STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mathematics II		**1010331211010341489**
Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**English**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **30** Classes: **30** Laboratory: **-** Project/seminars: **-**		**6**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
(brak)	**(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)
the sciences		**100 6%**
Mathematical sciences		**100 6%**

Responsible for subject / lecturer:

dr hab. inż. Paweł Kolwicz
email: pawel.kolwicz@put.poznan.pl
tel. 61 665 2802
Faculty of Electrical Engineering
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Mathematical knowledge from the secondary school
2	**Skills**	Ability to solve problems and mathematical modeling at the level of secondary school
3	**Social competencies**	Awareness of the need to broaden their competences, willingness to work together as a team

Assumptions and objectives of the course:

1. Learning algebraic structures and method of classical and linear algebra.
2. Learning the methods and applications of analytic geometry.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. has knowledge of complex numbers, operations with complex numbers, complex numbers form and their applications - [K_W01]
2. has knowledge of the roots of polynomials, also in the set of complex numbers - [K_W01]
3. has knowledge of the matrix, operations on matrices, determinants of matrices, inverse matrix calculation, the use of matrix to solve systems of linear equations - [K_W01]
4. has knowledge of basic algebraic structures - monoids, groups, rings and fields - [K_W01]
5. has knowledge of n-dimensional vector space, database space, database changes, eigenvalues of matrix - [K_W01]
6. has knowledge of the operations on vectors in three-dimensional space, the basic geometric creations - a line, planes, quadrics - [K_W01]

Skills:

1. Can operate on complex numbers, can find certain types of complex roots of polynomials - [K_U05]
2. can perform operations with matrices, can find an inverse matrix using elementary operations method, calculate the determinant of a matrix, solve the system of linear equations using Gaussian method of elimination - [K_U05]
3. is able to recognize the algebraic structures, can apply the structure of monoid and group to describe the state of semi-automaton and automaton - [K_U05]
4. can determine the dimension of space and linear subspace, can solve the matrix eigenvalue problem. - [K_U05]
5. can perform operations on vectors in three-dimensional space and apply the methods of vector calculus to describe lines and planes. It can classify surfaces of the second degree (quadrics). - [K_U05]

Social competencies:

1. He can think and act precisely in the area of process description in technical sciences - [K_K04]

Assessment methods of study outcomes

Lecture

assess the knowledge and skills listed on the written exam including the theoretic part of the subject

Classes:

-testing and rewarding of knowledge needed for solving posed problems (solving tasks),

-assessment of knowledge and skills - tests,

-the activity during classes causes the upgrade of the classes evaluation.

Course description

Actualization 2018/2019.

Relations. Complex numbers and their applications. Calculus matrix and its application in solving systems of linear equations. Algebraic structures: monoids, infinite and finite groups, rings, fields. Vector spaces (n-dimensional), linear space, linear transformations, analytical geometry of 3-dimensional space: plane, straight line, surfaces.

The applied methods of education:

-lectures

1. lecture led in interactive way with questions formulating to group,
2. the students' activity is taken into account during the final evaluation (the preparation of historical reports connected with the mathematicians' related to material),
3. in track of lecture initiating the discussion,
4. theory presented with connections of current knowledge from previous lectures.

-classes

1. solving on board example tasks,
2. detailed the reviewing by leader the solutions of tasks of practice and the discussions over comments,
3. the students' activity is taken into account during the final evaluation.

Basic bibliography:

1. Fraleigh, John B., Calculus with analytic geometry, Addison-Wesley. Addison-Wesley, cop. 1980.
2. Bodewig, Ewald, Matrix calculus, North-Holland, 1956.
3. Edelen, Dominic G. B., Kydoniefs, Anastasios D., An Introduction to linear algebra for science and engineering, Elsevier, 1976.
4. Hartfiel, Darald J., Hobbs, Arthur M., Elementary linear algebra, Prindle, Weber & Schmidt, c1987.
5. Nering, Evar D., Linear algebra and matrix theory, John Wiley and Sons, Inc., 1963.
6. S. Przybyło, A. Szlachtowski, Algebra i wielowymiarowa geometria analityczna w zadaniach, WNT Warszawa 1994 (i późniejsze),
7. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1, Wrocław 2003.
8. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2, Wrocław 2005.

Additional bibliography:

1. Anton, Howard, Calculus with analytic geometry, John Wiley & Sons, 1989.
2. Brown, William C., A Second Course in Linear Algebra, John Wiley, 1987.
3. Kolman, Bernard, Introductory linear algebra with applications, Macmillan Publishing Co., 1976.
4. Nicholson, W. Keith., Elementary linear algebra with applications, Prindle, Weber & Smith, 1986.
5. Brown, William C., A second course in linear algebra, John Wiley & Sons, cop. 1988.
6. Chih-Han Sah., Abstract algebra, New York ; London : Academic Press, cop. 1967.
7. M. Grzesiak, Liczby zespolone i algebra liniowa, Wydawnictwo PP, Poznań 1999,
8. A. I. Kostrykin, Wstęp do algebry, cz.1 Podstawy algebry, PWN, Warszawa 2004.
9. A. I. Kostrykin, Wstęp do algebry, cz.2 Algebra liniowa, PWN, Warszawa 2004.
10. A. I. Kostrykin, Zbiór zadań z algebry, PWN, Warszawa 2005.

Result of average student's workload

Activity	Time (working hours)
1. Lecture	30
2. Classes	30
3. Exam and consultation	10
4. Preparing to classes	40
5. Preparing to exam	30

Student's workload

Source of workload	hours	ECTS
Total workload	140	6
Contact hours	70	3
Practical activities	70	3