



DISCIPLINE ACADEMIC SHEET ACADEMIC YEAR 2025 – 2026

1. PROGRAMME DATA

1.1. Higher Education Institution	UNIVERSITY OF CRAIOVA
1.2. Faculty	Automation, Computers and Electronics
1.3. Department	Computers and Information Technology
1.4. Field of Study	Computers and Information Technology
1.5. Study level	L(License / Undergraduate)
1.6. Organizational form	IF
1.7. Study Program (name/code) /Qualification	Computers / L2060101010

2. DISCIPLINE DATA

2.1 Discipline Name	Linear Algebra, Analytical and Differential Geometry						
2.2 Course Activities Holder	Associate Professor Florian MUNTEANU Ph.D.						
2.3. Practical Activities Holder	Assistant Professor Andrei GRECU Ph.D.						
2.4. Study Year	I	2.5. Semester	I	2.6. Evaluation type	E	2.7. Discipline regime	DOB

3. ESTIMATED TOTAL TIME (hours per semester of teaching activities)

3.1. Number of hours per week	5	in which: 3.2 course	3	3.3. sem./lab./pr.	2
3.4. Total hours of curriculum	70	in which: 3.5 course	42	3.6. sem./lab./pr.	28
3.7. Time distribution - hours/week					hours
Study after manual, course support, bibliography and notes					20
Additional documentation in library, on specialized electronic platforms and field					14
Training seminars / labs, homework, portfolios and essays					14
Tutorial					-
Examinations					5
Other activities.....					2
Total hours per individual activities					55
3.8. Total hours per semester					125
3.9. Number of credits					5

4. PRECONDITIONS (where appropriate)

4.1. of curriculum	Students must have acquired specialized knowledge in the following subjects: Elementary algebra and geometry, Calculus, Physics.
4.2. of competence	Working with matrices, determinants computation, solving algebraic equations and solving linear equations systems, derivation of one variable real function.

5. CONDITIONS (where appropriate)

5.1. of the course	Didactic activity with physical presence. Teaching the course is
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	done using the video projector and blackboard. Also, to answer certain questions from students and for explanations, examples, demonstrations is used blackboard and oral presentation. It provides ongoing support in print and in electronic format with free access. To make the teaching activity more efficient, the Google Classroom platform is used for the dissemination of teaching materials, the collection of remarks and homework, the posting of evaluation results. Also, the Student Records platform related to the official website of the University of Craiova, https://evstud.ucv.ro/ is used. Teaching is as follows: • 80% theoretical presentation based on support material (slides) • 20% interactive activity (discussions with students)
5.2. of the seminar	Didactic activity with physical presence. The seminar takes place in a room equipped with a blackboard. Together with students give explanations, guidance and solve practical applications to the blackboard, exercises and problems that illustrate the concepts presented in class. Students receive homework. To streamline the activity at the seminar, the Google Classroom platform is used for the dissemination of teaching materials, the collection of remarks and homework, the posting of evaluation results. Also the Student Records platform related to the official website of the University of Craiova, https://evstud.ucv.ro/ is used.

6. COURSE OBJECTIVES – expected learning outcomes that are supported by completing and passing the course

Knowledge	Student/Graduate: 1. identifies and describes basic concepts, principles and methods in mathematics, strictly necessary for the formation of their professional skills. The aim is to introduce the fundamental notions of linear algebra, analytical and differential geometry: vector spaces, linear applications, quadratic forms, Euclidean spaces, line and plane, conics and quadratics, curves in the plane and in space, surfaces. 2. explains and interprets theoretical results in mathematics. The seminar aims to consolidate theoretical knowledge and create calculation skills through practical applications, exercises and problems.
Skills (Abilities)	Student/Graduate: 1. operates with basic mathematical concepts, principles and methods. 2. solve mathematical problems with applicability in engineering and validate the solution obtained. 3. performs engineering and economic calculations of medium complexity and associates them with graphical representations or specific to computer-aided design. 4. applies criteria and evaluation methods for the identification, modeling, experimentation, analysis and qualitative and quantitative assessment of phenomena and processes specific to the fundamental field using digital technologies. 5. acquires and processes data, interprets theoretical mathematical and experimental results.
Responsibility and autonomy	Student/Graduate: 1. applies the values of ethics and deontology of the engineering profession. 2. practices logical reasoning, evaluation and self-assessment in decision-making. 3. communicates effectively about engineering activities with a wide range of audiences. 4. is engaged in lifelong learning to acquire and implement knowledge, as needed, using appropriate learning strategies. 5. promotes dialogue, cooperation, respect for others and interculturality.

