Kielce University of Technology

FACULTY OF MECHATRONICS AND MECHANICAL ENGINEERING

4Annex 9
to the Rector's Ordinance No. 35/19
of 12 June 2019

COURSE SPECIFICATION

Course code	**M#1-S1-ME-101**
Course title in Polish	**Algebra liniowa**
Course title in English	**Linear Algebra**
Valid from (academic year)	**2019/2020**

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**first-cycle**
Type of education	**academic**
Mode of study	**full-time**
Specialism	**all**
Department responsible	**Department of Manufacturing Engineering and Metrology**
Course leader	**dr inż. Paweł Łabędzki**
Approved by	

COURSE OVERVIEW

Course type	**basic**
Course status	**compulsory**
Language of instruction	English
Semester of delivery	**semester 1**
Pre-requisites	**None**
Examination required (YES/NO)	YES
ECTS value	**4**

Mode of instruction	**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	**20**	**20**			

LEARNING OUTCOMES

Category of outcome	Out-come code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Student knows complex numbers and the basics of matrix and vector calculus. Knows selected methods of solving systems of linear equations. Student has knowledge of the basic concepts of analytical geometry. He knows the basic types of quadricks	MIBM1_W01
Skills	U01	On completion of the course, students will be able to solve polynomial equations in complex numbers. They have the skills required to use the operations and determinants. Student can solve systems of linear equations. Can choose an appropriate method to solve a system of equations.	MiMB1_U01
	U02	Student is able to solve simple tasks in analytical geometry. Is able to use the vector calculus in practice. Can sketch graphs of basic quadricas.	MiMB1_U01
Competence	K01	The student understands the need for continuous training and improvement of their competences in the field of mathematical methods used to solve typical engineering problems. He can complete and improve the acquired knowledge and skills in the field of methods of solving equations and systems of linear equations, matrix calculus, vector calculus.	MiBM1_K06
	K02	Is aware of responsibility for their own work and is able to submit to the rules of teamwork.	MiBM1_K04

COURSE CONTENT

Type of instruction*	Topics covered
lecture	Complex numbers. Geometric interpretation of a complex number. Operations in a set of complex numbers. Modulus and argument of a complex number. Algebraic, trigonometric and exponential form of a complex number. The de Moivre and Euler formulas. Root of a complex number. Geometric interpretation of the root value of a complex number. Solving polynomial equations in the complex domain. Matrices. Types of matrices. Matrix algebra. Determinant. Properties and calculation of determinants. Laplace expansion. Inverse matrix. Matrix equations. Systems of linear equations. Matrix form of a system of equations. Cramer's formulas. Gauss elimination method. Vectors. Actions on vectors. Scalar, vector and mixed product. Elements of analytical geometry on a plane. Elements of analytical geometry in space: straight and plane. Mutual position of points, lines and planes in space. Quadriki. Canonical form and graphs of the fundamental surfaces of the second degree
class	Geometric interpretation of a complex number. Operations in a set of complex numbers. Representing a complex number in trigonometric form. Exponentiation of a complex number. Finding the root of a complex number. Solving polynomial equations in the complex domain. Matrix operations. Calculation of markers. Matrix inversion. Solving matrix equations. Solving systems of linear equations using Cramer's formulas. Solving systems of linear equations using Gaussian elimination. Actions on vectors. Scalar, vector and mixed product. Determining the plane and line equations. Investigation of the mutual position of points, lines and planes in space. Quadriki. Canonical form and graphs of the fundamental surfaces of the second degree.

ASSESSMENT METHODS

Outcome code	Methods of assessment *(Mark with an X where applicable)*					
	Oral examination	Written examination	Test	Project	Report	Other
W01		x				
W02		X				
U01		X				
U02		X				
U03		X				
K01						X
K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction*	Assessment type	Assessment criteria
lecture	**examination assessment**	*The pass mark is a minimum of 50% for all the in-class tests.*
class	non-examination assessment	*Class attendance. The pass mark is a minimum of 50% for all the in-class tests.*

OVERALL STUDENT WORKLOAD

ECTS weighting								
	Activity type	**Student workload**					**Unit**
1.	Scheduled contact hours	L	C	Lab	P	S	h
		20	20				
2.	Other contact hours (office hours, examination)	4	2				h
3.	**Total number of contact hours**	**46**					h
4.	**Number of ECTS credits for contact hours**	**1,8**					ECTS
5.	**Number of independent study hours**	**54**					h
6.	**Number of ECTS credits for independent study hours**	**2,2**					ECTS
7.	**Number of practical hours**	**50**					h
8.	**Number of ECTS credits for practical hours**	**2,0**					ECTS
9.	**Total study time**	**100**					h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**4**					ECTS

READING LIST

1. Gdowski B., Pluciński E., Zadania z rachunku wektorowego i geometrii analitycznej, PWN, Warszawa 1982.
2. Hożejowska S., Hożejowski L., Maciąg A., Matematyka w zadaniach dla studiów ekonomiczno-technicznych, Wydawnictwo Politechniki Świętokrzyskiej, Kielce 2005.

3. Jurlewicz T., Skoczylas Z., Algebra liniowa 1. Definicje, twierdzenia, wzory, Oficyna wydawnicza GiS, Wrocław 2004.
4. Tarnowski S., Wajler S., Matematyka w zadaniach cz.II. PŚk. Kielce
5. Trajdos T., Matematyka. Cz. 3, WNT, Warszawa 1987.
6. Wstęp do matematyki, red. A Płoski, Wydawnictwo Politechniki Świętokrzyskiej, Kielce 1995.
7. Skrypt z Algebry: http://wzimk-moodle.tu.kielce.pl/