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

The name and code of the course: Mathematics II - Calculus II., BMXM2EHBNE
Credit points*:* 6
Year: 2022/23, semester II.

Training: **Mechanical engineering BSc**

Responsible:	Lecturer:	Teachers	
Dr. Hanka László	**Dr. Hanka László**		**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 systems of linear equations using Gauss elimination and Gauss-Jordan method. Homogeneous and nonhomogeneous linear systems. Matrix multiplication, inverse of quadratic matrices. Determinant of an n×n matrix. Cofactor expansion of the determinant.
Week 2.	Linear algebra II. Solving linear systems via inverse matrices. Cramer's rule. Eigenvalues and eigenvectors of a matrix.
Week 3.	Functions of two variables I. Plotting functions. Partial derivatives. Higher order derivatives. Total derivative and its 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. The concept 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 concept of an ODE including its 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-transform.
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 concept of a random variable. Distribution function. Characterization of a random variable. Expected value and standard deviation.

Week 14.	Probability III**.** Discrete distributions. Probability distribution. Binomial, hypergeometric and Poisson distributions. Continuous distributions. Probability density function. Normal, exponential, uniform distribution. **Midterm test.**
Reqirements	One **midterm test**: On the 10th week. Its subjects are the topics covered up to the 7th week, both the theory and the problems. On the test you can get 50 points: 10 for theory and 40 for problems. The **prerequisite for the signature** is the achievement of at least 25 points on the test. In case you missed or failed the test you have to retake it in order to qualify for the exam. If you passed the test you may retake it if you want to try to improve your score. In case you fail to achieve 25 points even after retaking the test, you can take a special **exam to get the signature** at the beginning of the exam period. The signature is registered in Neptune system. (??? Ez mit takar?) If you fail this special exam your will gain the "**signature is denied**" status. 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 14. On the exam you can get 50 points, 10 for theory and 40 for 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 test and on the exam. The intervals are as follows: 0-49%: fail (1,F) 50-62%: pass (2,D) 63-74%: satisfactory (3,C) 75-87%: good(4,B) 88-100%: excellent (5,A)
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

lecturer