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	**Electrical Engineering**
1.5. Course of Study	**Bachelor**
1.6. Study Programme	**Electromechanics**

2. Discipline Data

2.1. Discipline Name	Mathematical Analysis						
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	Lect.univ.dr. Andrea Amalia Minda						
2.3.3. Project Coordinator							
2.4. Year of Study	I	2.5. Semester	I	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	**6**	from which: 3.2. Course	**3**	3.3. laboratory & project	**2/1**
3.4. Total Hours from the Curriculum Plan	**84**	from which: 3.5. Course	**42**	3.6. laboratory & project	**28+14**
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					**24**
Mentoring					
Examination					**2**
Other Activities					

3.7. Total Time of Individual Study	**66**
3.8. Total Hours per Semester	**150**
3.9. Number of Credits	**6**

4. Pre-condition (where is the case)

4.1. of Curriculum	Mathematical analysis from high school
4.2. of Competences	• Basic notions of mathematical analysis, real functions of a real variable

5. Condition (where is the case)

5.1. of Course Progress	Video projector, PC, whiteboard, chalk, MS Teams
5.2.1. of Seminary Progress	•
5.2.2. of Laboratory Progress	MS Office, GEOGEBRA
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 electrical engineering (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 to transmit and acquire knowledge of mathematical analysis, create a solid knowledge base of mathematics and the ability to use this knowledge to interpret, describe and solve engineering problems. The fundamental objectives of the Mathematical Analysis discipline are the acquisition by students of the elements of differential calculus and integral calculus, as well as the improvement of students' mathematical knowledge useful for effective calculations in subsequent years of study and at work.
7.2. Specific Objectives	• mastering mathematical methods that have applications in engineering, physics, mechanics,machine parts, mechanisms, materials strength, computer science, numerical methods, materials study and technology. • explaining and interpreting some processes, as well as the theoretical contents and practices of the discipline. • use of methods, techniques and tools of mathematical calculation and application; • acquiring the basic knowledge of higher mathematics, necessary for understanding • mathematical mechanisms applied in the other disciplines that use it; • the development of students' logical thinking, the formation of skills to use rigorous reasoning.

8. Content

8.1. Course	Teaching methods	Observation
1. Sequences of real numbers. Convergence. Numerical series with arbitrary terms.	exposition, problematization, heuristic conversation, explanation	3 hours
2. Numerical series with pozitive terms. Alternate series. Absolute convergent series.		3 hours
3. Limits, continuity and derivability for functions with one variable. Higher order derivatives and differentials. Properties of derivable functions		3 hours
4. The space R^n . Convergence of sequences in R^n . Scalar and vector functions of several variables. Limits and continuity for functions of several variables. Partial derivatives		3 hours
5. Differentiability of scalar and vector functions of several variables. Differential of order I. Partial derivatives of order I for composed functions		3 hours
6. High order differentials. Taylor formula for functions with several variables. Some notions in fields theory: directional derivative, gradient, divergence, curl		3 hours
7. Local extreme points for functions with several variables. Implicit functions.		3 hours
8. Definite integral.		3 hours
9. Applications in Geometry and Mechanics. Improper (generalized) integrals		3 hours
10. Line integral of the first type. Computation. The length of a curve. Line integral of the second type. Computation		3 hours
11. Path dependence and independence . Applications of line integral in Geometry and Mechanics		3 hours
12. Double integrals. Change of variables in a double integral		3 hours
13. Applications of double integral in Geometry and Mechanics.		3 hours
14. Triple integrals. Computation. Change of variables in a triple integral. Applications in Geometry and Mechanics		3 hours

Bibliography
1. B. Demidovich, Problems in Mathematical Analysis, Mir Publishers, Moscow, 1989.
2. S. Lang, Calculus of several variables, Springer Verlag, 1996.
3. S. M. Nikolsky, A course of Mathematical Analysis, Mir Publishers, Moskow, 1981.
4. G. Păltineanu, Mathematical analysis. Integral Calculus (Romanian), Editura AGIR, Bucharest, 2003.
5. *** Problems in Mathematical Analysis (Romanian), Mathematics Department, TUCIB, Matrix Rom, Bucharest, 2002.
6. E. Cinlar, R. J. Vanderbei, Mathematical Methods of Engineering Analysis, www.princeton.edu/~rvdb/506book/book.pdf , 2000.
7. G. Weinstein, Advanced Calculus, 1996-1997, www.math.uab.edu/weinstei/notes/ac.pdf

8.2.1. Seminary	Teaching methods	Observation
1. Sequences of real numbers applications		2 hours
2. Numerical series with pozitive terms and alternate series applications		2 hours

3. Limits, continuity and derivability for functions	problem solving and discovery, solving exercises, linking theoretical knowledge to practical applications	2 hours
4. Limits and continuity for functions of several variables. Partial derivatives		2 hours
5. Differentiability of scalar and vector functions of several variables. Differential of order I. Partial derivatives of order I for composed functions		2 hours
6. High order differentials. Taylor formula for functions with several variables. Some notions in fields theory		2 hours
7. Local extreme points for functions with several variables. Implicit functions.		2 hours
8. Defined integral, integration methods. Applications of integrals in geometry and mechanics		2 hours
9. Improper (generalized) integrals		2 hours
10. Line integral		2 hours
11. Applications of line integral in Geometry and Mechanics		2 hours
12. Double integrals		2 hours
13. Applications of double integral in Geometry and Mechanics.		2 hours
14. Triple integrals		2 hours
8.2.2. Laboratory	Teaching methods	Observation
1. MS EXCEL	problematization and discovery, problem solving, linking theoretical knowledge to practical applications	2 hours
2. Determining the sums of a series of numbers		2 hours
3. Function charts. Geometric interpretation of the derivative. Series of functions		2 hours
4. GEOGEBRA. Graphs of two or three variable functions		2 hours
5. Calculation of integrals. Applications of integrals. Curves in plan and curves in space		2 hours
6 Applications of double integrals		2 hours
7. Applications of triple integrals		2 hours
Bibliography		
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	Number of interventions	5%
	Acquired knowledge level	Exam (on paper)	50 %
10.5.1. Seminary	Activity / implication		30%
	Gained competence level		
10.5.2. Laboratory	Activity / implication		15 %
	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 Activities (laboratory work accomplishment and seminary by the minimum grade of 5).			

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

Department Endorsement Date	Chief of Department Signature

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