COURSE SYLLABUS

MATHEMATICS
2022-2023 I.

Course Code:	MSM601ANEG
Semester:	1st
Number of Credits:	7
Allotment of Hours per Week:	2 lectures, 2 practices
Evaluation:	exam
Prerequisites:	**-**
Instructors:	**Dr. Ildikó PERJÉSI- HÁMORI, associate professor** **Dr. Mihály KLINCSIK, professor**

Introduction, Learning Outcomes

Students with a medical background will become familiar with the basic mathematics required to understand and master the engineering sciences. During the mathematical problem solving, they get acquainted with the possibilities of applying the Maple Computer Algebra System (CAS).
The students solve successfully 2 homeworks and 2 midterm tests using Möbius T.A and one exam test.

General Course Description and Main Content:

There are two main aims of the course.

Firstly, we wish to provide a readable, accessible, and student-friendly introduction to mathematics for engineers and technologists at the degree level. Great care has been taken with explanations of difficult concepts, and wherever possible statements are made in everyday language, as well as symbolically. It is the use of symbolic notation that seems to cause many students problems, and we hope that we have gone a long way to alleviate such problems.

Secondly, we wish to develop in the reader the confidence and competence to handle mathematical methods relevant to engineering and technology through an interactive approach to learning. You will find that the course materials encourage you to take an active part in the learning process – this is an essential ingredient in the learning of mathematics.

The Mathematics course includes the following **topics**

- Vectors in space, operations with vectors, dot product, and cross product.
- Complex numbers: operations with algebraic, polar, and exponential forms.
- Matrices and determinant. Matrix algebra.
- Solving system of linear equations using Gauss-Jordan elimination. Cramer's rule.

- Power, root, trigonometric, logarithmic, and exponential functions.
- Limit and continuity of functions. Differentiation.
- Application of differential calculus.
- Antiderivatives, basic integration formulas.
- Definite integral, Riemann-sum, Newton-Leibniz theorem.
- Applications of integral.
- The function of two variables. Partial derivatives.
- Double integral, substitution by polar coordinates
- First- and second-order linear Ordinary Differential Equations

Methodology:

We would encourage you to explore the use of software packages such as **Maple**. Through them, you will find the whole new areas of engineering mathematics become accessible to you, and you will develop skills that will help you to solve engineering problems that you meet in other areas of study and in the workplace. The facility to work with symbols, as opposed to just numbers, means that these packages are often referred to as c**omputer algebra systems** or **symbolic processors**. You will be able to enter mathematical expressions, functions and perform all of the common mathematical operations: simplification, factorization, differentiation, integration, and much more. You will be able to perform calculations with vectors and matrices. With experience will find that lengthy, laborious work can be performed at the click of a button.

At first sight, you might be tempted to think that the availability of such a package removes the need for you to become fluent in algebraic manipulation and other mathematical techniques. We believe that the converse of this is true. These packages are sophisticated, professional tools, and as such require the user to have a good understanding of the functions they perform, and particularly their limitations.

Learning mathematics requires you to **participate** actively in the learning process. This means that to get a sound understanding of any mathematical topic it is essential that you actually perform the calculations yourself. You can't learn mathematics by being a spectator. *You* must use *your* brain to solve the problem, and *you* must write out the solution. These are essential parts of the learning process. It is not sufficient to watch someone else solve a similar problem, or to read a solution in a book, although these things of course can help. The test of real understanding and skill is whether or not you can do the necessary work **on your own**.

Möbius test and assessment system is used for teaching and after evaluating the mathematical knowledge of students in online mode with taking time limitations**.** We use the following features of the Möbius to learn mathematical concepts and algorithms interactively

- The ability to accept responses in mathematical notation
- The ability to accept equivalent responses in different mathematical forms
- Visualization tools for 2D and 3D plots
- A simple equation editor
- Open-ended questions with many answers
- Powerful algorithmically generated questions
- Adaptive questions to guide students following an incorrect response.

Möbius Assessment is accessed through MS Teams and the assignments are graded automatically in Möbius.

Schedule:

week	topic
1	Introduction to Maple computer algebra and Möbius test and assessment system. Vectors in space, operations with vectors, scalar and vector products. Vector equations of line and plane

2	Complex numbers: operations with algebraic, polar, and exponential form
3	Matrices and determinant. Matrix algebra. Inverse matrix. Application to Computer graphics.
4	Solving system of linear equations using Gauss-Jordan elimination. Cramer's rule Solving system of linear equations with iteration. Eigenvalue, eigenvector. Application to electrical networks.
5	Power, root, trigonometric, logarithmic, and exponential functions, operations on functions, composite and inverse functions
6	Limit and continuity of functions. Differential coefficient, derivative. Rules of derivation, derivatives of elementary functions. **Homework 1.**
7	Application of differential calculus: Linear approximation, Taylor polynomial. Antiderivatives, basic integration formulas. Integration by parts.
8	**Midterm test 1.**
9	**Autumn holiday**
10	Integral of rational functions by a partial fraction. Definite integral, Riemann-sum, numerical integration, Newton-Leibniz theorem.
11	Applications of integral: the area between curves, volume, length, areas of surfaces, Fourier series.
12	The function of two variables. Partial derivatives, directional derivatives. Gradient vector, tangent plane
13	Double integral, substitution by polar coordinates
14	First- and second-order linear Ordinary Differential Equations, solution using Laplace transform. **Homework 2.**
15	**Midterm test 2.**

Attendance:
Attending is required all classes. Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of the lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid

excuse, such as a doctor's note.

Evaluation + Grading

Grading will follow the course structure with the following evaluations:

1. Two homeworks using Möbius-test and assessment system.
2. Two Midterm Tests using Möbius-test and assessment system
3. Offered exam grade: over 55 % during the study and correction period.
4. Written exam in the exam period. A minimum of 40% is required to pass the exam.

Evaluation + Grading factors without exam	Evaluation + Grading factors with exam
1. Two midterm tests with a weighting factor of 70%	**1. Two midterm tests with a weighting factor of 30%**
2. Two homeworks with a weighting factor of 30%	**2. Two homeworks with a weighting factor of 20%**
	3. Exam test with weighting factor 50%

Final grading scale

Numeric Grade:	**excellent (5)**	**good (4)**	**satisfactory (3)**	**pass (2)**	**fail (1)**
Evaluation in points:	[85%,100%]	[70%,85%)	[55%,70%)	[40%,55%)	[0%,40%)

Students with special needs:

Students with special physical needs and requiring special assistance must first register with the Dean of the Students Office. All reasonable requests to provide an equal learning environment for all students are to be assured.

Readings and Reference Materials:

[1] Joel Hass, Christopher Heil, Maurice D. Weir: Thomas's Calculus, PEARSON (13th Edition) 2015.
[2] Anthony Croft, Robert Davison, Mathematics for Engineers, PEARSON EDUCATION LIMITED, (Fourth Edition) 2015.