

SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	Babeş Bolyai University
1.2 Faculty	Faculty of Mathematics and Computer Science
1.3 Department	Department Mathematics
1.4 Field of study	Mathematics
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Computer Science

2. Information regarding the discipline

2.1 Name of the discipline	Geometry						
2.2 Course coordinator	Assoc.Prof.PhD. Cornel Pintea						
2.3 Seminar coordinator	Assoc.Prof.PhD. Cornel Pintea						
2.4. Year of study	1	2.5 Semester	2	2.6. Type of evaluation	VP	2.7 Type of discipline	Compulsory

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

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar	2 sem
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar	28
Time allotment:	hours				
Learning using manual, course support, bibliography, course notes	20				
Additional documentation (in libraries, on electronic platforms, field documentation)	10				
Preparation for seminars/labs, homework, papers, portfolios and essays	15				
Tutorship	12				
Evaluations	12				
Other activities:	-				
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	<ul style="list-style-type: none"> Elementary abstract algebra
4.2. competencies	<ul style="list-style-type: none"> Competencies of logic reasonings and in using the knowledges of the above mentioned curricula.

5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> The classroom should be gifted with a board and video projector. The attendance is strongly recommended within the set timetable.
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> The classroom should be gifted with a board and video projector. The attendance is recommended within the set timetable. The study of the courses and the seminars prior to the seminar is also recommended.

6. Specific competencies acquired

Professional competencies	<p>C4.3 Identifying the appropriate models and methods for solving real problems</p> <p>C4.5 Incorporating formal models into specific applications in various fields</p>
----------------------------------	---

Transversal competencies	<p>CT1 Applying 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</p> <p>CT3 The use of effective methods and techniques of learning, information, research and development of knowledge valorization capacities, adjustment to the requirements of a dynamic and communication society in Romanian and in an international language</p>
---------------------------------	---

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> • Ability to distinguish the objects of analytic geometry in different contexts. • To get hold of the fundamental theoretical results of analytic geometry. • Knowledge, understanding and use of basic objects and concepts of analytic geometry.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • The students are expected to acquire the ability to recognize the objects of analytic geometry in different contexts such as other courses studied by themselves which require such knowledge. • The students are expected to cultivate their abilities acquired within the course of analytic geometry in order to connect and apply them within some other courses studied by themselves which require such knowledge. • To use the knowledge acquired within the course of analytic geometry in order to apply them in real life problems which lend oneself to analytic approaches.

8. Content

8.1 Course	Teaching methods	Remarks
<p>1. Vector algebra</p> <p>1.1 Free vectors</p> <p>1.1.1 Operations with vectors</p> <ul style="list-style-type: none"> • The addition of vectors • The multiplication of vectors with scalars 	<p>Exposure: description, explanation, examples</p>	

<p>2. Straight lines and planes</p> <p>2.1 Linear dependence and linear independence of vectors</p> <p>2.1.1 The vector equation of the straight lines and planes</p>	<p>Exposure: description, explanation, examples</p>	
<p>3. Cartesian equations of lines and planes</p> <p>3.1 Cartesian reference systems</p> <p>3.2 The cartesian equations of the straight lines</p> <p>3.3 The cartesian equations of the planes. Pencils of planes</p> <p>3.4 Analytic conditions of parallelism</p> <p>3.5 Appendix: The Cartesian equations of lines in the two dimensional setting</p>	<p>Exposure: description, explanation, examples</p>	
<p>4. Projections and symmetries</p> <p>4.1 Projections and symmetries</p> <p>4.1.1 The intersection point of a straight line and a plane</p> <p>4.1.2 The projection on a plane parallel to a given line .</p> <p>4.1.3 The symmetry with respect to a plane parallel to a line</p> <p>4.1.4 The projection on a straight line parallel to a given plane</p> <p>4.2 Appendix: Projections and symmetries in the two dimensional setting</p>	<p>Exposure: description, explanation, examples</p>	
<p>5. Products of vectors</p> <p>5.1 The dot product</p> <p>5.1.1 Applications of the dot product</p> <ul style="list-style-type: none"> ◆ The two dimensional setting ◆ The three dimensional setting <p>5.2 Appendix: Orthogonal projections and reflections</p> <p>5.2.1 The two dimensional setting</p> <p>5.2.2 The three dimensional setting</p>	<p>Exposure: description, explanation, examples, proofs, debate, dialogue</p>	
<p>6.1 The vector product</p> <p>6.2 Applications of the vector product</p>	<p>Exposure: description, explanation, examples, proofs, debate, dialogue</p>	
<p>7. 1 The double vector (cross) product</p>	<p>Exposure: description, explanation, examples.</p>	

