

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 | | | | | 20 |
| Additional documentation (in libraries, on electronic platforms, field documentation) | | | | | 20 |
| Preparation for seminars/labs, homework, papers, portfolios and essays | | | | | 20 |
| Tutorship | | | | | 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 | <ul style="list-style-type: none"> • Basic knowledge of algebra, trigonometry and elementary geometry |
|-------------------|--|

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 (main textbook)
2. M. Audin - Geometry, Springer, 2003
3. M. Berger - Geometry (vol. I and II), Springer, 1987
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. D.F. Rogers, J.A. Adams - Mathematical Elements for Computer Graphics (2nd edition), McGraw-Hill, 1990
8. C. Pinteă - Geometrie. Elemente de geometrie analitica. Elemente de Geometrie diferențială a curbelor și suprafețelor, Cluj University Press, 2001.
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. S.L. Atanasijan, V. I. Glizburg – Culegere de probleme de geometrie, vol. I, Eksmo Education, Moscova, 2000 (in Russian) 2. C. Coșniță - Culegere de probleme de geometrie analitică, Editura didactică și pedagogică, 1963 3. D. Kletenik – Problems in Analytic Geometry, Mir Publishers, Moscow, 1969 3. C. Ionescu-Bujor, O. Sacter - Exerciții și probleme de geometrie analitică și diferențială, volumul I, Editura didactică și pedagogică, 1963 4. F. Rado - Culegere de probleme de geometrie, Lito UBB, 1979 5. D. Brannan, M. Esplen – Geometry, Cambridge University Press, Second Edition 2011 5. Ion D. Teodorescu - Geometrie analitică și elemente de algebră liniară, culegere de probleme (ediția a IIa), Editura didactică și pedagogică, 1971 | | |

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

| |
|--|
| <ul style="list-style-type: none"> 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, 2023

Lect. dr. George Țurcaș

Lect. dr. George Țurcaș

Date of approval

Signature of the head of department

April 28, 2022

Prof. dr. Andrei Mărcuș