SYLLABUS

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)			**Topics in Geometry III**				
2.2 Course coordinator			**Prof. PhD. Dorin Andrica**				
2.3 Seminar coordinator			**Prof. PhD. Dorin Andrica**				
2.4. Year of study	**2**	2.5 Semester	**4**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Optional**
2.8 Code of the discipline		**MME3036**					

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	**36**	Of which: 3.5 course	**24**	3.6 seminar/laboratory	**12**

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	**50**
Additional documentation (in libraries, on electronic platforms, field documentation)	**30**
Preparation for seminars/labs, homework, papers, portfolios and essays	**34**
Tutorship	**40**
Evaluations	**10**
Other activities:	**-**

3.7 Total individual study hours	**164**
3.8 Total hours per semester	**200**
3.9 Number of ECTS credits	**7**

4. Prerequisites (if necessary)

4.1. curriculum	Minimal knowledges of vector calculus, complex numbers and analytic geometry
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	• The capacity to understand methodical and scientific mathematical works, to propose new problems and to open new research. • The capacity to find a suitable real documentation, to work independently or in a team in order to solve some problems of different levels of complexity.
Transversal competencies	• The capacity to understand and to use concepts, results and fundamental and advanced mathematical theories.

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

7.1 General objective of the discipline	1. To obtain new notions and results in geometry which are useful to understand and to improve new directions in modern mathematics. 2. To get the abilities to apply the new theoretical results in the study of some concrete problems in a modern setting. 3. To realize connections with other mathematical disciplines.
7.2 Specific objective of the discipline	At the end of the course the students will be able 1) to identify correctly various geometric configurations and the existing connections; 2) to combine the results and the methods in order to solve geometry problem of various level of difficulties.

8. Content

8.1 Course	Teaching methods	Remarks
1. Week 1: Elements of vector algebra in plane and space.	presentation, explanation, dialog, problem-solving	
2. Week 2: The dot product and Lagrange Theorem.	presentation, explanation, dialog, problem-solving	

3. Week 3: The cross product and the triple scalar product.	presentation, explanation, dialog, problem-solving	
4. Week 4: The group of isometries	presentation, explanation, dialog, problem-solving	
5. Week 5: Nonisometric transformations : homothety	presentation, explanation, dialog, problem-solving	
6. Week 6: Nonisometric transformations : inversion	presentation, explanation, dialog, problem-solving	
7. Week 7: The real product of two complex numbers	presentation, explanation, dialog, problem-solving	
8. Week 8: The complex product of two complex numbers	presentation, explanation, dialog, problem-solving	
9. Week 9: The n-th roots of unity	presentation, explanation, dialog, problem-solving	
10. Week 10: Classical theorems proved by complex numbers	presentation, explanation, dialog, problem-solving	
11. Week 11: The group of plane isometries described by complex numbers	presentation, explanation, dialog, problem-solving	
12. Week 12: Nonisometric transformations of complex plane	presentation, explanation, dialog, problem-solving	

Bibliography

1.Andreescu,T.,Andrica,T.,Complex Numbers from A to…Z, Second Edition, Birkhauser,2014.
2.Andrica,D, GEOMETRIE. Teme pentru perfectionarea profesorilor de matematica 4, Casa Cartii de Stiinta, 2017.
3.Andrica,D.,s.a.,Teme si probleme alese de geometrie,Editura Plus,Bucuresti,2002.
4.Andrica,D.,s.a.,Matematica de baza,Editura Studium,Editia a 4-a,Cluj-Napoca,2004.
5.Berger,M.,Geometrie, CEDUC NathanParis,1977-1978.
6.Coxeter,H.S.M.,Greitzer,S.L.,Geometry Revisited,Random House,New York,1967.
7.Engel,A.,Problem-Solving Strategies,Springer Verlag,1998.
8.Fenn,R.,Geometry,Springer Verlag,2001.
9.Hahn,L.,Complex Numbers & Geometry,The Mathematical Association of America,1994.
10.Mihalescu,C.,Geometria elementelor remarcabile, Societatea de Stiinte Matematice din Romania,2007.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Collinearity problems solved by vector algebra	conversation, dialog, problem-solving strategies	

2. Metric problems solved by the dot product	conversation, dialog, problem-solving strategies	
3. Problems involving areas	conversation, dialog, problem-solving strategies	
4. Problems solved by translation	conversation, dialog, problem-solving strategies	
5. Problems solved by symmetry	conversation, dialog, problem-solving strategies	
6. Problems solved by homothety	conversation, dialog, problem-solving strategies	
7. Problems solved by inversion	conversation, dialog, problem-solving strategies	
8. Metric problems solved by the real product	conversation, dialog, problem-solving strategies	
9. Written paper		
10. Problems involving areas solved by the complex product	conversation, dialog, problem-solving strategies	
11. Barycentric coordinates in the complex plane	conversation, dialog, problem-solving strategies	
12. Problems solved using barycentric coordinates	conversation, dialog, problem-solving strategies	
13.		

Bibliography

1.Andreescu,T.,Andrica,T.,Complex Numbers from A to…Z, Birkhauser,2006.
2.Andrica, D., Varga, Cs., Văcăreţu, D., Teme şi probleme alese de geometrie, Editura Plus, Bucureşti, 2002
3.Barbu, C., Teoreme fundamentale din Geometria triunghiului, Editura Unique, Bacau, 2008
4.Salagean,Gr.S.,Geometria planului complex, Ed.Promedia-Plus, Cluj-Napoca, 1997.
5.Scwerdtfeger,H.,Geometry of Complex Numbers,University of Toronto Press,Toronto,1962.
6.Yaglom,I.,M.,Complex Numbers in Geometry,Academic Press,New York,1968.
7.Yaglom,I.,M.,Geometric Transformations,Vol.I-III,The Mathematical Association of America,1962,1968,1973.

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

1) The contents is directed towards applications of the methods of Geometry to mathematical didactics and problem solving.

2) Most of the topics in the course are included in the national curriculum and are necessary for various exams for teachers in general schools and high schools.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	To understand the notions and the results by typical examples or counterexamples. To be able to present the main ideas in the proof of the theoretical results.	Written exam	60%
	To develop a specific subject by reading the bibliography.	Report	10%
10.5 Seminar/lab activities	. Solving problems skills	Quiz Continous observations	10% 10%
	Active participation in the classroom		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
18.04.2018	Prof. Dr. Dorin Andrica	Prof. Dr. Dorin Andrica

Date of approval	Signature of the head of department
21.04.2018	Prof. Dr. Octavian Agratini