

## SYLLABUS OF A MODULE (№ E5400)

Polish name of a module	<b>Elementy Matematyki Wyższej</b>
English name of a module	<b>Elements of Higher Mathematics</b>
ISCED classification - Code	0541
ISCED classification - Field of study	<i>Mathematics</i>
Languages of instruction	<i>English</i>
Level of qualification:	<i>1</i>
Number of ECTS credit points	<i>6</i>
Examination:	<i>EW</i>

### Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
30	45	0	0	0	0

## MODULE DESCRIPTION

### Module objectives

- O1. To introduce to the basics of linear algebra, to number sequence and number series theory, and differential calculus of one variable.
- O2. To acquire the ability to perform operations on matrices and vectors, to solve the systems of linear equations, to analyse convergence of sequences and number and function series, and differential functions of one variable and to use basics of linear algebra and calculus.

### PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge on linear algebra and calculus.
2. Knowledge on solving the elementary algebraic equations, operations on functions, calculations of easy limits of functions and sums of arithmetic and geometric sequences.

### LEARNING OUTCOMES

- LO 1 – Knowledge on the basics of linear algebra, properties of operations on vectors and matrices, properties of a determinant and a rank of matrix, systems of linear equations.
- LO 2 – Knowledge on definitions and convergence tests of number series and sequences; Knowledge on the basic concepts, theorems, and applications of differential calculus of one variable.
- LO 3 – Ability to perform operations on matrices and vectors, to calculate a determinant and a rank of a matrix, and an inverse of a matrix, to solve systems of linear equations with using Cramer theorem and Kroncker-Capelli theorem.
- LO 4 – Ability to analyse convergence of number sequences and series; to calculate limits of functions and to find asymptotes; to calculate derivatives of first and higher orders of a function and apply them; to sketch the graphs of functions.

## MODULE CONTENT

Type of classes – lecture	Number of hours
Lec 1 - Matrices and determinants	2
Lec 2 - Inverse of a matrix. Applications	2
Lec 3 - Rank of a matrix	2
Lec 4 - Systems of linear equations	2
Lec 5 - Number sequences	2
Lec 6 - Number series	2
Lec 7 - Limits of functions	2
Lec 8 - Asymptotes	2
Lec 9 - Continuity	2
Lec 10 - Differentiation	2
Lec 11 - Applications of first differentiation	2
Lec 12 - Higher order derivatives. Applications	2
Lec 13 - Sketching graphs of functions	2
Lec 14 - Taylor formula	2
Lec 15 - Function series	2
<b>Sum</b>	<b>30</b>
Type of classes– exercises	Number of hours
Ex 1 - Matrices and determinants	3
Ex 2 - Inverse of a matrix. Applications	3
Ex 3 - Rank of a matrix	2
Ex 4 - Systems of linear equations	4
Ex 5 - Number sequences	3
Ex 6 - Number series	3
Ex 7 - Limits of functions	3
Ex 8 - Asymptotes	3
Ex 9 - Continuity	2
Ex 10 - Differentiation	3
Ex 11 - Applications of first differentiation	4
Ex 12 - Higher order derivatives. Applications	3
Ex 13 - Sketching graphs of functions	3
Ex 14 - Taylor formula	3
Ex 15 - Function series	3
<b>Sum</b>	<b>45</b>

## TEACHING TOOLS

1. - lecture with using multimedia presentations
2. - exercises

## WAYS OF ASSESSMENT ( F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - assessment of activity during classes
S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *

## STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
<b>1. Contact hours with teacher</b>		
1.1	Lectures	30
1.2	Tutorials	45
1.3	Laboratory	
1.4	Seminar	
1.5	Project	
1.6	Consulting teacher during their duty hours	5
1.7	Examination	3
Total number of contact hours with teacher:		83
<b>2. Student's individual work</b>		
2.1	Preparation for tutorials and tests	30
2.2	Preparation for laboratory exercises, writing reports on laboratories	
2.3	Preparation of project	
2.4	Preparation for final lecture assessment	20
2.5	Preparation for examination	
2.6	Individual study of literature	10
Total number of hours of student's individual work:		60
Overall student's workload:		143
<b>Overall number of ECTS credits for the module</b>		6
Number of ECTS points that student receives in classes requiring teacher's supervision:		3,2
Number of ECTS credits acquired during practical classes including laboratory exercises and projects:		

## BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Farlow J., Hall J.E., McDill J.M., West B.H, Differential Equations & Linear Algebra, Person Education Inc., 2007.
2. Robinson D.J.S, A Course in Linear Algebra with Applications, World Scientific Publishing, 2006.
3. Ian Craw, Advanced Calculus and Analysis MA 1002, University of Aberden, 2000.
4. Trench William F., Introduction to Real Analysis, Pearson Education, 2003.
5. Bittinger Marvin L., Ellenbogen David J., Calculus and its Applications, Pearson International Edition, 2007.
6. M. Klimek, Z. Domański, J. Błaszczuk, Mathematics I, 2009– a handbook in an electronic version

## MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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