcul diferențial și calcul integral pentru învățământul politehnic</i>, Ed. Tehnică, București, 1997. 9. A. Pletea, L. Popa, <i>Teoria probabilităților</i>, Univ. Tehnică, Iași, 1998. 10. L.Popa, <i>Matematici speciale</i>, Ed. CERM, 2004 11. L.Popa, D. Roșu, <i>Matematici speciale. Culegere de probleme</i>, Ed. Dosoftei, Iași, 2003. 12. L. Popa, D. Roșu, <i>Modele probabilistice în inginerie</i>, Ed. Politehnia, Iași, 2007. 13. I Șabac, <i>Matematici speciale, vol. I, II</i>, Ed. Didactică și Pedagogică, București, 1965. 14. P. Talpalaru, L. Popa, E. Popovici, <i>Probleme de teoria probabilităților și statistică matematică</i>, Univ.Tehnică, Iași, 1995. 15. D.W.Jordan & P.Smith, „Mathematical Techniques”(third edition), Oxford University Press, ISBN:0 19 924972 5, (2002). 16. Advanced Engineering Mathematics-NPT EL, http://nptel.ac.in/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 consulted 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	<ul style="list-style-type: none"> - Accuracy and completeness of knowledge; - Consistency of logical expression and appropriate use of learned concepts -The level of assimilation of the subjects taught. 	<p>Exam (6 problems)</p> <p>Test during semester (3 problems)</p>	<p>60%</p> <p>(minimum 5)</p> <p>20%</p> <p>(minimum 5)</p>

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	20% (minimum 5)
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10.6 Minimum performance standard

Students will be able to:

- to calculate double integrals on simple domains using the reduction to Riemann integrals or the change of variables in polar coordinates;
- to obtain the canonical form of an PDE of order II;
- to recognize the classic distributions;
- to calculate the mean and the standard deviation of a random variable (discrete or continuous).

Completion date:
24.09.2019

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

