COURSE GUIDE

Dean,
Prof.dr. Daniela Tarniceriu

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 2**					Code: EDIF 204	
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 Assessement	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. Infrestructure (where applicable)

5.1. for lectures	• The classroom wil 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 Iasi.
5.2. for seminars	• The classroom wil be endowed with video projector, blackboard. • Time limits for tests are set by the course organizer.

6. Specific competences

Professional competences	• 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	• 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 acquirementof knowledge about the theory of probabilities 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 partial differential equations (PDE) of order II. • Analysis and computations involving random variables. • Acquirement of the formulas of the theory of probabilities.

8. Contents

8. 1 Lectures	**Teaching methods**	**Notes**
Chapter I. Multiple integrals 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.	Presentation, lecture, heuristic conversation, demonstration, connections with other disciplines.	Video projector, blackboard.
Chapter II. Partial differential equations of order II 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.		
Chapter III. Theory of probability 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, $\chi 2$-distribution, Fischer distribution, student-distribution. The law of large numbers. Moivre-Laplace theorem. The central limit theorem.		

References

1. V. Brînzănescu, O. Stănăşilă, Matematici speciale, teorie, exemple, aplicaţii, Ed. All, Bucureşti, 1998.
2. G. Ciobanu, G. Chiorescu, V. Sava, Capitole de matematici speciale, Univ.Tehnică „Gh.Asachi" Iaşi, 1999.
3. G. Ciucu, V. Craiu, I, Săcuiu, Probleme de teoria probabilităţilor, Ed. Tehnică, Bucureşti, 1974.
4. I. Cuculescu , Teoria probabilităţilor, Ed. All, Bucureşti, 1998.
5. S. Chiriţă, Probleme de matematici superioare, Ed. Didactică şi Pedagogică, Bucureşti, 1989.
6. N. Donciu, D. Flondor, Analiză matematică: culegere de probleme, Ed. All, Bucureşti, 2 vol, 1998.
7. R. Luca-Tudorache, Probleme de analiză matematică. Calcul integral; Casa de editura Venus, Iaşi, 2007.
8. C. Meghea, I. Meghea, Tratat de calcul diferenţial şi calcul integral pentru învătământul politehnic, Ed. Tehnică, Bucureşti, 1997.
9. A. Pletea, L. Popa, Teoria probabilităţilor, Univ. Tehnică, Iaşi, 1998.
10. L.Popa, Matematici speciale, Ed. CERMI, 2004.
11. L.Popa, D. Roşu, Matematici speciale. Culegere de probleme, Ed. Dosoftei, Iaşi, 2003.
12. L Popa, D. Roşu, Modele probabilistice in inginerie, Ed. Politehnium, Iaşi, 2007.
13. I Şabac, Matematici speciale, vol. I, II, Ed. Didactică şi Pedagogică, Bucureşti, 1965.
14. P. Talpalaru, L. Popa, E. Popovici, Probleme de teoria probabilităţilor şi statistică matematică, Univ.Tehnică, Iaşi, 1995.
15. D.W.Jordan & P.Smith, „Mathematical Techniques"(third edition), Oxford University Press, ISBN:0 19 924972 5, (2002).
16. Advanced Engineering Mathematics-NPTEL, http://nptel.ac.in/courses/index.php?subjectId=111105035

8. 2 Laboratory/seminar	**Teaching methods**	**Notes**
Chapter I. Multiple integrals 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.	Discussions, solving exercises.	Video projector, blackboard.
Chapter II. Partial differential equations of order II 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.		

Chapter III. Theory of probability 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, $\chi 2$-distribution, Fischer distribution, student-distribution. The law of large numbers. Moivre-Laplace theorem. The central limit theorem.		

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2. G. Ciobanu, G. Chiorescu, V. Sava, Capitole de matematici speciale, Univ.Tehnică „Gh.Asachi" Iaşi, 1999.
3. G. Ciucu, V. Craiu, I, Săcuiu, Probleme de teoria probabilităţilor, Ed. Tehnică, Bucureşti, 1974.
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6. N. Donciu, D. Flondor, Analiză matematică: culegere de probleme, Ed. All, Bucureşti, 2 vol, 1998.
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9. A. Pletea, L. Popa, Teoria probabilităţilor, Univ. Tehnică, Iaşi, 1998.
10. L.Popa, Matematici speciale, Ed. CERMI, 2004.
11. L.Popa, D. Roşu, Matematici speciale. Culegere de probleme, Ed. Dosoftei, Iaşi, 2003.
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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	- 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% (minimum 5)

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)
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:
16.09.2019

Course organizer signature,
Lect.dr. Marcel Roman

Teaching assistant signature,
Lect.dr. Marcel Roman

Department approval date:
16.09.2019

Head of Department signature,
Lect.dr. Marcel Roman