7.2 The triple scalar product		
8. Applications of the triple scalar product 8.1 The distance between two straight lines 8.2 The coplanarity condition of two straight lines	Exposure: description, explanation, examples, proofs	
9. Conics 9.1 The Ellipse 9.2 The Hyperbola. 9.3 The Parabola	Exposure: description, explanation, examples, proofs	
10. Quadrics 10.1 The ellipsoid 10.2 The hyperboloid of one sheet 10.3 The hyperboloid of two sheets 10.4 Hyperbolic Paraboloids 10.5 Elliptic Cones 10.6 Elliptic Paraboloids 10.7 Singular Quadrics	Exposure: description, explanation, examples, proofs	
11. Generated Surfaces 11.1 Cylindrical Surfaces 11.2 Conical Surfaces 11.3 Conoidal Surfaces 11.4 Revolution Surfaces	Exposure: description, explanation, examples, proofs	
12. Transformations of the plane 12.1 Translations 12.2 Scaling about the origin 12.3 Reflections 12.4 Rotations 12.5 Shears	Exposure: description, explanation, examples, proofs	
13. Homogeneous coordinates 13.1 Transformations of the plane in homogeneous coordinates	Exposure: description, explanation, examples, proofs	

13.2 Translations and scalings		
13.3 Reflections		
13.4 Rotations		
13.5 Shears		
14. Transformations of the space	Exposure: description, explanation, examples, proofs	
14.1 Translations		
14.2 Scaling about the origin		
14.3 Reflections about planes		
14.4 Rotations		
14.5 Homogeneous coordinates		
Bibliography		
1. Andrica, D., Țopan, L., Analytic Geometry, Cluj University Press, 2004.		
2. Blundell , B.G., An Introduction to Computer Graphics and Creative 3-D Environments , Springer, 2008.		
3. Pinteș, C., Geometrie. Elemente de geometrie analitică. Elemente de geometrie diferențială a curbilor și suprafețelor, Presa universitară clujeană, 2001.		
4. Smaranda, D., Soare, N., Transformări geometrice, Editura Academiei RSR, București, 1988.		
8.2 Seminar	Teaching methods	Remarks
1) Problems on vector algebra with applications in classical geometry.	Explanation, dialogue, solving problems	One tutorial
2) Problems involving various equations of lines and planes	Dialogue, debate, examples, solving problems	Two tutorials
3) Problems on vector products (dot product, cross product, triple scalar product)	Dialogue, debate, case studies, examples, solving problems	Two tutorials
4) Problems on angles distances and projections	Dialogue, debate, case studies, examples, solving problems	Two tutorials
5) Problems on associated geometric objects to conics, such as tangent lines and normal lines.	Dialogue, debate, examples, solving problems	Two tutorials
	Dialogue, debate, examples, solving	Two tutorials

5) Problems on associated geometric objects to quadrics, such as tangent plane, normal line and rectilinear generatrices.	problems	
7) Examples of cylindrical surfaces, conic surfaces, conoidal surfaces and of revolution surfaces.	Dialogue, debate, examples, solving problems	One tutorial
8) Problems on reflexions, translations, scalling and projections.	Dialogue, debate, examples, solving problems	Two tutorials

Bibliography

1. Andrica, D., Țopan, L., Analytic Geometry, Cluj University Press, 2004.
2. Blundell , B.G., An Introduction to Computer Graphics and Creative 3-D Environments , Springer, 2008.
3. Nicolescu, L., Boskoff, V., Probleme practice de geometrie, Ed. Tehnica, București, 1990.
4. Pinte, C., Geometrie. Elemente de geometrie analitică. Elemente de geometrie diferențială a curbelor și suprafețelor, Presa universitară clujeană, 2001.
5. Smaranda, D., Soare, N., Transformări geometrice, Editura Academiei RSR, București, 1988.
6. Bercovici, M., Rimer, S., Triandaf, A., Culegere de probleme de geometrie analitică și diferențială, Editura didactică și pedagogică, București, 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

- Generally speaking, Geometry, and Analytic Geometry in particular, may help individuals to build a logical thinking based on intuition. This may help to understand other mathematical fields or even other sciences. Also, geometry cultivate the practical abilities, from a theoretical point of view, extremely necessary in real life problems.
- The course exists in the studying program of all major universities in Romania and abroad. The content of the course is suitable to build a strong mathematical background.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	The students are expected to know the basic concepts and results of analytic geometry; The students are expected to apply the course concepts in real life situations	Written final exam consisting in theoretical questions alongside applications and problems.	60%
10.5 Seminar	The ability to solve problems which are close to those solved during the tutorials. Good students are expected to solve problems which require deep knowledge of the important results presented at the course.	A grade for the student's activity within the tutorial during the whole semester. This might include a grade for the homeworks and/or a grade for a midterm quiz.	40%
10.6 Minimum performance standards			
At least grade 5 (from a scale of 1 to 10) at the final exam and the grade for tutorial component.			

Date

20.04.2018

Date of approval

.....

Signature of course coordinator

Assoc.Prof.PhD. Cornel PINTEA

Signature of seminar coordinator

Assoc.Prof.PhD. Cornel PINTEA

Signature of the head of department

PROF. OCTAVIAN AGRATINI