SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babes-Bolyai University, Cluj-Napoca
1.2 Faculty	Mathematics and Computer Science
1.3 Department	Department of Mathematics
1.4 Field of study	Mathematics and Computer Science
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Mathematics and Computer Science

2. Information regarding the discipline

2.1 Name of the discipline	Complements of Mathematical Analysis				
2.2 Course coordinator	Lect. dr. Berinde Stefan				
2.3 Seminar coordinator	Lect. dr. Berinde Stefan				
2.4. Year of study 2	2.5 Semester	4	2.6. Type of evaluation VP	2.7 Type of discipline	Op.

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week		4	Of which: 3.2 course	2	3.3 seminar/laboratory	2
3.4 Total hours in the curriculum		56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:						hours
Learning using manual, course support, bibliography, course notes						36
Additional documentation (in libraries, on electronic platforms, field documentation)						13
Preparation for seminars/labs, homework, papers, portfolios and essays						30
Tutorship						10
Evaluations						30
Other activities:						
3.7 Total individual study hours	119					
3.8 Total hours per semester	175					
3.9 Number of ECTS credits	7					

4. Prerequisites (if necessary)

4.1. curriculum	• Mathematical Analysis I
4.2. competencies	• Understanding calculus on the real axis

5. Conditions (if necessary)

5.1. for the course	• Class room with blackboard
5.2. for the seminar /lab activities	• Class room with blackboard

6. Specific competencies acquired

Professional competencies	• C1.5 Elaborarea unor proiecte si lucrari de prezentare a unor rezultate si metode matematice. • C5.4 Evaluarea comparativa si utilizarea eficienta a diferitelor metode de demonstratie

Transversal competencies	• CT2. Desfasurarea eficienta si eficace a activitatilor organizate in echipa

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• Complementary results from the field of classical analysis on the real axis
7.2 Specific objective of the discipline	• a short history of mathematical analysis • reccurent sequences and their connection with continued fractions and generating functions • computation techniques based on operations with power series • study of some remarcable series and their connection with Riemann zeta function • study of some remarcable improper integrals: Euler's Gamma and Beta functions • A short introduction to calculus of variations

8. Content

8.1 Course	Teaching methods	Remarks
1. A short history of mathematical analysis	interactive exposure, explanation, didactical demonstration	
2. Decimal and continued fractions	interactive exposure, explanation, didactical demonstration	
3. Recurrent sequences	interactive exposure, explanation, didactical demonstration	
4. Remarcable numbers as limits of sequences	interactive exposure, explanation, didactical demonstration	
5. Arithmetic-geometric mean. Gauss formula	interactive exposure, explanation, didactical demonstration	
6. Toeplitz theorem and applications	interactive exposure, explanation, didactical demonstration	
7. Stirling formula	interactive exposure, explanation, didactical demonstration	
8. Infinite products	interactive exposure, explanation, didactical demonstration	
9. Operations with power series	interactive exposure, explanation, didactical demonstration	
10. Euler sum and Bernoulli numbers	interactive exposure, explanation, didactical demonstration	
11. Riemann zeta function	interactive exposure, explanation, didactical demonstration	
12. Euler's Gamma and Beta functions	interactive exposure, explanation, didactical demonstration	
13. Proper integrals with parameter	interactive exposure, explanation,	

	didactical demonstration	
14. Introduction to calculus of variations	interactive exposure, explanation, didactical demonstration	

Bibliography
1. Cobzas S.: Analiza matematica (Calcul diferential), Presa Universitara Clujeana, 1997
2. Gelbaum B.R., Olmsted J.M.H.: Contraexample in analiza, Ed. Stiintifica, Bucuresti, 1973
3. Kaczor W.J., Nowak M.T.: Problems in Mathematical Analysis, vol. I and II, AMS, 2001
4. Megan M.: Bazele Analizei matematice, vol. 1,2,3, Editura Eurobit, 1997, 1997, 1998
5. Siretchi, Gh.: Calcul diferential si integral, vol. I si II, Editura Stiintifica si Enciclopedica, Bucuresti, 1985
6. Wilf H.S.: generatingfunctionology, A.K. Peters Ltd., Massachusetts, 2006
7. Zorich V.A.: Mathematical Analysis I, Springer, Berlin, 2004

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Classic inequalities	project exposure by student team	
2. Decimal and continued fractions	project exposure by student team	
3. Recurrent sequences	project exposure by student team	
4. Remarcable numbers as limits of sequences	project exposure by student team	
5. Arithmetic-geometric mean. Gauss formula	project exposure by student team	
6. Toeplitz theorem and applications	project exposure by student team	
7. Stirling formula	project exposure by student team	
8. Infinite products	project exposure by student team	
9. Operations with power series	project exposure by student team	
10. Euler sum and Bernoulli numbers	project exposure by student team	
11. Riemann zeta function	project exposure by student team	
12. Euler's Gamma and Beta functions	project exposure by student team	
13. Proper integrals with parameter	project exposure by student team	
14. Introduction to calculus of variations	project exposure by student team	

Bibliography
1. Cobzas S.: Analiza matematica (Calcul diferential), Presa Universitara Clujeana, 1997
2. Duren P.: Invitation to Classical Analysis, AMS, 2012
3. Kaczor W.J., Nowak M.T.: Problems in Mathematical Analysis, vol. I si II, AMS, 2001
4. Siretchi, Gh.: Calcul diferential si integral, vol. I si II, Editura Stiintifica si Enciclopedica, Bucuresti, 1985
5. ***: Pagina cursului Complemente de analiza matematica (notite de curs ale titularului),
http://math.ubbcluj.ro/~sberinde/comp/

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

- This lecture is useful for teacher and research candidates in mathematics, enriching their knowledge in classical mathematical aanalysis. More specifically, we address new methods and results which might be useful later for a master degree preparation in mathematics or a related field.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of basic concepts and results,	Written exam	50

	problem solving		
10.5 Seminar/lab activities	Individual project evaluation	Continous observation, dialogue	50
10.6 Minimum performance standards			
➢ Grade 5			

Date

8 april 2018

Signature of course coordinator

lect.dr. Berinde Stefan

Signature of seminar coordinator

lect.dr. Berinde Stefan

Date of approval

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Signature of the head of department

prof.dr. Octavian Agratini