

1. Program Data

1.1. Institution of Higher Education	Babeş-Bolyai University
1.2. Faculty	Faculty of Engineering
1.3. Department	Department of Engineering Science
1.4. Field of Study	Electrical Engineering
1.5. Course of Study	Bachelor
1.6. Study Programme	ELECTROMECHANICS

2. Discipline Data

2.1. Discipline Name	Equations of mathematical physics						
2.2. Course Coordinator	Ș.I.dr.fiz. Hațiegan Cornel						
2.3.1. Seminary Coordinator	Ș.I.dr.fiz. Hațiegan Cornel						
2.3.2. Laboratory Coordinator	-						
2.3.3. Project Coordinator	-						
2.4. Year of Study	II	2.5. Semester	I	2.6. Evaluation Time	C	2.7. Discipline Regime	Op.

3. Estimated Total Time (hours per semester of teaching activities)

3.1. Number of Hours per Week	3	from which: 3.2. Course	2	3.3. seminary	1
3.4. Total Hours from the Curriculum Plan	42	from which: 3.5. Course	28	3.6. seminary	14
Time Fund Distribution - hours					33 ore
Study of Handbook, Course Materials, Bibliography & Notes					20
Additional Documentation in Library, on Special E-learning Platforms & in the Field					6
Preparation of seminars/laboratories/ projects, topics, reports, portfolios & essays					3
Mentoring					2
Examination					2
Other Activities					
3.7. Total Time of Individual Study	33				
3.8. Total Hours per Semester	75				
3.9. Number of Credits	3				

4. Pre-condition (where is the case)

4.1. of Curriculum	• Mathematics, physics.
4.2. of Competences	• Basic computer knowledge

5. Condition (where is the case)

5.1. of Course Progress	• knowledge of the basic notions of physics and mathematics
5.2.1. of Seminary Progress	• knowledge of the basic notions of physics and mathematics
5.2.2. of Laboratory Progress	-
5.2.3. of Project Progress	-

6. Acquired Specific Competences

Professional Competence	<ul style="list-style-type: none"> • CP1 - Identification, definition, use of notions in fundamental sciences specific to the field of engineering. • CP2 - Use of graphic principles and tools to describe and design mechanical systems and processes.
Transversal Competences	<ul style="list-style-type: none"> • CT2 - Applying the techniques of teamwork and efficient labor in a multidisciplinary team, on various hierarchical levels, within the work team-specific project management. • CT3 - Appropriate use of effective lifelong learning methods and techniques; appropriate use of information and oral and written communication in an international European language.

7.7. Discipline Objectives (coming out from the Checklist of Acquired Specific Competences)

7.1. General Objective of Discipline	The course aims to transmit and acquire knowledge about the equations of mathematical physics, how to solve them, the physical interpretation of the results obtained and their application in various technical fields.
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7.2. Specific Objectives	<p><i>1. Knowledge and understanding</i> Students need to know and understand: the main types of first order equations, higher order linear differential equations, linear systems of differential equations, physical phenomena modeled by partial differential II equations of different types, methods for solving equations of mathematical physics: bringing to canonical form, separation of variables</p> <p><i>2. Explanation and interpretation</i> Students must have the ability to: explain the need and usefulness of mathematical modeling by ordinary differential equations with partial derivatives, correlate exact solving methods with approximation, interpret the results of mathematical calculation practically.</p> <p><i>3. Instrumental Applications</i> Students must be able to: create mathematical models of physical phenomena, capitalize on theoretical knowledge to solve technical problems modeled by differential equations, use the computer to solve differential equations and partial derivatives</p> <p><i>4. attitude</i> Students must gain confidence in the mathematical methods of investigating physical phenomena, to show a scientific spirit of studying nature</p>
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8. Content

