Assessment and subject description

<table>
<tr><td colspan="3">Óbuda University
Kandó Kálmán Faculty of Electrical Engineering</td><td colspan="3">Institute of Microelectronics and Technology</td></tr>
<tr><td colspan="6">Subject name and code: Mathematics I KMEMA11ANC, KMEMA11AND
Credits: 6
Autumn Semester 2015-2016</td></tr>
<tr><td colspan="6">Course: Electrical engineering</td></tr>
<tr><td colspan="2">Responsible: Dr. Kovács Judit</td><td colspan="4">Teaching staff: Schmidt Edit</td></tr>
<tr><td>Prerequisites:</td><td colspan="5">---</td></tr>
<tr><td>Contact hours per week:</td><td>Lecture: 2</td><td>Class discussion: 3</td><td>Lab hours: 0</td><td colspan="2">Tutorial: 0</td></tr>
<tr><td>Assessment and evaluation:</td><td colspan="5">written examination</td></tr>
<tr><td colspan="6">Subject description</td></tr>
<tr><td colspan="6">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.</td></tr>
<tr><td colspan="6">Topics to be covered: Complex numbers. Linear algebra. Sequences. Real-valued functions of one variable. One-variable calculus.</td></tr>
<tr><td colspan="4">Topics</td><td>Week</td><td>Lessons</td></tr>
<tr><td colspan="4">Complex numbers
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. Elementary operations in trigonometric and exponential forms.
Applications for electricity.</td><td>1.</td><td>2+3</td></tr>
<tr><td colspan="4">Linear algebra I
Concept and characteristics of the determinant. Solution of linear equation systems by Cramer’s Rule and by Gauss- elimination.</td><td>2.</td><td>2+3</td></tr>
<tr><td colspan="4">Linear algebra II
Concept of matrices. Special matrices. Basic operations of matrices. Rank and inverse of a matrix. Concept of vector spaces. Linear independence. Rank of a system of vectors. Vector subspace. Basis.</td><td>3.</td><td>2+3</td></tr>
<tr><td colspan="4">Linear algebra III
Change of bases and applications (determination of the rank of a system of vectors, solution of linear equation systems, specification of the inverse of a matrix).</td><td>4.</td><td>2+3</td></tr>
<tr><td colspan="4">Linear algebra IV
Concept and characteristics of the n-dimensional Euclidean space. Orthonormal bases. Linear transformations and their main characteristics.</td><td>5.</td><td>2+3</td></tr>
<tr><td colspan="4">Test 1</td><td>6.</td><td>2+3</td></tr>
<tr><td colspan="4">Sequences
Concept of sequences. Bounded sequences, monotonicity, limit of sequences, convergence. 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. 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.).</td><td>7.</td><td>2+3</td></tr>
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Real-valued functions of one variable II 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). Chain rule and rule for finding the derivative of the inverse function.	**8.**	**2+3**
Differential calculus II Mean value theorems. L'Hospital's rule. Higher derivatives. Discussion of functions by using derivatives. Examples.	**9.**	**2+3**
Differential calculus III 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: $\int f(ax+b)\,dx,\ \int f^{\alpha}(x)\cdot f'(x)\,dx,\ \int \frac{f'(x)}{f(x)}\,dx,\ \int f(g(x))\cdot g'(x)\,dx$. Integrals of trigonometric functions. Integration by parts.	**10.**	**2+3**
Holiday	**11.**	**---**
Indefinite integrals II Integrals of rational functions. Partial fractions in integration. Integration by substitution. ($\int R(\sqrt[n]{ax+b})\,dx,\ \int R(e^{x})\,dx,\ \int R(\sin x, \cos x)dx.$ etc.)	**12.**	**2+3**
Test 2	**13.**	**2+3**
Definite integrals/Riemann-integral Concept of definite integrals. Properties. Fundamental theorem of calculus.	**14.**	**2+3**

Assessment

Students are expected to attend every lectures and class meetings. Students over the permitted number of missed classes 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 to obtain signature. No electronic devices are allowed to be used during any tests.

	Date	Length	Max. score	Topics
Test 1	17th October	45 minutes	50	Complex numbers. Linear equation systems. Matrices.
Test 2	5th December	45 minutes	50	Differential calculus of real-valued functions with one variable.
Make-up tests		45 (75) minutes	50 (100)	Topics of the missing tests.

Make-up tests:
Make-up tests are available only for students not ”disabled”.

- Any student not disabled may take an overall make-up test (topics of both test 1 and 2) with duration 75 minutes and max. score 100.
- Any student, who has taken one of the tests and missed the other one for documented reasons, may also take a make-up only for the missing test.
- Any student who has taken both tests 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 any ways in the autumn semester may take an overall make-up test once on a scheduled date during the first two weeks of the examination term. The overall make-up test of the examination term covers topics of both tests 1 and 2 with duration 75 minutes and max. score 100.

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). <u>No electronic devices are allowed to be used during exams.</u> 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 not taken an overall test then the cumulative score is counted by the score of the exam plus 30 % of the score of the tests of the semester. If the student has taken an overall test then the cumulative score is counted by the score of the exam plus score 15. 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

01-07-15 Schmidt Edit (lecturer)