SYLLABUS

1. Information about the program

1.1 Higher education institution	Politehnica University Timisoara
1.2 Faculty[1]/ Department [2]	Chemical Engineering, Biotechnologies and Environmental Protection / Mathematics
1.3 Field of study (name/code[3])	Chemical Engineering / 10.30.50
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	Chemical Engineering / 10.30.50.60 /engineer

2. Information about the discipline

2.1 Name of discipline/ formative category[4]	Algebra and Geometry / DF						
2.2 Coordinator (holder) of course activities	Lect. dr. Nicolae LUPA						
2.3 Coordinator (holder) of applied activities[5]	Lect. dr. Nicolae LUPA						
2.4 Year of study[6]	I	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DI

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
		hours of individual study after manual, course support, bibliography and notes			1.14
		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			14
		hours of individual study after manual, course support, bibliography and notes			16
		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				

4. **Prerequisites** (where applicable)

4.1 Curriculum	• NA
4.2 Competencies	• Basic knowledge of high school algebra

[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.

5. **Conditions** (where applicable)

5.1 of the course	• A large classroom with whiteboard, enrollment of the students to the course in CV.
5.2 to conduct practical activities	• A classroom with whiteboard, enrollment of the students to the course in CV.

6. **Specific competencies** acquired through this discipline

Specific competencies	• Using some mathematical concepts and techniques in the approach of some specific problems from Chemistry. • Applying mathematical modeling on engineering problems.
Professional competencies ascribed to the specific competencies	• . - Analyse production processes for improvement; • - Manage chemical testing procedures; • - Test materials; • - Write technical reports • -Performs chemical experiments • -Approve engineering design • -Assess environmental impact

Transversal competencies ascribed to the specific competencies

- - Conduct quality control;
- - Apply scientific, technological and engineering knowledge;
- - Uses equipment, instruments or technological equipment accurately.

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

7.1 The general objective of the discipline	• Developing the ability of logical thinking and mathematical modeling.
7.2 Specific objectives	• Emphasizing basic concepts, methods and techniques provided by various chapters from Linear Algebra and Differential Geometry necessary for the design and analysis of mathematical models of real problems/processes specific to the profile.

8. **Content** [10]

8.1 Course	Number of hours	Teaching methods [11]
Matrices. Matrix operations. Determinants. The rank of a matrix.	2	Lectures, explanation, discussion, electronic resources.
Linear systems.	2	
(Reduced) row echelon form of matrices. Gauss/Gauss-Jordan method.	2	
Vector spaces: definition, properties, examples. Bases. The coordinates of a vector in a basis. The transition matrix between two bases.	4	
Vector subspaces: definition, standard examples. Construction of a basis in a vector subspace.	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.).

Dot product, cross product, orthogonal systems. Orthogonal matrices. Orthonormal bases. Gram-Schmidt process.	4	
Linear transformations. The matrix associated to a linear transformation. Eigenvectors and eigenvalues.	4	
Quadratic forms. Positive/negative definite quadratic forms, undefined quadratic forms.	2	
Lines and planes in 3D. Distance problems and projections.	4	
Curves.	2	

Bibliography [12] 1. N. Lupa, Algebra and Geometry (electronic resources on CV).
2. A. Juratoni, O. Bundău, Exerciții și probleme de algebră liniară, geometrie analitică și diferențială, Ed. Politehnica, Timișoara, 2012.
3. C.D. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2000.
4. D. Poole, Linear Algebra: A Modern Introduction, Cengage Learning, 2006.

8.2 Applied activities [13]	Number of hours	Teaching methods
Exercises and problems to fix the concepts and results studied in the unit courses.	28	Exercises, explanation, case study, discussion, electronic resources.

Bibliography [14] 1. N. Lupa, Algebra and Geometry (electronic resources on CV).
2. A. Juratoni, O. Bundău, Exerciții și probleme de algebră liniară, geometrie analitică și diferențială, Ed. Politehnica, Timișoara, 2012.
3. C.D. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2000.
4. D. Poole, Linear Algebra: A Modern Introduction, Cengage Learning, 2006.

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 topics are taken from prestigious universities in the world, where the program is studied.
- The discipline provides the necessary background for understanding the main disciplines of the program, but also gives the analysis of mathematical models of real problems/processes.

10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Ability to correctly use the notions and methods presented in the unit courses.	Written exam.	0.66
10.5 Applied activities	**S:** Understanding the issues covered in the unit courses.	Two tests. The activity during the semester is also important.	0.34
	L:		

[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.
[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.)

	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 ability to solve a linear system of small dimensions.
- The ability to determine a basis in a vector subspace.
- The ability to identify orthogonal vectors.
- The ability to determine the eigenvalues of a 2X2 matrix.
- The ability to identify the direction of a line and the normal of a plane.

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
	Lect. dr. Nicolae LUPA	Lect. dr. Nicolae LUPA
Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
Conf. univ. dr. Tudor BÎNZAR		Ș.L. dr. ing. Mircea Laurențiu DAN

[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.