SYLLABUS

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Applications of Geometry to Computer Science /** Aplicatii ale geometriei in informatica				
2.2 Course coordinator			**Assoc. Prof. Blaga Aurel Paul**				
2.3 Seminar coordinator			**Assoc. Prof. Blaga Aurel Paul**				
2.4. Year of study	**2**	2.5 Semester	**3**	2.6. Type of evaluation	**VP**	2.7 Type of discipline	**DS**
2.8 Code of the discipline		MLE0044					

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

3.1 Hours per week	4	Of which: 3.2 course		3.3 seminar/laboratory	0+1+1
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					15
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					10
Evaluations					4
Other activities:					0

3.7 Total individual study hours	69
3.8 Total hours per semester	125
3.9 Number of ECTS credits	5

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	•

6. Specific competencies acquired

Professional competencies	C3.1 The description of concepts, theories and models that are used in the application field. C4.3 The identification of appropriate models and methods used for the solution of real life problems.
Transversal competencies	CT1 Applying the organized and efficient work rules, responsible attitudes towards the didactic-scientific field, for the creative valorisation of their own potential, observing the principles and norms of professional ethics

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

7.1 General objective of the discipline	Learning to understand the principles and methods of CAGD
7.2 Specific objective of the discipline	To understand and be able to use -the basic notions and results of differential geometry -the Bezier curves and surfaces -the B-spline curves and surfaces

8. Content

8.1 Course	Teaching methods	Remarks
1. Plane curves (parameterization, curvature, the Frenet frame)	Lecture, description, exemplification and questioning	
2. Space curves (parameterization, curvature, the Frenet frame)	Lecture, description, exemplification and questioning	
3. Parameterized surfaces	Lecture, description, exemplification and questioning	
4. The curvature of surfaces	Lecture, description, exemplification and questioning	
5. Geometric transformations of curve	Lecture, description, exemplification and questioning	
6. Geometric transformations of surfaces	Lecture, description, exemplification and questioning	

7. Polynomial curves 1 (Bezier)	Lecture, description, exemplification and questioning	
8. Polynomial curves 2 (B-spline)	Lecture, description, exemplification and questioning	
9. Polynomial surfaces 1 (Bezier tensor product surfaces)	Lecture, description, exemplification and questioning	
10. Polynomial surfaces 2 (B-spline tensor product surfaces)	Lecture, description, exemplification and questioning	
11. Polynomial surfaces 3 (triangular Bezier surfaces)	Lecture, description, exemplification and questioning	
12. Bezier rational curves	Lecture, description, exemplification and questioning	
13 B-spline rational curves	Lecture, description, exemplification and questioning	
14. Bezier rational surfaces	Lecture, description, exemplification and questioning	

Bibliography

1. Agoston, M.K.: Computer Graphics and Geometry: Mathematics, Springer, 2004
2. Argeri, M., Calio, F., Lazzari, A., Sesana, D.: Geometria vettoriale per la grafica, CittaStudi Edizioni, Milano, 2011
3. Beach, R.: An Introduction to the Curves and Surfaces of Computer-Aided Design, Van Nostrand Reinhold, 1991
4. Davies, A., Samuels, P.: An Introduction to Computational Geometry for Curves and surfaces, Clarendon Press, 1996
5. Farin, G.: Curves and Surfaces for CAGD, 5th edition, Academic Press, 2001
6. Faux, I.D., Pratt, M.J.: Computational Geometry for Design and Manufacture, Ellis Horwood, 1979
7. Marsh, D.: Applied Geometry for Computer Graphics and CAD, 2nd edition, Springer, 2004
8. Rogers, D.: An Introduction to NURBS, Academic Press, 2001
9. Rogers, D.F., Adams, J.A.: Mathematical Elements for Computer Graphics, 2nd edition, McGraw Hill, 1990

8.2 Seminar / laboratory	Teaching methods	Remarks
1. The reprezentation of plane curves	Description, explanation, conversation, individual study and / or teamwork	
2. The reprezentation of space curves	Description, explanation, conversation,	

	individual study and / or teamwork	
3. The reprezentation of parameterized surfaces	Description, explanation, conversation, individual study and / or teamwork	
4. The computation of the curvature of surfaces	Description, explanation, conversation, individual study and / or teamwork	
5. Geometrical transformations of curves	Description, explanation, conversation, individual study and / or teamwork	
6. Geometrical transformations of surfaces	Description, explanation, conversation, individual study and / or teamwork	
7. Computations with Bezier curves. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
8. Computations with B-spline curves. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
9. Computations with tensor product Bezier surfaces. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
10. Computations with tensor product B-spline surfaces. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
11. Computations with triangular Bezier surfaces. The graphical reprezentation	Description, explanation, conversation, individual study and /	

	or teamwork	
12. Computations with rational Bezier curves. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
13. Computations with rational B-spline curves. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	
14. Computations with rational Bezier surfaces. The graphical reprezentation	Description, explanation, conversation, individual study and / or teamwork	

Bibliography

1. Agoston, M.K.: Computer Graphics and Geometry: Mathematics, Springer, 2004
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6. Faux, I.D., Pratt, M.J.: Computational Geometry for Design and Manufacture, Ellis Horwood, 1979
7. Marsh, D.: Applied Geometry for Computer Graphics and CAD, 2nd edition, Springer, 2004
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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

Accumulated notions can be applied in computer graphics and CAGD.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the

			grade (%)
10.4 Course		Two tests	75%
10.5 Seminar/lab activities		Active participation in didactic activities and solving the homeworks received.	25%
10.6 Minimum performance standards			
In order to take the exam students must accumulate at the end of the semester at least 5 points for activity during the year.			

Date Signature of course coordinator Signature of seminar coordinator

.April 30, 2019.....Assoc. Prof. Paul Blaga.. .....
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Date of approval Signature of the head of department

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