SYLLABUS

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline			Mathematical Software			
2.2 Course coordinator			Assoc. Professor Radu Trîmbiţaş, Ph. D.			
2.3 Seminar coordinator			Assoc. Professor Radu Trîmbiţaş, Ph. D.			
2.4. Year of study	**3**	2.5 Semester	**5**	2.6. Type of evaluation	**Exam**	2.7 Type of discipline	Optional, package 3

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	0/2
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	0/28

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	20
Additional documentation (in libraries, on electronic platforms, field documentation)	20
Preparation for seminars/labs, homework, papers, portfolios and essays	30
Tutorship	14
Evaluations	8
Other activities:	2

3.7 Total individual study hours	94
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	• Programming backgrounds
4.2. competencies	• Programming skills

5. Conditions (if necessary)

5.1. for the course	• Videoprojector (offline), MSTeams or Zoom (online)
5.2. for the seminar /lab activities	• Computer Network, Mathematical Software (Maple, MATLAB)

6. Specific competencies acquired

Professional competencies	• C3.1. Identification of basic notions required for algorithms design and specification • C3.3 Applying peculiar methods and techniques for algorithms design
Transversal competencies	CT3. Usage of efficient methods and techniques for inventing, information, research and capacity of knowledge development, adaptation to a dynamic society and communication (in English and Romanian) requirements

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

7.1 General objective of the discipline	• Introduction to mathematical software and mathematical programs usage • Introduction to Computer Algebra and Numerical software backgrounds
7.2 Specific objective of the discipline	• Solution of routine mathematical problems by computer • Mathematical software-aided teaching

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction to Mathematical Software. Introduction to Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
2. Differential and Integral Calculus in Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
3. Functions, procedures and programming in Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	

4. Maple Graphics	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
5. Data Structures in Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
6. Equations in Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
7. Linear Algebra in Maple	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
8. Introduction to MATLAB	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
9. Matrices in MATLAB	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
10. Programming in MATLAB	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
11. MATLAB Graphics	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
12. Mathematics in MATLAB	Lecture, lecture with demonstrations, computer demonstrations,	

	Teaching methods	Remarks
	problematization, individual study, mathematical software	
13. Mathematics in MATLAB	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	
14. Examples	Lecture, lecture with demonstrations, computer demonstrations, problematization, individual study, mathematical software	

Bibliography
The Mathworks – MATLAB set of manuals
Cleve Moler - Numerical Computing in MATLAB, SIAM, 2005
D. J. Higham, N. J. Higham, MATLAB Guide, 2nd edition, SIAM, 2005
Radu Trimbitas – Numerical Analysis in MATLAB, Cluj University Press, 2009
P. Marchand, O. T. Holand - Graphics and GUI with MATLAB, 3rd edition, Barnes and Noble, 2003
Robert M. Corless - Essential Maple 7, Springer 2002
A. Heck - Introduction to Maple, 3rd edition, Springer, 2003
V. Anisiu - Calcul simbolic cu Maple. Presa Universitara Clujeana, 2006
T.A. Driscoll - Learning MATLAB, SIAM 2009
Ian Thompson – Understanding Maple, Cambridge University Press, 2017
W. Fox, W. Bauldry - Advanced Problem Solving with Maple™ A First Course, CRC Press, 2020

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Introduction to Maple	Computer demonstrations, individual study, mathematical software	
2. Assignments in Maple, unassignment	Computer demonstrations, individual study, mathematical software	
3. Maple: Applications to expression representation and simplification; assume	Computer demonstrations, individual study, mathematical software	
4. Maple: Aplications to differentiation and integration. Computing sums and limits	Computer demonstrations, individual study, mathematical software	
5. Maple: statements, functions, procedures	Computer demonstrations, individual study, mathematical software	
6. Maple: 2D and 3D graphics. Special graphs, animation.	Computer demonstrations, individual study, mathematical software	

7. Maple: Equations. Recurrences. Linear Algebra.	Computer demonstrations, individual study, mathematical software	
8. Introduction to MATLAB	Computer demonstrations, individual study, mathematical software	
9. Matrices in MATLAB – generation, indexing, matrix and vector operations	Computer demonstrations, individual study, mathematical software	
10. Control flow, M files, data types and advanced data structures	Computer demonstrations, individual study, mathematical software	
11. MATLAB Graphics: 2D and 3D graphs (carthesian and in other type of coordinates).	Computer demonstrations, individual study, mathematical software	
12. MATLAB Graphics: special graphs, animation, volume visualization, GUIs	Computer demonstrations, individual study, mathematical software	
13. Approximation, least-squares, interpolation, systems, eigenvalues and eigenvectors.	Computer demonstrations, individual study, mathematical software	
14. Differential equations in MATLAB	Computer demonstrations, individual study, mathematical software	

Bibliography
Radu Trimbitas – Numerical Analysis in MATLAB, Presa Universitara Clujeana 2009
A. Heck - Introduction to Maple, 3rd edition, Springer, 2003
V. Anisiu: Calcul simbolic cu Maple. Presa Universitara Clujeana, 2006
Driscoll T.A. Learning MATLAB, SIAM 2009
W. Fox, W. Bauldry - Advanced Problem Solving with Maple™ A First Course, CRC Press, 2020

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 course appears in relevant universities from Rumania and abroad curricula
- The practical importance of mathematical software
- Usage of mathematical software in teaching and research
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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	Skills for the solution of mathematical problems in Maple and MATLAB	Practical test	80%
10.5 Seminar/lab activities	Solution of mandatory problems, lab activity		20%
10.6 Minimum performance standards at least 5 mark, both for practical test and lab activity			
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Date   Signature of course coordinator   Signature of seminar coordinator

23 May 2023   ....

Date of approval   Signature of the head of department

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