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					14
Tutorship					14
Evaluations					11
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	• Elementary abstract algebra
4.2. competencies	• Competencies of logic reasonings and in using the knowledges of the above mentioned curricula.

5. Conditions (if necessary)

5.1. for the course	• The classroom should be gifted with a board and video projector. The attendance is strongly recommended.
5.2. for the seminar /lab activities	• The classroom should be gifted with a board and . The attendance is strongly recommended.

6. Specific competencies acquired

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

Transversal competencies	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 CT3 The use of efficient methods and techniques of learning, information, research and development of knowledge acquisition capacities, adapting to the requirements of a dynamic and communicating society in Romanian and in an international language

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

7.1 General objective of the discipline	● 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	●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 couse 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
1. Vector algebra 1.1 Free vectors 1.1.1 Operations with vectors • The addition of vectors • The multiplication of vectors with scalars • The vector space of free vectors	Exposure: description, explanation, examples	
2. **Straight lines and planes** 2.1 Linear dependence and linear independence of vectors	Exposure: description, explanation, examples	

2.1.1 The vector equations of the straight lines and planes		
3. **Cartezian equations of lines and planes** 3.1 Cartesian and affine reference systems 3.2 The cartesian equations of the straight lines 3.2.1 The cartesian equations of the planes. Pencils of planes 3.2.2 Analytic conditions of parallelism 3.3 Appendix: The Cartesian equations of lines in the two dimensional setting	Exposure: description, explanation, examples	
4. Analytic conditions of parallelism and nonparallelism 4.1. The parallelism between a line and a plane 4.2. The intersectin point betweena a straight line and plane 4.3. Parallelism of two planes 4.4. Straight lines as intersections of two planes Appendix. **Projections and symmetries** 4.1 Projections and symmetries 4.1.1 The intersection point of a straight line and a plane 4.1.2 The projection on a plane parallel to a given line . 4.1.3 The symmetry with respect to a plane parallel to a line 4.1.4 The projection on a straight line parallel to a given plane 4.2 Projections and symmetries in the two dimensional setting	Exposure: description, explanation, examples	
5. **Products of vectors** 5.1 The dot product 5.1.1 Applications of the dot product ♦ The two dimensional setting ♦ The three dimensional setting 5.2 Appendix: Orthogonal projections and reflections 5.2.1 The two dimensional setting 5.2.2 The three dimensional setting	Exposure: description, explanation, examples, proofs, debate, dialogue	
6. The vector product 6.1 Definition and properties of the vector product 6.2 Applications of the vector product 6.3. The double vector product	Exposure: description, explanation, examples, proofs, debate, dialogue	

7.The triple vector product 7.1. Definition and properties of the triple scalar product 7.2. Applications of the triple scalar product 7.2.1 The distance beteen two straight lines 7.2.2 The coplanarity condition of two straight lines	Exposure: description, explanation, examples.	
8. Curves and surfaces 8.1 Regular curves and local parametrizations 8.2 Parametrized differentiable surfaces 8.3 Regular surfaces	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 13.2 Translations and scalings 13.3 Reflections 13.4 Rotations 13.5 Shears	Exposure: description, explanation, examples, proofs	
14. **Transformations of the space** 14.1 Translations 14.2 Scaling about the origin 14.3 Reflections about planes 14.4 Rotations 14.5 Homogeneous coordinates	Exposure: description, explanation, examples, proofs	

Bibliography
1. Andrica, D., Ţopan, L., Analytic Geometry, Cluj University Press, 2004.
2. Eggerton, P.A., Hall, W.S., Computer Graphics. Mathematical First Steps, Prentice Hall, 1999.
3. Pintea, C., Geometrie. Elemente de geometrie analitică. Elemente de geometrie diferențială a curbelor 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.	Explation, 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
6. Problems on associated geometric objects to quadrics, such as tangent plane, normal line and rectilinear generatrices.	Dialogue, debate, examples, solving problems	Two tutorials
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., Ţopan, L., Analytic Geometry, Cluj University Press, 2004.

2. Eggerton, P.A., Hall, W.S., Computer Graphics. Mathematical First Steps, Prentice Hall, 1999.

3. Nicolescu, L., Boskoff, V., Probleme practice de geometrie, Ed. Tehnica, Bucureşti, 1990.

4. Pintea, 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 skils, 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 closed 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	Signature of course coordinator	Signature of seminar coordinator
20.04.2020	Assoc.Prof.PhD. Cornel PINTEA	Assoc.Prof.PhD. Cornel PINTEA
Date of approval		Signature of the head of department
.....		Prof. Octavian AGRATINI