Zał. nr 5 do ZW 16/2020

FACULTY ELECTRONICS

SUBJECT CARD

Name of subject in Polish:	**Matematyka – Algebra**
Name of subject in English:	**Math – Algebra**
Main field of study (if applicable):	**Electronic and Computer Engineering**
Specialization (if applicable):	**……..**
Profile:	**academic**
Level and form of studies:	**1 st level/ full-time**
Kind of subject:	**university - wide**
Subject code:	**MAT001654**
Group of courses:	**YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	120	90			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course	x				
Number of ECTS points	**8**				
including number of ECTS points for practical (P) classes		3			
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1	1			

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Recommended knowledge of mathematics equivalent to graduating from high school at the advanced level

SUBJECT OBJECTIVES

C1. Opanowanie podstawowej wiedzy i umiejętności w zakresie logiki matematycznej i teorii mnogości

C2. Opanowanie podstawowej wiedzy i umiejętności z geometrii analitycznej w przestrzeni.

C3. Opanowanie podstawowej wiedzy i umiejętności w zakresie liczb zespolonych.

C4. Poznanie podstawowych pojęć rachunku macierzowego z zastosowaniem do rozwiązywania układów równań liniowych.

C5. Opanowanie podstawowej wiedzy i umiejętności w zakresie wielomianów i funkcji wymiernych

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge: Student..
PEU_W01 has a basic knowledge of mathematical logic and set theory
PEU_W02 has a basic knowledge of analytic geometry on a plane and in space,
PEU_W03 knows the properties of complex numbers
PEU_W04 has a basic knowledge of linear algebra, knows matrix methods of solving of linear equations systems
PEU_W05 has knowledge of polynomial and rational functions, knows the basic theorem of algebra
relating to skills: Student
PEU_W01 able to use the knowledge of mathematical logic and set theory
PEU_U02 able to determine the equation of surfaces and line in space and use vector calculus in the geometrical construction
PEU_U03 can perform calculations using various forms of complex numbers
PEU_U04 can use the matrix calculus, calculate determinants and solve systems of linear equations using linear algebra methods
PEU_U05 can decompose polynomial and rational function into partial fractions
relating to social competences:
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PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1-3	INTRODUCTION TO MATHEMATICS. Mathematical logic and set theory	6
Lec 4,5	ANALYTICAL GEOMETRY ON A PLANE. Vectors on the plane. Operations on vectors. Dot product. Orthogonality. Equations of the line (in traditional, directional, parametric forms). Terms of parallel and perpendicular lines. Distance from a point to a line. Parabola, ellipse, hyperbole	4
Lec 6	ANALYTICAL GEOMETRY IN SPACE. Cartesian coordinate system. Adding vectors and vector multiplication by a number. The length of the vector. Dot product. The angle between the vectors. Three vectors in space. Cross product. Area and volume calculations using vectors. Non-Cartesian coordinate systems	2
Lec 7,8	COMPLEX NUMBERS. Operations, exponential and trigonometric forms.	4
Lec 9	MATRICES. The definition of a matrix. Matrix multiplication by a number. Matrix operations. Properties of matrix operations. Transposing a matrix. The types of matrix (unit, diagonal, symmetric, etc.).	2
Lec 10,11	DETERMINANTS. Definition of determinant - Laplace expansion. Determinant of transposed matrix. Elementary transformations of determinant. Cauchy theorem Inverse matrix.	4
Lec 12,13	SYSTEMS OF LINEAR EQUATIONS. The system of linear equations. Cramer's rule. Homogenous system. Solving of arbitrary systems of linear equations. Gauss elimination - transformation of a matrix to upper triangular. Solving the system with triangular matrix.	4

