SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	**Babeş-Bolyai University**
1.2 Faculty	**Faculty of Mathematics and Computer Science**
1.3 Department	**Department of Mathematics**
1.4 Field of study	**Matematics**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**Master of Advanced Mathematics**

2. Information regarding the discipline

2.1 Name of the discipline	Wavelet Analysis						
2.2 Course coordinator	Professor Agratini Octavian, PhD						
2.3 Seminar coordinator	Professor Agratini Octavian, PhD						
2.4. Year of study	2	2.5 Semester	4	2.6. Type of evaluation	E	2.7 Type of discipline	DS / optional

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar	14

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	40
Additional documentation (in libraries, on electronic platforms, field documentation)	44
Preparation for seminars/labs, homework, papers, portfolios and essays	50
Tutorship	10
Evaluations	14
Other activities:	--

3.7 Total individual study hours	152
3.8 Total hours per semester	42
3.9 Number of ECTS credits	8

4. Prerequisites (if necessary)

4.1 curriculum	Mathematical Analysis Special Topics in Numerical Analysis
4.2 competencies	Comparative assessment and efficient use of various methods of demonstration

5. Conditions (if necessary)

5.1 For the course	• ---
5.2 For the seminar	• ---

6. Specific competencies acquired

Professional competencies	• The ability to understand and manipulate concepts, results and theories advanced in Mathematics • Ability to use the knowledge gained and complementary in achieving a PhD in Mathematics
Transversal competencies	• Ability to self-improvement and to train continuously

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

7.1 General objective of the discipline	• Assimilation of the modern technique of approximation of functions by using Wavelet Analysis.
7.2 Specific objective of the discipline	• Uses knowledge of Fourier transform. • Presents major developments in wavelets, Gabor transform, multiresolution analysis. • Offers detailed of every concept and method, accompanied by carefully selected worked examples.

8. Content

8.1 Course	Teaching methods	Remarks
1. Wavelets: a positional notation for functions	Interactive exposure: explanation, conversation	
2. Algebra and geometry of wavelet matrices	Interactive exposure: explanation, conversation	
3. One-dimensional wavelet systems	Interactive exposure: explanation, conversation	
4. Vanishing moments of wavelet bases	Interactive exposure: explanation, conversation	
5. Continuous wavelet transforms	Interactive exposure: explanation, conversation	
6. The discrete wavelet transforms	Interactive exposure: explanation, conversation	
7. Multiresolution analysis	Interactive exposure: explanation, conversation	
8. Sampling, reconstruction and approximation	Interactive exposure: explanation, conversation	
9. Construction of orthonormal wavelets	Interactive exposure:	

	explanation, conversation	
10. Image compression	Interactive exposure: explanation, conversation	
11. Wavelet image compression	Interactive exposure: explanation, conversation	
12. Harmonic wavelets	Interactive exposure: explanation, conversation	
13. Wavelet expansion and Parseval's formula	Interactive exposure: explanation, conversation	
14. Wavelet transform analysis of turbulence	Interactive exposure: explanation, conversation	
Bibliography [1] Agratini, O., Blaga, P., Coman, Gh., *Lectures on Wavelets, Numerical Methods and Statistics*, Casa Cărții de Știință, Cluj-Napoca, 2005. [2] Lokenath Debnath, *Wavelet Transforms & Their Applications*, Birkhauser, Boston, 2002. [3] Resnikoff, H. L., Wells, R. O. Jr.,*Wavelet Analysis*, Springer, New York, 1998.		
8.2 Seminar	Teaching methods	Remarks
1-2 Wavelet phase space	Exercise, dialogue, individual study	
3-4 The scaling equations - examples	Exercise, dialogue, individual study	
5-6 Polynomial-regular and smooth wavelets	Exercise, dialogue, individual study	
7-8 Quiz and exercises	Exercise, dialogue, individual study	
9-10 Zak transform	Exercise, dialogue, individual study	
11-12 Ambiguity functions	Exercise, dialogue, individual study	
13-14 Mallat's pyramid algorithm	Exercise, dialogue, individual study	
Bibliography [1] Lokenath Debnath, *Wavelet Transforms & Their Applications*, Birkhauser, Boston, 2002. [2] Truchetet, F., *Ondelettes pour le signal numerique*, Ed. Hermes, 1998.		

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 program covers the necessary basic knowledge in this area
- Software companies consider important in that it provides a solid theoretical foundation in skills development programmer.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Knowledge of the fundamental elements of the studied field	Written exam	65%
10.5 Seminar	Solving problems	Quiz Continuous observations	25% 10%

10.6 Minimum performance standards

- At least grade 5 (from a scale of 1 to 10) at written exam

Date	Signature of course coordinator	Signature of seminar coordinator
April 10th, 2017	Octavian Agratini	Octavian Agratini

Date of approval	Signature of the head of department
April25th, 2017	Octavian Agratini