8.1. Course	Teaching methods	Observation
1. Equations with partial derivatives	exposition, problematization, heuristic conversation, explanation.	8 hours
1.1. First order partial differential equations		
1.2. Equations with linear and homogeneous partial derivatives		
1.3. Equations with linear and inhomogeneous partial derivatives		
2. Systems of differential equations		8 hours
2.1. First order systems of differential equations		
2.2. First-order systems of linear differential equations		
2.3. Symmetric first order differential equation systems		
3. Equations of Mathematical Physics		12 hours
3.1. Quasi-linear equations. Reduction to the canonical form		
3.2. The vibrating string equation		
3.2.1. Infinite rope. D'Alembert's method		
3.2.2. Finite rope. Fourier method		
3.3. The heat equation		
3.3.1. Solve the Cauchy problem for the heat equation		
3.4. Propagation of waves in space		
3.4.1. Vibrations of limited volumes		
Bibliography:		
1. A.N. Tihonov, A.A. Samarski. Ecuatiile fizicii matematice, Editura tehnică, București, 1956.		
2. L.Jude. Ecuatiile fizicii matematice. Teorie și aplicații, Matrix Rom, București, 2010.		
3. Hărăguș, D. Ecuatii cu derivate parțiale. Editura Universității de Vest, Timișoara, 2001.		
4. Gh. Babescu, A. Juratoni, O. Budău. Ecuatii diferențiale și cu derivate parțiale, Editura Mirton, Timișoara, 2009.		
5. C. Kalik. Ecuatii cu derivate parțiale. Editura Didactică și Pedagogică, București, 1980.		
6. V.Olariu, T. Stănășilă. Ecuatii diferențiale și cu derivate parțiale, Editura Tehnică, București, 1982.		
7. V.S. Vladimirov. Ecuatiile fizicii matematice, Editura Științifică și Enciclopedică, București, 1980.		
8.2.1. Seminary	Teaching methods	Observation
1. First order and higher order differential equations	problematization, heuristic conversation, explanation	2 hours
3. Systems of differential equations		2 hours
4. Equations with partial derivatives		2 hours
6. The equation of the vibrating string		2 hours
7. The heat equation		2 hours
8. Reducing the equations of the theory of elasticity to the wave equation		2 hours
10. Thin film effect		2 hours
Bibliography:		
1. A. Kovacs, D. Mihailov, Gh. Țigan. Matematici speciale în inginerie. Culegere de probleme. Editura Politehnica, Timișoara, 2007		
2. G. Moroșanu. Ecuatii diferențiale. Editura Academiei, București, 1982		
3. C. Tudosie. Probleme de ecuații diferențiale. Editura Dacia, Cluj-Napoca, 1990.		
4. Hărăguș, D. Ecuatiile fizicii matematice. Caiet de seminar. Tipografia Universității de Vest, Timișoara, 1993		
5. I.A. Rus, Gh. Micula, P. Pavel, B.B. Ionescu. Probleme de ecuații diferențiale și cu derivate parțiale. Editura		

Didactică și Pedagogică, București, 1982. 6. Olariu, V., Stănișilă, T., Ecuații diferențiale și cu derivate parțiale, Editura tehnică, București, 1982. 7. A.N. Tihonov, A.A. Samarski. Ecuațiile fizicii matematice, Editura tehnică, București, 1956.		
8.2.2. Laboratory	Teaching methods	Observation
Bibliography:		
8.2.3. Project	Teaching methods	Observation
Bibliography:		

9. Corroborating Discipline's Contents with the Expectation of the Epistemic Community Representatives, the Professional Associations and the Employers' Representatives from the Programme Corresponding Field

- They have been established with the main employers by previous discussions at the study programme substantiation.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Pondere din nota finală
10.4. Course	Debates participation	Number of interventions	10 %
	Acquired knowledge level	Exam (on paper)	60 %
10.5.1. Seminary	Activity / implication	Intervenții	20%
	Gained competence level	Test	10%
10.5.2. Laboratory	Activity / implication		
	Gained competence level in practice		
10.5.3. Project	Readiness in phrasing the project stages		
	Project quality		
10.6. Performance Minimum Standard			
<ul style="list-style-type: none"> • Completion of Applicative Activities (the minimum grade of 5). • Completion of each exams subject by the minimum grade of 5. 			

Completion Date

May 2022

Course Coordinator's Signature

Ș.I.dr.fiz. Hațiegan Cornel

Seminary Coordinator's Signature

Ș.I.dr.fiz. Hațiegan Cornel

Department Endorsement Date

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Completion Date

Chief of Department Signature

Ș.I.dr.fiz. Hațiegan Cornel