Course description, Requirements

Óbuda University Bánki Donát Faculty of Mechanical and Safety Engineering	Institute of Natural Sciences and Basic Subjects (TAI)

Course title and code: Mathematics I, BTXMME1BNF **Credits: 5**

Full-time, semester 1.

Faculties in which the subject is taught: **Mechatronics engineer, BSc**

Supervised by:	**Dr. Hanka László**	Instructors:	**Zsombor Szilágyi**
Prerequisites conditions:	-		

Lessons per week:	Theory: 2	Practice (in Auditorium): 2	Laboratory: 0	Consultation:
Exam type (s,v,f):	exam			

Syllabus

Aim: The purpose of the lecture is to present efficient mathematical tools that can be successfully applied in engineering sciences. In the framework of the practice lessons, the students deepen their knowledge through practical tasks, thereby becoming able to solve complex engineering problems at the end of the semester.

Curriculum: Elementary algebra, Polynomials, Trigonometry, vector geometry, Complex algebra, Functions, Sequences, Limit, Differentiation and its applications.

Topics:	**Lec.**	**Lab.**
1. Elementary algebra, exponentiation, root extraction, application of identities. Solving equations. Logarithms and their identities. Calculations with logarithms, solving equations. The logarithmic function.	**2**	**2**
2. Polynomials, long division of polynomials, polynomial factorization. Solving higher-degree equations. The binomial theorem and its applications. Binomial coefficients and their properties, Pascal's triangle.	**2**	**2**
3. Trigonometric functions of acute and general angles, trigonometry. Trigonometric identities, addition formulas, trigonometric equations. Trigonometric functions.	**2**	**2**
4. Vector geometry in 3D, basic vector operations. Scalar/dot/inner product, vector/cross product, mixed/scalar-triple product. Calculations using coordinates. Geometric applications.	**2**	**2**
5. Analytic geometry. Equations of geometric figures. Equation of a plane, system of equations of a line.	**2**	**2**
6. Complex algebra. Operations with complex numbers in algebraic, trigonometric, and exponential form. Solving equations.	**2**	**2**
7. Functions, basic concepts. Domain, range, monotonicity, boundedness, parity. Operations with functions. Inverse function, composition of functions.	**2**	**2**
8. Sequences, monotonicity, boundedness, limit. Convergent and divergent sequences. The concept of infinity. Euler’s sequence, interpretation of Euler’s number.	**2**	**2**
9. Limits of functions. Finite and infinite limits at finite and infinite points, one-sided limits. Continuity of functions.	**2**	**2**
10. Definition of the derivative, equation of the tangent line, linear approximation.	**2**	**2**
11. Differentiation rules. Rules for scalar multiples, sums/differences, products, quotients, composite functions, and inverse functions.	**2**	**2**
12. Applications of the derivative, finding extrema, complete function analysis.	**2**	**2**
13. Applications of the derivative, L'Hospital’s rule.	**2**	**2**
14. Applications of the theory.	**2**	**2**

Semester requirements
blitz quizzes, midterm test, exam.

Requirements:

There will be 10 **blitz quizzes**, each worth 2 points. The quiz will always be taken at the beginning of the lesson. Quizzes cannot be retaken, made up, or improved. If you arrive late, you will receive zero points for that quiz.

The **midterm test**: On the 10th week. Its subjects are the topics covered up to the 7th week, only computational problems. On the test you can get 30 points.
The **prerequisite for the signature** is taking the midterm, and taking at least 7 blitz quizzes. In case you missed or failed the midterm test you have to retake on the last week. If you want to improve the midterm, you can retake it on the last week. But the last result will be taken into consideration.
Altogether you can get 50 points during the semester. If you take the midterm and at least 7 quizzes you get a signature, and you can take exam.
If you miss the midterm and its retake and/or you miss more than 3 quiz tests, the course can't be completed, in this case you have to register for the course again in the following year!

If you have a signature, you are free to take the **exam** in the exam period. The exam covers only the topics presented between weeks 8 and 13. On the exam you can get 50 points. The exam is written, only computational problems, the minimum score you have to get in order to pass is 15 points.

The **grade** is determined by the sum of the points you achieved on the tests (midterm and quizzes) and on the exam. The intervals are as follows:

0-49%: fail (1)
50-62%: pass (2)
63-74%: satisfactory (3)
75-87%: good(4)
88-100%: excellent (5)

Exam method: written

Literature:

Mandatory:

Thomas Calculus I-III.; Pearson Addison- Wesley, 2005
Stewart Calculus; Brooks, 2008
Sheldon Ross: A first course in probability, Pearson, 2010
Paul Dawkins: Differential Equations, Prentice-Hall, 2007

Offered: