SYLLABUS

Approved,
DEAN
Prof.univ.dr.ing. Gilbert-Rainer Gillich

1. Program Data

1.1. Institution of Higher Education	**Babeș-Bolyai University**
1.2. Faculty	**Faculty of Engineering**
1.3.Department	**Department of Engineering Science**
1.4. Field of Study	**Applied Engineering Science**
1.5. Course of Study	**Bachelor**
1.6. Study Programme	**Industrial Informatics**

2. Discipline Data

2.1. Discipline Name	Linear Algebra, Analytical and Special Mathematics						
2.2. Course Coordinator	Lect.univ.dr. Andrea Amalia Minda						
2.3.1. Seminary Coordinator	Lect.univ.dr. Andrea Amalia Minda						
2.3.2. Laboratory Coordinator							
2.3.3. Project Coordinator							
2.4. Year of Study	I	2.5. Semester	2	2.6. Evaluation Time	E	2.7. Discipline Regime	Cmp.

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

3.1. Number of Hours per Week	**5**	from which: 3.2. Course	**3**	3.3. seminar	**2**
3.4. Total Hours from the Curriculum Plan	**70**	from which: 3.5. Course	**42**	3.6. seminar	**28**
Time Fund Distribution - hours					
Study of Handbook, Course Materials, Bibliography & Notes					**30**
Additional Documentation in Library, on Special E-learning Platforms & in the Field					**10**
Preparation of seminaries/laboratories/ projects, topics, reports, portfolios & essays					**13**
Mentoring					
Examination					**2**
Other Activities					

3.7. Total Time of Individual Study	**55**
3.8. Total Hours per Semester	**125**
3.9. Number of Credits	**5**

4. Pre-condition (where is the case)

4.1. of Curriculum	Mathematical Analysis
4.2. of Competences	Basic mathematical analysis

5. Condition (where is the case)

5.1. of Course Progress	Video projector, PC, whiteboard, chalk, MS Teams
5.2.1. of Seminar Progress	•
5.2.2. of Laboratory Progress	
5.2.3. of Project Progress	•

6. Acquired Specific Competences

Professional Competences	Application and adequacy of basic knowledge of mathematics, physics, chemistry specific in the field of applied engineering science (CP1) Operating with basic concepts in the field of computer technology and information technology. (CP2)
Transversal Competences	Identifying the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the related deadlines and the related risks. (CT1)

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

7.1. General Objective of Discipline	The course aims at transmitting and acquiring knowledge of special mathematics, creating a solid foundation of mathematical knowledge and the ability to use this knowledge for the interpretation, description and resolution of engineering problems. The fundamental objectives of the special mathematical discipline are the appropriation by students of elements from the theory of differential equations, complex functions, Fourier series and Laplace transformed, as well as the improvement of students' knowledge of mathematics useful to actual calculations in subsequent years of study as well as in the workplace.
7.2. Specific Objectives	• acquiring mathematical methods that have applications in engineering, physics, mechanics, machinery parts, mechanisms, material strength, computer science, numerical methods, materials study and technology. • explanation and interpretation of processes, as well as theoretical and content practice of discipline. • use of methods, techniques and tools for mathematical calculation and application; • the acquisition of basic knowledge of higher mathematics necessary for understanding mathematical mechanisms applied in the other disciplines that use it; developing students' logical thinking, forming habits to use rigorous reasoning.

8. Content

8.1. Course	Teaching methods	Observation
1. Differential equations of the first order. Equations with separable variables. Equations with exact total differentials. Differential equations with integral factor	exposition, problematization, heuristic conversation, explanation	3 hours
2. Homogeneous equations. First order linear equations. Bernoulli type equations. Riccati's equation. Lagrange equations. Clairaut equations		3 hours
3. Higher order homogeneous differential equations with constant coefficients		3 hours
4. Higher-order non-homogeneous differential equations with constant coefficients		3 hours
5. Linear differential equations with variable coefficients		3 hours
6. Complex functions. Holomorphic functions		3 hours
7. Complex functions. Curvilinear integral in the complex plane		3 hours
8. Complex functions. Sequences and series of functions. The residue theorem and its applications		3 hours
9. Fourier series. Fourier series development for a periodic function with period 2π		3 hours
10. Fourier series development for a periodic function with period T		3 hours
11. Complex form of Fourier series decomposition		3 hours
12. Laplace transform		3 hours
13. Inverse Laplace transform		3 hours
14. Applications of the Laplace transform		3 hours

Bibliography
1. Kecs, W. – Produsul de convoluţie şi aplicaţii, Editura Academiei, 1978
2. Şabac, I. G – Matematici speciale, vol. 2, EDP, 1965
3. Craciun, I. – Capitole de Matematici Speciale, Ed. Pim, Iasi, 2007
4. Oppenheim, A. V., Willsky, A. S., & Nawab, S. H. – Signals and systems, Englewood Cliffs, N.J: Prentice-Hall, 1997
5. I. A. Rus, Ecuaţii diferenţiale, ecuaţii integrale si sisteme dinamice, Transilvania Press, Cluj-Napoca, 1996
6. Minda A.A, Note de curs

8.2.1. Seminar	Teaching methods	Observation
1. Differential equations of the first order. Equations with separable variables. Equations with exact total differentials. Differential equations with integral factor	problem solving and discovery, solving exercises, linking theoretical knowledge to	2 hours
2. Homogeneous equations. First order linear equations. Bernoulli type equations. Riccati's equation. Lagrange equations. Clairaut equations		2 hours
3. Higher order homogeneous differential equations with constant coefficients		2 hours
4. Higher-order non-homogeneous differential equations with constant coefficients		2 hours
5. Linear differential equations with variable coefficients		2 hours
6. Complex functions. Holomorphic functions		2 hours
7. Complex functions. Curvilinear integral in the complex plane		2 hours
8. Complex functions. Sequences and series of functions. The residue theorem and its applications		2 hours

9. Fourier series. Fourier series development for a periodic function with period 2π	practical applications	2 hours
10. Fourier series development for a periodic function with period T		2 hours
11. Complex form of Fourier series decomposition		2 hours
12. Laplace transform		2 hours
13. Inverse Laplace transform		2 hours
14. Applications of the Laplace transform		2 hours

Bibliography
1. Kecs, W. – Produsul de convoluție și aplicații, Editura Academiei, 1978
2. Șabac, I. G – Matematici speciale, vol. 2, EDP, 1965
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6. Minda A.A, Note de curs

8.2.3. Project	Teaching methods	Observation

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. Weight from the final grade
10.4. Course	Debates participation	Continuous evaluation according to number of interventions and quality of response	10%
	Acquired knowledge level	Exam (on paper)	60 %
10.5.1. Seminary	Activity / implication	Continuous evaluation according to number of interventions and quality of response	30%
	Gained competence level	Continuous evaluation Summative evaluation	
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			
• Completion of Applicative Seminar Activities			

Completion Date	Course Coordinator's Signature	Seminar Coordinator's Signature
1.05.22	Lect.univ.dr. Andrea Amalia Minda	Lect.univ.dr. Andrea Amalia Minda

Department Endorsement Date

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Chief of Department Signature
Ş.l.dr.fiz. Cornel Haţiegan