

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş-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)	Geometrie I (Geometrie Analitică)/Analytic Geometry						
2.2 Course coordinator	Lect. dr. George Țurcaș						
2.3 Seminar coordinator	Lect. dr. George Țurcaș						
2.4. Year of study	I	2.5 Semester	1	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory
2.8 Code of the discipline	MLE0013						

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					24
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					20
Tutorship					14
Evaluations					6
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	<ul style="list-style-type: none"> • None necessary
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4.2. competencies	<ul style="list-style-type: none"> • Basic knowledge of algebra, trigonometry and elementary geometry
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5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> •
5.2. for the seminar	<ul style="list-style-type: none"> • Attendance to at least 75% of the seminars.

6. Specific competencies acquired

Professional competencies	<p>C1.1 The ability to identify concepts, theories and use of specific description language</p> <p>C2.1 The ability to identify basic concepts used in the description of specific phenomena and processes</p> <p>C4.5 The ability to produce a mathematical model for a certain problem.</p>
Transversal competencies	<p>CT1. 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</p>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> • Acquiring theoretical and practical knowledge necessary for understanding the principles and methods of analytic geometry.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • Introduction of basic notions for analytic geometry (vectors, coordinates, straight lines, planes, conic sections and quadric surfaces), the study of their properties and of the relations between them, by means of the geometric transformations.

8. Content

8.1 Course	Teaching methods	Remarks
1. Vector algebra and coordinates (3 lectures)	Lecture, description, exemplifications by using multimedia tools	
2. The straight line in the plane (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
3. The line and plane in space (2 lectures)	Lecture, description, exemplifications by	

	using multimedia tools	
4. Isometries and affine transformations in the plane (2 lectures)	Lecture, description, exemplifications by using multimedia tools	
5. Conic sections. Reduction to the canonical equation (3 lectures)	Lecture, description, exemplifications by using multimedia tools	
6. Quadric surfaces on the canonical equations (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
7. Generated surfaces (1 lecture)	Lecture, description, exemplifications by using multimedia tools	
8. Isometries and affine transformations in space (1 lectures)	Lecture, description, exemplifications by using multimedia tools	

Bibliography

1. D. Andrica, L. Topan - Analytic Geometry, Cluj University Press, 2004
2. M. Audin - Geometry, Springer, 2003
3. P. A. Blaga – Geometrie liniară: cu un ochi către grafica pe calculator, Presa Universitară Clujeană, 2022.
4. P.A. Blaga – Geometrie si grafica I (lecture notes available on the author website)
5. P. A. Blaga - Lectures on Classical Differential Geometry, Risoprint, 2005
6. M. P. Deisenroth, A. A. Faisal, C. S. Ong - *Mathematics for Machine Learning*, Cambridge University Press, 2020.
7. C. Pinteă - Geometrie. Elemente de geometrie analitică. Elemente de Geometrie diferențială a curbelor și suprafețelor, Cluj University Press, 2001.
8. D. Moulton – Geometry. Lecture notes from the Michaelmas Term 2021, University of Oxford (available on <https://courses.maths.ox.ac>)
9. M. Reid, B. Szendroi- *Geometry and Topology*, Cambridge University Press, 2005.

8.2 Seminar / laboratory	Teaching methods	Remarks
1. Vector algebra and coordinates (3 seminars)	Description, explanation, independent and/or team study	
2. The straight line in the plane (1 seminar)	Description, explanation, independent and/or team study	
3. The line and plane in space (2 seminars)	Description, explanation, independent and/or team study	

4. Isometries and affine transformations in the plane (2 seminars)	Description, explanation, independent and/or team study	
5. Conic sections. Reduction to the canonical equation (3 seminars)	Description, explanation, independent and/or team study	
6. Quadric surfaces (1 seminar)	Description, explanation, independent and/or team study	
7. Generated surfaces (1 seminar)	Description, explanation, independent and/or team study	
8. Isometries and affine transformations in space (1 seminars)	Description, explanation, independent and/or team study	
Bibliography 1. D. Andrica, L. Topan - Analytic Geometry, Cluj University Press, 2004 2. C. Blaga, P. Blaga – Geometrie analitică: culegere de probleme, Presa Universitară Clujeană, 2024. 3. D. Brannan, M. Esplen – Geometry, Cambridge University Press, Second Edition 2011 4. F. Rado - Culegere de probleme de geometrie, Lito UBB, 1979 5. D. Kletenik - Problems in Analytic Geometry, Arhiant, 2019 6. G. Simmons – Calculus with Analytic Geometry, McGraw-Hill Education, 1995 7. D. Moulton – Geometry. Problem sets from the Michaelmas Term 2021, University of Oxford (available on https://courses.maths.ox.ac)		

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		Final written exam	75%
10.5 Seminar/lab activities		Active attendance and seminar test	25%

10.6 Minimum performance standards
<ul style="list-style-type: none">➤ The student should attend at least 75% of the seminars.➤ The grade of the written exam should be at least 5.

Date

Signature of course coordinator

Signature of seminar coordinator

April 28, 2024

Lect. dr. George Țurcaș

Lect. dr. George Țurcaș

Date of approval

Signature of the head of department

April 28, 2024

Prof. dr. Andrei Mărcuș