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| **Óbuda University** | | | | | | | | | | | | | | | | | | |
| **Rejtő Sándor Faculty of Light Industry and Environmental Engineering** | | | | | | | | | *Faculty* | | **Environmental Engineering** | | | | | | | *Institute* |
| *Hungarian title of the course:* | | | | | | **Matematika I.** | | | | | | | | *Neptun code:* | | NMXAN1EBNE | | |
| *English title of the course:* | | | | | | **Mathematics I** | | | | | | | | *Credit:* | | **6** | | |
| *Type (compulsory/obligatory:)* | | | | | **obligatory** | | | *Education Type* | | | **full-time** | *Semester :* | | | | | **1** | |
| *Study field:* | | | | | | | **environmental engineering, industrial product and form design** | | | | | | | | | | | |
| *Lecturer:* | | **Dr Henry González** | | | | | | | | | | | | | | | | |
| *Required preliminary knowledge:* | | | | | | | **˗** | | | | | | | | | | | |
| *Weekly teaching hours:* | | *Lecture:* | | **3** | | | *Practical work:* | | | **3** | | | *Laboratory work:* | | **0** | | | |
| *Exam type:* | | | | **exam** | | | *Language of course:* | | | **English** | | | *In timetable:* | | **Monday 8:55-11:30**  **Thursday 11:40-14:15** | | | |
| **Curriculum** | | | | | | | | | | | | | | | | | | |
| *Abstract:* | | | | | | | | | | | | | | | | | | |
| The goals of this course are: introduction of basic concepts of the real line, the complex plane and the three-dimensional space; development of differential and integral calculus with the help of the concepts of sequences, real functions, convergence and continuity to the level of practical applicability in further engineering / mechanical / physical studies. Introduction to the application of program MatLab. | | | | | | | | | | | | | | | | | | |
| ***Detailed schedule of the course:*** | | | | | | | | | | | | | | | | | | |
| ***Topics of lectures****:* | | | | | | | | | | | | | | | | | | |
| No. | Date | | Description | | | | | | | | | | | | | | | |
| 1. | Sep 6 | | Sets. Natural numbers. Integers. Rationals, real numbers, upper limit. Roots, powers. | | | | | | | | | | | | | | | |
| 2. | Sep 13 | | Trigonometric functions. Complex numbers, algebraic, trigonometric and exponential form. Taking *n*th roots. Polynomials, rational expressions. | | | | | | | | | | | | | | | |
| 3. | Sep 20 | | Three-dimensional vectors. Vector algebra, vector geometry. Matrices. transpose matrix. Three-dimensional determinants. | | | | | | | | | | | | | | | |
| 4. | Sep 27 | | Real functions. Operations with functions. Polynomial and power functions. Trigonometric and arc functions. Exponential and logarithmic functions. Sketching graphs of functions. | | | | | | | | | | | | | | | |
| 5. | Oct 4 | | 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. | Oct 11 | | Limits and continuity of real functions. The concept of differentiation. Equations of tangent and normal lines. The rules of differentiation. | | | | | | | | | | | | | | | |
| 7. | Oct 18 | | **Solution Test #1 type problems.** | | | | | | | | | | | | | | | |
| 8. | Oct 25 | | Elementary functions and their derivatives. Mean value theorems of differential calculus. Monotonity of differentiable functions. L′Hpital’s rule. | | | | | | | | | | | | | | | |
| 9. | Nov 1 | | **HOLIDAY** | | | | | | | | | | | | | | | |
| 10. | Nov 8 | | Calculus of extrema. Higher order derivatives. Convexity and inflection. Discussion of real functions. The concept of definite integral, its geometrical meaning and basic properties. Primitive functions, indefinite integral. | | | | | | | | | | | | | | | |
| 11 | Nov 15 | | Newton−Leibniz formula. Fundamental integrals. Integration by parts and by substitution. | | | | | | | | | | | | | | | |
| 12 | Nov 22 | | Arc-length, area. Revolution surfaces and bodies. Improper integrals. Nujerical integration. Conversation into partial fractions. Integration of rational functions. | | | | | | | | | | | | | | | |
| 13 | Nov 29 | | **Solution of Test #2 type problem.** | | | | | | | | | | | | | | | |
| 14 | Dec 6 | | **Supplementary Test.** | | | | | | | | | | | | | | | |
| ***Practical work:*** | | | | | | | | | | | | | | | | | | |
| No. | Date | |  | | | | | | | | | | | | | | | |
| 1. | Sep 9 | | Common denominators. Roots and powers. Quadratic equations. Polynomial division. | | | | | | | | | | | | | | | |
| 2. | Sep 16 | | Radian, trigonometric functions. Complex operations in algebraic and trigonometric form. | | | | | | | | | | | | | | | |
| 3. | Sep 23 | | Solving complex equations. | | | | | | | | | | | | | | | |
| 4. | Sep 30 | | Equations of lines and planes. Fitting space elements, distances and angles between them. | | | | | | | | | | | | | | | |
| 5. | Oct 7 | | Matrix operations, transposition. Thre-dimensional determinants. Real functions. | | | | | | | | | | | | | | | |
| 6. | Oct 14 | | Limit of real sequences. | | | | | | | | | | | | | | | |
| 7. | Oct 21 | | ZH1+Derivatives, equations of the tangent and normal lines. | | | | | | | | | | | | | | | |
| 8. | Oct 28 | | L’Hôpital’s rule. | | | | | | | | | | | | | | | |
| 9. | Nov 4 | | Calculus of extrema. Integration by parts. Integration by substitution. | | | | | | | | | | | | | | | |
| 10. | Nov 11 | | Convexity and inflection. | | | | | | | | | | | | | | | |
| 11 | Nov 18 | | Holiday | | | | | | | | | | | | | | | |
| 12 | Nov.25 | | Basic integrals. Integration by parts. Definite integral and applications. | | | | | | | | | | | | | | | |
| 13 | Dec 2 | | ZH2+Integration by substitution. | | | | | | | | | | | | | | | |
| 14 | Dec 9 | | Solution of problems for the exam. | | | | | | | | | | | | | | | |
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| *Attendance at lectures:* | | | | | | | | | | | | | | | | | | |
| The rules of education and exam directory (TVSZ) are the guidelines. | | | | | | | | | | | | | | | | | | |
| *Exams and tests (types, data)* | | | | | | | | | | | | | | | | | | |
| written  written | **Test #1** (week #7),  **Test #2** (week #13):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:* | | | | | | | | | | | | | | | | | | |
| 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) | | | | | | | | | | | | | | | | | | |
| **Literature** | | | | | | | | | | | | | | | | | | |
| *Compulsory:* | | |  | | | | | | | | | | | | | | | |
| *Recommended:* | | | Thomas, G.B. et al.: Thomas’ Calculus, 11e, Addison-Wesley, 2005, ISBN: 0-321-18558-7. | | | | | | | | | | | | | | | |
| *Others:* | | |  | | | | | | | | | | | | | | | |
| ***Quality Management*** | | | | | | | | | | | | | | | | | | |
| The structure of the course is harmonized with other lecturers from the university. Assessment of students is carried out at every lecture, and at the end of semester.  The ppt files are continuously renewed according to the new literature data. | | | | | | | | | | | | | | | | | | |

**Date: 2021 Augusztus 10.**

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| **Lecturer: Dr. Henry González** |  | Director of the Institute: Dr. Bodáné Dr.Kendrovics Rita |