	Plane. General and parametric equation. Normal vector to the plane. The angle between the planes. The mutual position of the surfaces. Line in space. Line as intersection of two planes. Parametric equation of a line. The direction vector. The point of intersection of the plane and line. Skew lines. Distance of a point to a plane and line.	
Lec 14,15	POLYNOMIALS. Operations on polynomials. Polynomial root. Bezout theorem. The fundamental theorem of algebra. Linear and quadratic factors of Polynomial. Rational function. Real simple fractions. Decomposition of rational function into partial fractions.	4
	TOTAL	**30**
Classes		**Number of hours**
Cl 1	INTRODUCTION TO MATHEMATICS. Mathematical logic and set theory	4
Cl 2	ANALYTICAL GEOMETRY ON A PLANE. Vectors on the plane. Operations on vectors. Dot product. Orthogonality. Equations of the line (in traditional, directional, parametric forms). Terms of parallel and perpendicular lines. Distance from a point to a line. Parabola, ellipse, hyperbole	2
Cl 3	ANALYTICAL GEOMETRY IN SPACE. Cartesian coordinate system. Adding vectors and vector multiplication by a number. The length of the vector. Dot product. The angle between the vectors. Three vectors in space. Cross product. Area and volume calculations using vectors. Non-Cartesian coordinate systems	2
Cl 4	COMPLEX NUMBERS. Operations, exponential and trigonometric forms.	4
..	MATRICES. The definition of a matrix. Matrix multiplication by a number. Matrix operations. Properties of matrix operations. Transposing a matrix. The types of matrix (unit, diagonal, symmetric, etc.).	4
	DETERMINANTS. Definition of determinant - Laplace expansion. Determinant of transposed matrix. Elementary transformations of determinant. Cauchy theorem Inverse matrix.	4
	SYSTEMS OF LINEAR EQUATIONS. The system of linear equations. Cramer's rule. Homogenous system. Solving of arbitrary systems of linear equations. Gauss elimination - transformation of a matrix to upper triangular. Solving the system with triangular matrix. Plane. General and parametric equation. Normal vector to the plane. The angle between the planes. The mutual position of the surfaces. Line in space. Line as intersection of two planes. Parametric equation of a line. The direction vector. The point of intersection of the plane and line. Skew lines. Distance of a point to a plane and line.	4
	POLYNOMIALS. Operations on polynomials. Polynomial root. Bezout theorem. The fundamental theorem of algebra. Linear and quadratic factors of Polynomial. Rational function. Real simple fractions. Decomposition of rational function	4

	into partial fractions.	
	Resume	2
	TOTAL	**30**

TEACHING TOOLS USED
N1.Chalkboard N2.Consultations N3. Self-education

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 – PEU_W04	Writen exam
F2	PEU_U01 - PEU_U04	Test
P = P = (0.51*F1+0.49*F2); F1 i F2 must be positive		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] S. Lipschutz, M. Lipson, Linear Algebra, McGraw Hill, 5th edition
[2] Robert A. Beezer, A First Course in Linear Algebra
[3] M. Spiegel, S. Lipschutz, Vector Analysis, McGraw Hill
[4] M. Spiegel, S. Lipschutz, Complex Variables, McGraw Hill

SECONDARY LITERATURE:

[5] T. Huskowski, H. Korczowski, H. Matuszczyk, Algebra liniowa, Wydawnictwo Politechniki Wrocławskiej, Wrocław 1980.
[6] T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2011.
[7] T. Jurlewicz, Z. Skoczylas, Algebra liniowa. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2005.
[8] J. Klukowski, I. Nabiałek, Algebra dla studentów, WNT, Warszawa 2005.
[9] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. A, PWN, Warszawa 2003.
[10] .T. Trajdos, Matematyka, Cz. III, WNT, Warszawa 2005
[11] G. Banaszak, W. Gajda, Elementy algebry liniowej, część I, WNT, Warszawa 2002
[12] B. Gleichgewicht, Algebra, Oficyna Wydawnicza GiS, Wrocław 2004.
[13] T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna.. Definicje, twierdzenia i wzory. Oficyna Wydawnicza GiS, Wrocław 2011.
[14] T. Jurlewicz, Z. Skoczylas, Algebra liniowa. Definicje, twierdzenia i wzory. Oficyna Wydawnicza GiS, Wrocław 2005.
[15] E. Kącki, D.Sadowska, L. Siewierski, Geometria analityczna w zadaniach, PWN, Warszawa 1993
[16] F. Leja, Geometria analityczna, PWN, Warszawa 1972

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)