Tárgy neve: Mathematics I.	**NEPTUN-code:** RKXMA1EBNF	**Weekly** teaching hours: I+cw+lw 2+2+0	**Credit: 6** **Exam type:e**
Course leader: Aurél Galántai, Dr.Prof	**Position:** professor	**Required preliminary knowledge:-** -	
Assessment: Examination	**Teacher: István Baranyai**	**Language of training: English**	
Place of subject in timetable: Ea: **Tuesday: 9:50 - 11:30** **Tuesday: 11:40 a.m. to 1:20 p.m**	**Nature: Mandatory**		

Curriculum:

The main goal of the course is to introduce the set theory marks and to describe the algebraic and geometric properties of the real number line, complex numerical plane and the three-dimensional space. Additionally, with the help of the concepts of sequences, real functions and convergence to construct univariate differential and integral computing in a way which makes the students capable of solving any technical / mathematical / physical problems that arise in subsequent studies

Topics of lectures: **Detailed schedule of the course:**

	Description
Weeks	
1.	Sets. Natural numbers. Integers. Rationals, real numbers, upper limit. Roots, powers
2.	Trigonometric functions. Complex numbers, algebraic, trigonometric and exponential form. Taking nth roots. Polynomials, rational expressions
3.	Three-dimensional vectors. Vector algebra, vector geometry. Matrices. transpose matrix. Three-dimensional determinants
4.	Real functions. Operations with functions. Polynomial and power functions. Trigonometric and arc functions. Exponential and logarithmic functions. Sketching graphs of functions.
5.	Convergence of real sequences. Monotonic and bounded sequences. Density points.Limit calculation methods. Celebrated sequences. The Eulerian number. Powers of irrational exponents. Limits of type 1^{∞}.
6.	**Limits and continuity of real functions. The concept of differentiation. Equations of tangent and normal lines. The rules of differentiation.**
7.	Solution Test #1 type problems.
8.	Elementary functions and their derivatives. Mean value theorems of differential calculus. Monotonity of differentiable functions. L′Hôpital's rule.
9.	Calculus of extrema. Higher order derivatives. Convexity and inflection. Discussion of real functions.
10.	**The concept of definite integral, its geometrical meaning and basic properties. Primitive functions, indefinite integral.**
11.	**Newton−Leibniz formula. Fundamental integrals. Integration by parts and by substitution**
12.	**Arc-length, area. Revolution surfaces and bodies. Improper integrals. Nujerical integration. Conversation into partial fractions. Integration of rational functions.**
13.	**Solution of Test #2 type problem.**
14.	**Supplementary Test.**

Week	Practical work: Description
1.	**Common denominators. Roots and powers. Quadratic equations. Polynomial division.**
2.	Radian, trigonometric functions. Complex operations in algebraic and trigonometric form
3.	Solving complex equations.
4.	Equations of lines and planes. Fitting space elements, distances and angles between them.
5	Matrix operations, transposition. Thre-dimensional determinants. Real functions
6.	Limit of real sequences.
7.	ZH1+Derivatives, equations of the tangent and normal lines.
8.	L'Hôpital's rule.
9.	Calculus of extrema. Integration by parts. Integration by substitution.
10.	Convexity and inflection.
11.	Basic integrals. Integration by parts.
12.	Definite integral and applications.
13.	ZH2+Integration by substitution.
14.	Solution of problems for the exam

Mid-semester requirements:

Attendance at lectures:

The rules of education and exam directory (TVSZ) are the guidelines.

Exams and tests (types, data)

Written Test#1(week #7),

Written Test#2(week13): both for max. 30 pts.

Requirements for qualification:

Signature can be obtained if the sum of the two tests is greater than or equal to 30 pts. In the opposite case a supplementary test from the material of the two tests on week #14, and (if required) one more possibility on the 2nd week exam session, with similar percents

Type of exam (written, oral, tests etc.) and the method of assessment:

Attendance at classes: mandatory.

Locks, records, reports, etc. (number, date):

1.ZH. (7th week): Complex equation. Polynomial division. Vector geometry problem. Matrix Operations/Determinant. Functions are elementary

properties. Limit of series. (20 points)

2. ZH. (Week 13): Tangent/normal equation. Application of L'Hôpital's rule. Extreme value calculation. Convexity test. Partial Integration. Area calculation. (20 points)

Method of obtaining signature:
40% of the total score of the two ZH
Signature replacement for the two zh. material in the 11th week and/or the 2nd week of the exam period.

Type of exam (written, oral, tests etc.) and the method of assessment:

Written exam from the material of the whole semester for max. 26 pts.
Marking:

22-26: excellent (5)
18-21: good (4)
14-17: satisfactory (3)
10-13: pass (2)
0 - 9: fail (1)

Az elsajátítandó szakmai kompetenciák:
Ismeri a környezetvédelmi szakterület műveléséhez szükséges általános és specifikus matematikai, természet– és társadalomtudományi elveket, szabályokat, összefüggéseket. Nyitott a szakmájához kapcsolódó, de más területen tevékenykedő szakemberekkel való szakmai együttműködésre. Multidiszciplináris ismereteik révén alkalmasak a mérnöki munkában való alkotó részvételre, képesek alkalmazkodni a folyamatosan változó követelményekhez.
Irodalom:
Thomas féle kalkulus 3. Typotex, 2007 Kovács J. – Takács G. – Takács M.: Analízis, Tankönyvkiadó 1986. Scharnitzky V.: Vektorgeometria és lineáris algebra, Nemzeti Tankönyvkiadó, 2000. Scharnitzky V. (szerk): Matematikai feladatok, Tankönyvkiadó, 1989. Szász G.: Matematika III, Tankönyvkiadó, 1989.
Megjegyzés: Konzultációs időpontok megbeszélés szerint