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 Computer Science**
1.4 Field of study	**Computer Science**
1.5 Study cycle	**Master**
1.6 Study programme / Qualification	**High Performance Computing and Big Data Analytics**

2. Information regarding the discipline

2.1 Name of the discipline	**Unconventional Computing in Solving Real-World Problems**						
2.2 Course coordinator	**Oltean Mihai**						
2.3 Seminar coordinator	**Oltean Mihai**						
2.4. Year of study	**4**	2.5 Semester	**2**	2.6. Type of evaluation	**O**	2.7 Type of discipline	**Compulsory**

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					18
Additional documentation (in libraries, on electronic platforms, field documentation)					8
Preparation for seminars/labs, homework, papers, portfolios and essays					14
Tutorship					2
Evaluations					2
Other activities:					

3.7 Total individual study hours	44
3.8 Total hours per semester	86
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	•
4.2. competencies	•

5. Conditions (if necessary)

5.1. for the course	•
5.2. for the seminar /lab activities	• Lab with specific equipment

6. Specific competencies acquired

Professional competencies	
Transversal competencies	Ability to extract computing ideas from the biological, physical and chemical processes.

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

7.1 General objective of the discipline	The course deals with the following notions and ideas: Unconvetional Computing, DNA Computing, Quantum Computing, Cellular Automata, Membrane Computing, Light-based computing, Unconventional sorting, NP-Complete problems. Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the subject, that (s)he is capable of stating these knowledge in a coherent form, that (s)he has the ability to establish certain connections and to use the knowledge in solving different problems.
7.2 Specific objective of the discipline	•

8. Content

8.1 Course	Teaching methods	Remarks
1. Administrivia; Introduction; Resources	Exposure: description, explanation, examples, discussion of case studies	
2. Unconventional Computing (UC): basic ideas	Exposure: description, explanation, examples, discussion of case studies	
3. Current achievements of UC	Exposure: description, explanation, examples, discussion of case studies	
4. DNA computing	Exposure: description, explanation, examples, discussion of case studies	
5. Optical computing	Exposure: description, explanation, examples, discussion of case studies	
6. Optical computing	Exposure: description, explanation, examples, discussion of case studies	
7. Mechanical computing	Exposure: description, explanation, examples, discussion of case studies	
8. Unconventional Sorting	Exposure: description, explanation, examples, discussion of case studies	
9. Quantum computing	Exposure: description, explanation, examples, discussion of case studies	
10. Quantum computing	Exposure: description, explanation,	

	examples, discussion of case studies	
11. Quantum computing	Exposure: description, explanation, examples, discussion of case studies	
12. Membrane computing	Exposure: description, explanation, examples, discussion of case studies	
13. FPGA	Exposure: description, explanation, examples, discussion of case studies	
14. Presentation of projects	Discussions	

Bibliography

[1]. International Journal of Unconventional Computing http://www.oldcitypublishing.com/IJUC/IJUC.html
[2]. Journal of Natural Computing, Springer.
[3]. Andrew Adamatzky, Christof Teuscher, From Utopian to Genuine Unconventional Computers, Luniver Press, 2006
[4]. Penrose, Roger: The Emperor@s New Mind. Oxford University Press
[5]. Gheorge Paun, Grzegorz Rozenberg, Arto Salomaa, DNA Computing - New Computing Paradigms. Springer-Verlag, 1998
[6]. Leonard M. Adleman (1994-11-11). Molecular Computation Of Solutions To Combinatorial Problems. Science (journal) 266 (11): 1021–1024.
[7]. L. Kuhnert, K. I. Agladze, V. I. Krinsky. Image processing using light-sensitive chemical waves. Nature 337: 244 – 247, 1989
[8]. G. Paun, C. Calude, Computing with Cells and Atoms, Taylor and Francis, London, 2000
[9]. Membrane Computing. An Introduction, Springer-Verlag, Berlin, 2002
[10]. G. Paun C.S. Calude, M.J. Dinneen, G. Rozenberg, S. Stepney Proceedings of Unconventional Computation, LNCS 4035, Springer-Verlag, Berlin, 2006

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Open discussion	discussion	
2. Bubble soap technique	Discussion	
3. Remy arithmetic	Discussion	
4. Xerox based computations	Discussion	
5. Mechanical arithmetic	Discussion	
6. Analog computations	Discussion	
7. Other techniques	Discussion	

Bibliography

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

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10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Based on a project implemented during semester	oral	100%
10.5 Seminar/lab activities			
10.6 Minimum performance standards			
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Date Signature of course coordinator Signature of seminar coordinator

....Oltean Mihai.... .....Oltean Mihai.....

Date of approval Signature of the head of department

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