SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty[1]/ Department [2]	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES / DEPARTMENT OF MATHEMATICS
1.3 Field of study (name/code[3])	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category[4]	Linear Algebra, Analytic and Differential Geometry / DF						
2.2 Coordinator (holder) of course activities	Lect. Dr. Ioana-Claudia Lazăr						
2.3 Coordinator (holder) of applied activities[5]	Lect. Dr. Ioana-Claudia Lazăr						
2.4 Year of study[6]	1	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DOb

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [8]

3.1 Number of fully assisted hours / week	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	2/0/0
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	28/0/0
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	3.14 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1.14
		hours of individual study after manual, course support, bibliography and notes			1
		training seminars / laboratories, homework and papers, portfolios and essays			1
3.7* Number of hours of unassisted activities / semester	44 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			16
		hours of individual study after manual, course support, bibliography and notes			14
		training seminars / laboratories, homework and papers, portfolios and essays			14
3.8 Total hours / week [9]	7.14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

[1] The name of the faculty which manages the educational curriculum to which the discipline belongs
[2] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[3] The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.
[4] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[5] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[6] Year of studies in which the discipline is provided in the curriculum.
[7] Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).
[8] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[9] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4. Prerequisites (where applicable)

4.1 Curriculum	• Mathematics taught in high school
4.2 Competencies	• Mathematical thinking

5. Conditions (where applicable)

5.1 of the course	• Big room; blackboard
5.2 to conduct practical activities	• Big room; blackboard

6. Specific competencies acquired through this discipline

Specific competencies	• Recognizing the main classes / types of mathematical problems and selecting the right methods and techniques for solving them • Identifying the basic notions used to describe processes and phenomena
Professional competencies ascribed to the specific competencies	• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. • Application of basic methods for signal acquisition and processing. •
Transversal competencies ascribed to the specific competencies	• Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Building a mathematical background, basis for the engineerical studies to follow. Understanding the main notions in linear algebra and analytical and differential geometry.
7.2 Specific objectives	• Understanding concrete situations when linear algebra and analytical and differential geometry are being applied. Developing abilities necessary to solve problems which make use of algebra and geometry. Accumulating competencies of selection and of merging mathematical results from algebra and geometry in order to use them for solving specific engineering problems.

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Generalities about matrices	1	Exposition, conversation, proof, problematizing, explanation, example, comparative analysis, case analysis, e-mail, electronic resourses
Vector spaces, vector subspaces, generating systems, linear independence, bases, dimension, change of bases	3	
Linear mappings, the matrix associated to a linear mapping with respect to two bases	2	
The kernel and the image of a linear mapping	2	
Eigenvalues and eigenvectors of a linear operator, diagonalization	2	

[10] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[11] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

Euclidean vector spaces, dot product, orthonormal bases, Gramm-Schmidt orthonormalization procedure	2	
Bilinear forms and quadratic forms	2	
Vectors, dot product, cross product, triple product	2	
The line and the plane, metric problems involving angles and distances, the sphere and the circle in space	4	
Conics and quadrics	2	
The differential geometry of curves, the representaion of a plane curve and of a curve in space, Frenet's frame	3	
The differential geometry of surfaces, the representation of a surface, normal plane and tangent at a point	3	

1. Bibliography [12] 1. C. Udrişte, Probleme de algebră liniară, geometrie analitică şi diferenţială, Editura didactică şi pedagogică, Bucureşti, 1976;
2. D. Rendi, I. Mihuţ, Algebră Liniară, Geometrie Analitică şi Diferenţială, Editura Politehnica, 2001;
3. I.-C. Lazăr, Algebră Liniară, Cluj University Press, 2013;
4. I.-C. Lazăr, Lineare Algebra, Analytische Geometrie, Kurven und Flaechen, Editura Politehnica, 2014

8.2 Applied activities [13]	Number of hours	Teaching methods
Vector spaces, vector subspaces, generating systems, linear independence, bases, dimension, change of bases	4	Exercises, discussion, problematizing, explanation, case analysis, e-mail, electronic resourses
Linear mappings, the matrix associated to a linear mapping with respect to two bases, the kernel and the image of a linear mapping	4	
Eigenvalues and eigenvectors of a linear operator, diagonalization, characteristic polynomial, eigenspace of a linear operator	2	
Euclidean vector spaces, dot product, orthonormal bases, Gramm-Schmidt orthonormalization procedure, orthogonal projection of a vector onto a subspace	2	
Bilinear forms and quadratic forms	2	
Vectors, dot product, cross product, triple product	2	
The line and the plane, metric problems involving angles and distances, the sphere and the circle in space, conics and quadrics	6	
The differential geometry of curves, the representaion of a plane curve and of a curve in space, Frenet's frame	3	
The differential geometry of surfaces, the representation of a surface, normal plane and tangent at a point	3	

1. Bibliography [14] 1. C. Udrişte, Probleme de algebră liniară, geometrie analitică şi diferenţială, Editura didactică şi pedagogică, Bucureşti, 1976;
2. D. Rendi, I. Mihuţ, Algebră Liniară, Geometrie Analitică şi Diferenţială, Editura Politehnica, 2001;
3. I.-C. Lazăr, Algebra Liniara, Cluj University Press, 2013;
4. I.-C. Lazăr, Lineare Algebra, Analytische Geometrie, Kurven und Flaechen, Editura Politehnica, 2014

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- The content of the discipline ensures the knowledge of algebra and geometry which are necessary to solve specific engineerical problems

10. Evaluation

[12] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[13] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[14] At least one title must belong to the discipline team.

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Knowing the main notions and results. Knowing the proofs of the main theoretical results. Applying the theoretical results in solving concrete problems	Exam	2/3
10.5 Applied activities	**S:** Solving some concrete problems using the results presented during the lecture	A test given during the problem session (at the end of the semester). Each homework and activity is graded 0.25 points. These points are being added to the grade obtained at the test.	1/3
	L:		
	P[16]**:**		
	Pr:		

10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [17])

- The definitions of the basic notions, the main theoretical results, the ability of applying these results in solving simple problems
- Identifying and selecting the methods for solving concrete simple problems
- Concretely, the minimal performance standards are referring to:
- 1. Finding out whether a system of vectors is a basis for a subspace or not
- 2. Finding the kernel and the image of a linear mappping
- 3. Finding the eigenvalues and the eigenvectors of a linear operator
- 4. Finding the equation of a line and of a plane
- 5. The intersection of a sphere and a plane
- 6. The representation of a plane curve and of a curve in space
- 7. The representation of a surface

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
06.07.2023		
Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.2023	

[15] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

[16] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.

[17] It will not explain how the promotion mark is awarded.

[18] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.