8. CONTENT

7.1. Course	The method of implementation	Teaching methods	Allocated time (hours)
Chapter 1. Vector Spaces 1.1 Definition, examples 1.2 Linear dependence. Generating systems 1.3 Basis and dimension. Coordinates of a vector with respect to a basis 1.4 Vector subspaces: definition, examples, operations with subspaces	face to face	Teaching the course is done using the video projector. - 80% theoretical presentation based on support material (slides). - 20% interactive activity (discussions with students) The necessary materials will be made available to students in electronic and printed form. To make the teaching activity more efficient, the Google Classroom platform is used for the dissemination of teaching materials.	4
Chapter 2. Linear Mappings 2.1 Definition, examples 2.2 Kernel and image: definition, Theorem of rank 2.3 Associated matrix of a linear mapping 2.4 Invariant subspaces. Eigenvalues and eigenvectors 2.5 Diagonalizable operators			6
Chapter 3. Bilinear Forms. Quadratic Forms 3.1 Bilinear forms: definition, examples, matrix, analytic expression 3.2 Symmetric bilinear forms and quadratic forms 3.3 Reduction of a quadratic form to a canonical form by Jacobi and Gauss methods 3.4 Quadratic form defined on a real vector space. The signature of a quadratic form			3
Chapter 4. Euclidian Spaces 4.1 Definition, examples 4.2 Norm, inequality of Cauchy 4.3 Orthonormal basis. Gram-Schmidt procedure 4.4 Orthogonal complement of a subspace of a Euclidian space 4.5 Symmetric operators. Method of orthogonal transformations			5
Chapter 5. Geometric Vectors 5.1 Geometric (free) vectors. Real vector space of geometric vectors 5.2 Scalar product, vector product, mixed product 5.3 Orthonormal Cartesian frames			2
Chapter 6. Straight Line and Plane 6.1 Straight line: geometrical determination, equations 6.2 Distance from a point to a			3

line. Angle of two lines 6.3 Plane: geometrical determination, equations 6.4 Distance from a point to a plane. Angle of two planes 6.5 Common orthogonal line of two no coplanar lines			
Chapter 7. Conics and Quadratic Surfaces 7.1 Cartesian general equation of a quadratic surface (conic). Center 7.2 Intersection of a quadratic surface (conic) with a straight line. The tangent plane 7.3 Reduction of the equation of a quadratic surface (conic) to the canonical equation 7.4 The study of the quadratic surfaces (conics) on the canonical equation 7.5 Ruled surfaces. Rotational surfaces			7
Chapter 8. Curves in Plane and Curves in Space 8.1 Parameterized curves. Natural parameterization 8.2 Definition of the curve. Representations modes 8.3 The tangent and the normal. The normal plane 8.4 Curvature. Torsion. Frenet's frame. Formulae of Frenet			7
Chapter 9. Surfaces 9.1 Parameterized surfaces. Surface 9.2 Curves on a surface. Coordinates curves. Singular and regular points 9.3 The tangent plan. The normal 9.4 First fundamental form of a surface. The length of a curve on a surface 9.5 Second fundamental form of a surface. Curvatures. Geodesics			5
Bibliography:			
1. Axler, S., Linear Algebra Done Right, Springer, San Francisco, ISBN 978-3-031-41025-3, 2024			
2. Berger, M., Geometry I, II, Springer Verlag, Berlin-Heidelberg, 1987			
3. Radu, C., Algebră liniară, geometrie analitică și diferențială, Ed. ALL, București, 1998			
4. Silov, G.E., Mathematical analysis. Finite dimensional spaces, Ed. St. Encicl., București, 1983			
5. Stănășilă, O., Analiză liniară și geometrie, Ed. ALL, București, 2000			
6. Vladimirescu, I., Matematici aplicate, Repr. Univ. Craiova, 1987			
7. Vladimirescu, I., Munteanu, F., Algebră liniară, geometrie analitică și geometrie diferențială, Ed. Universitaria, Craiova, 2007			
8. Munteanu, F., Slesar, V., Stanescu, M.M., Probleme de algebră liniară, geometrie analitică și geometrie diferențială, Ed. Sitech, Craiova, 2010			

9. Munteanu, F. Algebră liniară, geometrie analitică și geometrie diferențială, suport de curs și seminar online, 2025
http://www.ucv.ro/pdf/departamente_academice/dma/suporturi_curs/Munteanu_Florian_Alg_lin_geom.pdf

7.2. Seminar	The method of implementation	Teaching methods	Allocated time (hours)
1. Examples of vector spaces. Linear dependence. Generating systems. Basis and dimension	face to face	Conducting seminars with students is made. They give explanations, instructions and solve the blackboard practical applications, exercises and problems. They are available to students sample applications and a breviary resolved theoretically both electronically and in print. To streamline the activity at the seminar, the Google Classroom platform is used for the dissemination of teaching materials, the collection of homework and the posting of evaluation results. Activities: -80% effective deployment of seminar - 20% interpreting the results and discussions with student	2
2. Coordinates of a vector with respect to a basis. Vector subspaces. Operations with subspaces			2
3. Examples of linear mappings. Kernel and image. Associated matrix			2
4. Eigenvalues and eigenvectors. Diagonalizable operators			2
5. Bilinear forms, quadratic forms, canonical form of a quadratic form, method of Gauss, method of Jacobi			2
6. Examples of Euclidian spaces. Gram-Schmidt procedure			2
7. Symmetric operators. Method of orthogonal transformations			2
8. Operations with geometric vectors. Changing of orthonormal frames			2
9. Problems about line and plane in space: equations, angles, distances			2
10. Examples of conics and quadratic surfaces. Problems about center, tangent plan, sphere			2
11. Reduction to the canonical form of quadratic surfaces and conics			2
12. Examples of curves in plane and in space. Tangent, normal plan			2
13. Determination of Frenet's frame, curvature and torsion for a curve			2
14. Examples of surfaces. Tangent plan, normal. Problems			2
Bibliography:			
1. Axler, S., Linear Algebra Done Right, Springer, San Francisco, ISBN 978-3-031-41025-3, 2024			
2. Belage, A. et autres, Exercices resolu d'algebre lineaire, Masson, Paris, 1983			
3. Munteanu, F. ș.a., Culegere de probleme de alg. liniară, geom. analitică, difer., Ed. Universitaria, Craiova, 2009			
4. Udriște, C. ș.a., Probleme de algebră, geometrie și ecuații diferențiale, EDP, București, 1981			
5. Vladimirescu, I., Matematici aplicate, Repr. Univ. Craiova, 1987			
6. Vladimirescu, I., Munteanu, F., Algebră liniară, geometrie analitică și geometrie diferențială, Ed. Universitaria, Craiova, 2007			
7. Vladislav, T., Rașa, I., Matematici financiare și ingineresti, Ed. Fair Partners, București, 2001			
8. Munteanu, F. ș.a. Probleme de algebră liniară, geometrie analitică și geometrie diferențială, Ed. Sitech, Craiova, 2010			
9. Munteanu, F. Algebră liniară, geometrie analitică și geometrie diferențială, suport de curs și			

8. Correlating the content of the discipline with the expectations of representatives from the epistemic community, professional associations and representative employers in the field related to the program

Course content was discussed with representatives of

- Department of Computer Science and Information Technology, Faculty of Automation, Computers and Electronics
- Faculty of Automation, Computers and Electronics, University of Craiova

9. EVALUATION

Activity Type	9.1. Evaluation criteria	9.2. Evaluation methods	9.3. Final mark weight
9.4. Course	- Understanding the proper theoretical foundations.	- Written partial exam with two examiners	40%
	- The ability to make connections between the concepts taught.	- Final written exam with two examiners	35%
9.5. Seminar	- Ability to analyze and synthesize a concrete situation		
	- Interpretation of results;	Continuous assessment and final examination	25%
9.6. Minimum standard of performance	- Application solutions are presented and discussed within the group		
	- Solving practical applications left at each seminar topic		
Achieve a minimum of 50% of the score assessment, examination and final examination. Final scoring is done by rounding up. The minimum mark to promote the exam is 5.			

Date of Completion	Signature of the Course Activities Holder,	Signature of the Practical Activities Holder,
23.08.2025		

Date of Approval in the Department	Signature of the Department Director,
25.08.2025	Ș.I.dr.ing. Nicolae ENESCU

Date of Approval in the Faculty	Signature of the Dean,

	Prof.dr.ing. Dorin ȘENDRESCU
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