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) / Mathematician

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Complements of geometry / Complemente de geometrie**				
2.2 Course coordinator			**Lect. dr. George Țurcaș**				
2.3 Seminar coordinator			**Lect. dr. George Țurcaș**				
2.4. Year of study	**II**	2.5 Semester	**4**	2.6. Type of evaluation	**VP**	2.7 Type of discipline	**DS**
2.8 Code of the discipline		MLE0041					

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	20
Additional documentation (in libraries, on electronic platforms, field documentation)	20
Preparation for seminars/labs, homework, papers, portfolios and essays	20
Tutorials	14
Evaluations	10
Other activities: homework	10

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	• None necessary
4.2. competencies	•

5. Conditions (if necessary)

5.1. for the course	•
5.2. for the seminar	• Attendance to at least 75% of the seminars.

6. Specific competencies acquired

Professional competencies	• The ability to identify concepts, theories and use of specific description language • The ability to produce a mathematical model for a certain problem. • Developing independent learning skills and teamwork for realising projects and solving complex problems.
Transversal competencies	• Applying rigorous and efficient work rules, displaying a responsible attitude towards the scientific and educational and creative order to maximize their potential in specific situations with respect to the basic principles and norms of professional ethics

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

7.1 General objective of the discipline	• Acquiring theoretical and practical knowledge necessary for understanding the principles and methods of plane geometry. • Developing creative thinking and spatial orientation. • Developing teaching skills.
7.2 Specific objective of the discipline	At the end of the course, the students should be able to • Correctly identify planar geometric figures and the connections between them. • Combine several results and theorems such as Menelaus' or Cevas' to prove different results. • Use geometric transformations such as homothethy and inversion to solve problems in geometry.

8. Content

8.1 Course	Teaching methods	Remarks
1. Menelaus' theorem and applications (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
2. Ceva's theorem and applications (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
3. Metric problems in the triangle. Cosine theorem, Stewarts' theorem (2 lectures)	Lecture, description, exemplifications by using multimedia tools	
4. Angle chasing. Cyclic quadrilaterals (2 lecture)	Lecture, description, exemplifications by using multimedia tools	
5. The power of a point with respect to a circle (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
6. The radical axis of two circles (1 lecture)	Lecture, description, exemplifications by	

	using multimedia tools	
7. Curves and their parameterisations (2 lectures)	Lecture, description, exemplifications by using multimedia tools	
8. Differential geometry of curves (2 lectures)	Lecture, description, exemplifications by using multimedia tools	
9. Surfaces as level sets (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
10. Applications of parametric curves and surfaces (1 lecture)	Lecture, description, exemplifications by using multimedia tools	

Bibliography

1. D. Andrica – Geometrie. Teme pentru perfectionarea profesorilor de matematică, Casa cărții de știință, Cluj-Napoca, 2017
2. D. Andrica, Cs. Varga, D. Văcărețu, Teme și probleme alese de geometrie, Ed. Plus, București, 2002.
3. T. Andreescu, M. Rolinek, J. Tkadlec, 106 Problems from the AwesomeMath Summer Program, XYZ Press, 2013.
4. T. Andreescu, M. Rolinek, J. Tkadlec, 107 Problems from the AwesomeMath Summer Program, XYZ Press, 2014.
5. M. Berger - Geometry (vol. I and II), Springer, 1987
6. P.A. Blaga – Geometrie si grafica I (lecture notes available on the author website)
7. C. Mihailescu – The Geometry of Remarkable Elements: Points, Lines and Circles, XYZ Press 2016.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Problems using Menelaus Theorem (1 seminar)	Description, explanation, independent and/or team study	
2. Problems using Ceva's theorem (1 seminar)	Description, explanation, independent and/or team study	
3. Applications of cosine theorem, Stewarts' theorem and various problems involving metric computations in a triangle (2 seminars)	Description, explanation, independent and/or team study	
4. Problems with angle chasing and cyclic quadrilaterals (2 seminars)	Description, explanation, independent and/or team study	
5. Problems using the power of a and the concept of radical axis (2 seminars)	Description, explanation,	

	independent and/or team study	
6. Problems with parameteric curves (2 seminars)	Description, explanation, independent and/or team study	
7. Problems involving differential geometry of curves (2 seminars)	Description, explanation, independent and/or team study	
8. Problems with level sets of 3-variable functions (1 seminar)	Description, explanation, independent and/or team study	
9. Evaluation – test in the last seminar	Description, explanation, independent and/or team study	

Bibliography

1. D. Andrica – Geometrie. Teme pentru perfectionarea profesorilor de matematică, Casa cărții de știință, Cluj-Napoca, 2017
2. D. Andrica, Cs. Varga, D. Văcărețu, Teme și probleme alese de geometrie, Ed. Plus, București, 2002.
3. T. Andreescu, M. Rolinek, J. Tkadlec, 106 Problems from the AwesomeMath Summer Program, XYZ Press, 2013.
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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

- The notions assimilated are essential for any prospective mathematician or math teacher. Moreover, these competencies are very useful in activities related to computer graphics, computer aided geometric design or machine learning.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Critical grasp of the learned material, ability to use what was learned	Test in week 6	20%
	Critical grasp of the learned material, ability to use what was learned	Test in the last week of the semester	60%

10.5 Seminar/lab activities	Active participation at the seminars, ability to use the methods learned	Discussions in the seminars	
		Activity and homework	20%
10.6 Minimum performance standards			
➢ The student should attend at least 75% of the seminaries. ➢ The grade of the written test at the end of the semester should be at least 5 and the weighted average of all grades should be at least 5.			

Date	Signature of course coordinator	Signature of seminar coordinator
April 26, 2023	Lect. dr. George Țurcaș	Lect. dr. George Țurcaș

Date of approval	Signature of the head of department
April 26, 20223	Prof. dr. Andrei Marcus