Assessment and subject description

Óbuda University Kandó Kálmán Faculty of Electrical Engineering		Institute of Microelectronics and Technology		
Subject name and code: **Mathematics I KMEMA11AND** Credits**: 6** **Full time, Autumn Semester** (2016-2017)				
Course: Electrical engineering				
Responsible: Dr. Kovács, Judit		Teaching staff: Schmidt, Edit		
Prerequisites: ---				
Contact hours per week:	Lecture: **2**	Class discussion.: **3**	Lab hours: **0**	Tutorial: **0**
Assessment and evaluation: written examination				

Subject description

Aims: Emphasis is on basic topics of mathematics. Class discussions help students to solve problems in connection with the topics. This course will promote the development of algebraic and analytic skills as well as conceptual understanding.

Topics to be covered: Complex numbers. Linear algebra. Sequences. Real-valued functions of one variable. One-variable calculus.

Topics	Week	Lessons
Complex numbers I. Concept of complex numbers. Introduction of 3 forms of complex numbers. Representation of complex numbers on Argand diagram / the complex plane. Elementary operations in algebraic form.	**1.**	**2+3**
Complex numbers II. Elementary operations in trigonometric and exponential forms. Applications for electricity. *Linear algebra I.* Concept and characteristics of the determinant. Solution of linear equation systems by Cramer's Rule.	**2.**	**2+3**
Linear algebra II. Concept of matrices. Special matrices. Basic operations of matrices. Elementary row operations on matrices. Solution of linear equation systems by Gauss-elimination.	**3.**	**2+3**
Linear algebra III. Rank and inverse of a matrix. Concept of vector spaces. Linear independence. Rank of a system of vectors. Vector subspace. Basis.	**4.**	**2+3**
Linear algebra IV. Concept and characteristics of the *n*-dimensional Euclidean space. Orthonormal bases. Linear transformations and their main characteristics.	**5.**	**2+3**
Test 1.	**6.**	**2+3**
Sequences. Concept of sequences. Bounded sequences, monotonicity, limit of sequences, convergence, divergence. Types of sequences (geometric progression, $\left(1+\frac{1}{n}\right)^n$, etc.). *Real-valued functions of one variable I.* Real-valued functions of one variable. Bounded functions, monotonicity, even and odd functions, periodicity, convexity, points of inflection, local extrema.	**7.**	**2+3**

Real-valued functions of one variable II. Limits of functions on the real line and involving infinity. One-sided limits. Continuity. Limits of extra interest ($\frac{\sin x}{x}, \left(1+\frac{1}{x}\right)^x$, etc.). Elementary functions (polynomials, exponential, trigonometric and hyperbolic functions) and inverses. *Differential calculus I.* Concept of the differential quotient. Geometric and physical meaning. Derivatives of elementary functions. Rules for finding the derivative (constant rule, sum rule, product rule, quotient rule).	**8.**	**2+3**
Differential calculus II. Chain rule and rule for finding the derivative of the inverse function. Mean value theorems. L'Hospital's rule. Higher derivatives. Discussion of functions by using derivatives. Examples.	**9.**	**2+3**
Differential calculus III. More examples for discussion of functions. Optimization problems. Tangent line, velocity, acceleration, etc. Equivalent definitions for the derivative. Connection between differentiability and continuity. *Indefinite integrals I.* Concept of primitive functions and antiderivatives. Properties of antiderivatives. Integrals of basic functions. Techniques of integration: $\int f(ax+b)dx,\ \int f^n \cdot f' dx,\ \int \frac{f'}{f} dx,\ \int f(g(x)) \cdot g'(x) dx.$	**10.**	**2+3**
Holiday.	**11.**	**--**
Indefinite integrals II. Integrals of trigonometric functions. Integration by parts. Integration by substitution.	**12.**	**2+3**
Test 2.	**13.**	**2+3**
Indefinite integrals III. Integrals of rational functions. Partial fractions in integration. *Summary.* *Make-up tests.*	**14.**	**2+3**

Assessment

Students are expected to attend every lectures and class meetings. Students overtaking the possible misses according to Policy (TVSZ) may not be given a signature ("disabled") and there will be no make-up allowed under any circumstances.
Students are expected to take all tests as scheduled below. Students need to achieve at least score 50 from the maximum score 100 and at least score 20 from the maximum score 50 of each tests to obtain signature.
No electronic devices are allowed to be used during any tests.

	Date	**Length**	**Max. score**	**Topics**
Test 1	17th Oct	45 minutes	50	Complex numbers. Linear equation systems. Matrices.
Test 2	5th Dec	45 minutes	50	Differential calculus of real-valued functions with one variable.
Make-up tests	13th Dec	45+45 minutes	50+50	Topics of the corresponding tests.

Make-up tests:
Make-up tests are available only for students not ”disabled”. There are (differently scheduled) make-up tests for both tests as follows:

- Any student who missed one or both test(s) for documented reasons, may take a make-up for the missing test(s).
- Any student who has taken one or both test(s) not achieving the minimum score(s), may take a make-up for the test(s).
- Any student who has taken both tests achieving the minimum scores may take a make-up for the original test with smaller achieved score. In this case the score of the make-up test will be counted, even if it is smaller than the score of the original test. If the achieved score of both original tests are equal, then the student may decide which make-up test to take.

Any students not disabled who could not get the signature in the fall semester may take an overall make-up test once on a scheduled date at the beginning of the examination term. The overall make-up test of the examination term covers topics of both tests 1 and 2 with duration 100 minutes and max. score 100. Students need to achieve at least score 50 from the maximum score 100 and at least 40-40% of both the topics of test 1 and test 2.

Assessment and evaluation: written examination.
Any student may set for the exam only after obtaining the signature for the semester. Exam tests contain problem solving (score 50, duration 60 minutes) and theoretical questions (score 20, duration 15 minutes). No electronic devices are allowed to be used during exams.
Any students achieving less than score 35 will fail. Any students achieving at least score 35 will be given a cumulative score. If the student has taken both make-up tests then the cumulative score is counted by the score of the exam plus score 15. If the student has taken at most one make-up test then the cumulative score is counted by the score of the exam plus 30 % of the score of the tests of the semester. According to the cumulative score the mark of the exam is the following:

Cumulative score	Mark
86 - 100	”excellent” jeles (5)
74 - 85	”good” jó (4)
62 - 73	”fair” közepes (3)
50 - 61	”pass” elégséges (2)
0 - 49	”fail” elégtelen (1)

Recommended reference resources

1. Kovács, J., Schmidt E., Szabó, L.A.: Mathematics, ÓE KVK 2103, Budapest, 2013

2. Kovács, J., Schmidt E.: Mathematics. Problem Solving, E-learning

3. RA Adams, Ch Essex: Calculus: A Complete Course , Publisher: Toronto, Pearson Canada 2009, 973 pages, ISBN 9780321549280

4. Elliott Mendelson: 3000 Solved Problems in Calculus, McGraw-Hill, New-York 2009, 455 pages, ISBN 9780071635349

5. Dr. Baróti Gy. - Kis M. - Schmidt E. - Sréterné dr. Lukács Zs.: Matematika Feladatgyűjtemény, BMF 1190, Bp. 2005

26-06-15

Dr. Kovács Judit (responsible)
Schmidt Edit (lecturer)