COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	POLITEHNICA University of Bucharest
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Telecommunications
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License (engineering)
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications (TSTeng)

2. Course identification information

2.1 Name of the course				Algebra and Geometry			
2.2 Lecturer				Assoc. Prof. Irina Meghea			
2.3 Instructor for practical activities				Assoc. Prof. Irina Meghea			
2.4 Year of studies	I	2.5 Semester	I	2.6 Evaluation type	Exam	2.7 Course choice type	Compulsory

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	3	3.3 practical activities	1
3.4 Total hours in the curricula, out of which	56	3.5 course	42	3.6 practical activities	14

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	50
Supplemental documentation (library, electronic access resources, in the field, etc)	6
Preparation for practical activities, home works, essays, portfolios, etc.	15
Tutoring	0
Examinations	3
Other activities	0

3.7 Total hours of individual study	74
3.9 Total hours per semester	130
3. 10 Number of ECTS credit points	4

4. Prerequisites (if applicable)

4.1 curricular	Introductory notions on linear algebra: matrices, determinants, systems of linear equations; algebraic structures: groups, rings, fields
4.2 competence-based	No appropriate

5. Requisites (if applicable)

5.1 for running the course	No appropriate
5.2 for running of the applications	No appropriate

6. Specific competences

Professional competences	In accordance with C1 and C2. Accumulation of knowledge on basic linear algebra, analytic geometry and differential geometry need to the technical higher education, particularly notions need to provide a deeper understanding of specialty disciplines.
Transversal competences	In accordance with CT1. Development skills to approach and solve any scientific problems by widening horizon and reasoning capacity conferred by mathematics on an early development stage of the student.

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	Fundamental discipline need in approaching any specialty approaching. Presentation of main chapters of linear algebra, analytic geometry, differential geometry with focus on further specialization.
7.2 Specific objectives	Ability to use the abstract reasoning and of calculus techniques with accent on its correct finalization, not only to have an idea about it, since an engineer should to solve a problem until the end.

8. Content

8.1 Lectures	Teaching techniques	Remarks
Matrices, determinants, systems of linear equations	Teaching is based on presentations at the blackboard, in a permanent discussion with the students in order to involve them in clarification of notions and applications. Lecture materials are the notes and the presentations and three books of theory and solved and proposed problems.	2 hours
Algebraic structures. Elements of the theory of finite groups		2 hours
Vector spaces. Linear dependence and linear independence		8 hours
Eigenvalues, eigenvectors. Diagonalization. Localization of the eigenvalues		4 hours
Linear maps and associated matrices. Special types of linear operators		3 hours
Matrix analysis. Jordan matrix. Jordan basis		2 hours
Normed spaces. Hilbert spaces. Matricial norm. Gram - Schmidt method		3 hours
Bilinear forms. Quadratic forms. Canonical form. Classification		4 hours
Vector products. Mixed products. Straight line and plane in space		3 hours

Conics and quadrics. Geometrical representation		3 hours
Differential geometry of curves		4 hours
Differential geometry of surfaces		2 hours
Elements of linear programming		2 hours

Bibliography:

1. C. Meghea, **I. Meghea**, "*Treatise of differential calculus and integral calculus for mathematicians, physicists, chemists and engineers in ten volumes*", Old City Publishing, Philadelphia, Éditions des Archives Contemporaines, Paris, vol. 1-3 – 2013, vol. 4-8 – 2014, vol. 9-10 – 2015;
2. C. Meghea, **I. Meghea**, "*Tratat de calcul diferenţial pentru invăţământul politehnic*", Vol. I – Editura Tehnică, Bucureşti, 1998, Vol. II – Editura Tehnică, Bucureşti, 2000, Vol. III – Printech 2002
3. **I. Meghea**, "*Lessons of algebra and geometry*", Editura Politehnica Press, Bucureşti, 2017
4. **I. Meghea**, "*Lecţii de Algebră şi Geometrie*", Editura Politehnica Press, Bucureşti, 2012
5. http://electronica.curs.pub.ro/2016/mod/forum/view.php?f=38

8.2 Practical applications	Teaching techniques	Remarks
Matrices, determinants, systems of linear equations. Algebraic structures	Propose problems, explain the calculus methods and involve the students in discussions and the solutions of the exercises by work to the blackboard. Give homework with solved and proposed problems. Learning materials: three books which present and explain the theory, containing solved and proposed exercises.	2 hours
Vector spaces. Linear dependence and independence		2 hours
Eigenvalues. Eigenvectors. Diagonalization		2 hours
Linear maps and associated matrices. Euclidean vector spaces. Gram - Schmidt method		2 hours
Bilinear forms. Quadratic forms. Conics and quadrics		2 hours
Analytic geometry in plane and in space		2 hours
Differential geometry of curves and surfaces		2 hours

Bibliography

1. **I. Meghea**, "*Lecţii de Algebră şi Geometrie*", Editura Politehnica Press, Bucureşti, 2012
2. **I. Meghea**, "*Lessons of Algebra and Geometry. Theory and applications*", Politehnica Press, Bucureşti, 2017
3. http://electronica.curs.pub.ro/2016/mod/forum/view.php?f=38

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

As a result of modern evolution in sciences and techniques, in natural sciences and generally in any modeling of real phenomena, mathematics is compulsory. Contribution of this discipline should be considered as fundamental and have to be highlighted the way how the specialty study is necessary and how it complies with specific elements of training in this faculty.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- to know the fundamental theoretical notions - the capacity to apply the theoretical knowledge in some applications and the possibility to solve problems	- partial exam (weight 20%) established from the beginning of the semester - final exam (written), weight 50% The subjects to both verifications cover all the matter. - homework (weigh 10%)	80%
10.5 Practical applications	Starting from a summary of the notions and basic results, apply them in exercises and solve problems	- a verification test (10%) - a permanent quantification of the student activity at practical applications (10%)	20%
10.6 Minimal performance standard: To obtain 50 points from the total of 100 possible points.			

Date	Lecturer	Instructor for practical activities
25.09.2017	Lect. Irina Meghea, PhD	Lect. Irina Meghea, PhD

Date of department approval	Director of Department
26.09.2017	Prof. Mircea Olteanu, PhD