Óbuda University Bánki Donát Faculty of Mechanical and Safety Engineering	Institute of Mechatronics and Vehicle Engineering

The name and code of the course: Mathematics II - Calculus II., BMXM2EHBNE
Credit points*: 6*

Training: **Mechanical engineering BSc**

Responsible: **Dr. Hanka László**	Lecturer: **Dr. Hanka László**	Teachers	**Dr. Frigyik András, Dr. Hanka László**

Prerequisites		**Mathematics I - Calculus I., NMXAN1EBNE, signature**	
Number of lessons per week:	Lecture: 3	Group seminar: 3	Lab: 0	
Requirement:	**Signature and Exam**			

Topics
Linear algebra, Multivariable Calculus, Theory of series, Differential equations, Laplace-transform, Probability theory

Schedule	
Time	Chapters
Week 1.	Linear algebra 1. Solving linear systems. Gauss and Gauss-Jordan method. Homogeneous and nonhomogeneous systems. Multiplication of matrices. Inverse of a matrix. Determinant of an n×n matrix. Cofactor expansion of a determinant.
Week 2.	Linear algebra II. Solving linear systems using inverse matrix. Cramer's rule. Eigenvalue and eigenvector of a matrix.
Week 3.	Functions of two variables I. Graphing functions. Partial derivatives. Higher order derivatives. Total derivative and applications. Error estimation. Approximation. Tangent plane. Local extrema.
Week 4.	Functions of two variables II. Double integrals over rectangular and normal domain. Calculation of volume.
Week 5.	Number series Convergence of a number series. Basic theorems and concepts. Geometric series. Harmonic series. Convergence tests for positive series. Alternating series, Leibniz theorem.
Week 6.	Function series I. Notion of a function series. Convergence. Region of Convergence. Power series. Basic theorems for convergence of power series. Radius of convergence. Differentiation and integration of power series.
Week 7.	Function series II. Taylor series. Taylor polynomial. Lagrange form of the remainder. Taylor's theorem. Approximation. Error estimation. Integration.
Week 8.	Differential equations I. The notion of an ODE. The notion of the general and particular solution. Directly integrable ODE. Separable ODE. Applications in physics.
Week 9.	Differential equations II. First order linear differential equations. Homogeneous and nonhomogeneous equations. Basic theorems for solutions. Variation of constant. Linear ODE with constant coefficients. Method of undetermined coefficients.
Week 10.	Differential equations III. Second order linear differential equations with constant coefficients. Homogeneous and nonhomogeneous equations. Characteristic equation. Method of undetermined coefficients. Exponential and trigonometric resonance. **Midterm test.**
Week 11.	Laplace transform The concept of Laplace-transform. Inverse Laplace-transform. Partial fraction decomposition. Solving linear differential equations using Laplace.
Week 12.	Probability I. Combinatorics. Boolean algebra. The notion of event. Operations with events. Classic probability. Axioms of probability. Basic theorems.
Week 13.	Probability II. Conditional probability. The law of total probability. Bayes theorem. The notion of a random variable. Distribution function. Characterization of a random variable. Expected value and standard deviation.

Week 14.	<u>Probability III.</u> Discrete distributions. Probability distribution. Binomial, hipergeometric, Poisson distribution. Continuous distributions. Probability density function. Normal, exponential, uniform distribution. **Retake of the Midterm.**
Reqirements	One **midterm test**: On 10th week, including topics from the first 7 weeks. Theory and problems. For midterm test you can get 50 points, 10 for theory and 40 for problems. The **condition for signature** is at least 25 points from the test. The test can be retaken if someone wants to or has to improve, or it can be taken if someone missed it. If someone can't attain 25 points he/she can take an **exam for signature** at the beginning of the exam period. The signature is registered in Neptune system. If you fail you get "**signature is denied**". If someone has a signature, he/she can take **exam** in exam period. Exam covers every topic between weeks 8 and 14. For exam you can get 50 points, 10 for theory and 40 for problems. The minimum score is 15 points. Below 15 points you fail. For **exam mark** the sum of test points and exam points considered. The limits of exam marks are as follows: 0-49%: fail (1) 50-62%: pass (2) 63-74%: satisfactory (3) 75-87%: good(4) 88-100%: excellent (5)
Literature	Literature (recommended) can be found in moodle, and on the server of the Institute: http://siva.bgk.uni-obuda.hu/jegyzetek/Matematika/English/BSc/ username: mei password. mei2018

Budapest, 2022. január 15.

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Dr. Hanka László
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