COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2024/25 SEMESTER 1

Course title	*MATHEMATICS*
Course Code	MSM601ANEG
Hours/Week: le/pr/lab	2/2/0
Credits	7
Degree Programme	MSc
Study Mode	*Full-time*
Requirements	exam
Teaching Period	Semester 1
Prerequisites	-
Department(s)	Department of Mathematics, Department of Technical Informatics
Course Director	
Teaching Staff	*Dr. Ildikó PERJÉSI- HÁMORI, associate professor* *Dr. Mihály KLINCSIK, professor*

COURSE DESCRIPTION

A short description of the course (max. 10 sentences).
Nept n: Instruction/Subjects/Subject Details/Basic data/Subject description
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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 homework and 2 midterm tests using Möbius T.A and one exam test.

SYLLABUS

Neptun: Instruction/Subjects/Subject Details/Syllabus

1. GOALS AND OBJECTIVES

Goals, student learning outcome.
Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction

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 a 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.
- First- and second-order linear Ordinary Differential Equations

* Please note that one of the subjects of the comprehensive exam at the end of the 3rd semester is mathematics

Methodology:
We would encourage you to explore the use of software packages such as Maple. Through them, you will find that 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 computer 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, 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.

DETAILED SYLLABUS AND COURSE SCHEDULE

ACADEMIC HOLIDAYS INCLUDED

LECTURE and PRACTICE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
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	01_Vectors.pptx	01_Vectors.mw Ch01_Vectos in space (Möbius T.A)	…
2.	Complex numbers: operations with algebraic, polar, and exponential form	02_Complex_numbers.pptx	02_Complex_numbers.mw Ch02_Complex numbers (Möbius T.A)	
3.	Matrices and determinant. Matrix algebra. Inverse matrix. Application to Computer graphics.	03_Matrices_determinants.pptx	03_Matrices_determinants.mw Ch03_Matrices and determinant (Möbius T.A)	
4.	Solving system of linear equations using Gauss-Jordan elimination. Cramer's rule. Eigenvalue, eigenvector.	04_Linear_Equations.pptx	04_Linear_Equations.mw Ch04_Linear equation system (Möbius T.A)	
5.	Power, root, trigonometric, logarithmic, and exponential functions, operations on functions, composite and inverse functions	05_Functions of one variable.pptx	05_Functions of one variable.mw Ch05_Functions on one variable (Möbius T.A)	

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6.	Limit and continuity of functions. Differential coefficient, derivative. Rules of derivation, derivatives of elementary functions.	06_Differential calculus.pptx	06_Differential calculus.mw Ch06_Differential calculus (Möbius T.A)	
7.	Application of differential calculus: Linear approximation, Taylor polynomial.	07_Application of differential calculus.pptx	Homework 1. (Möbius T.A.) 07_Application of differential calculus.mw Ch07_Application of derivation (Möbius T.A)	Next week
8.	Antiderivatives, basic integration formulas	08_Indefinite integral.pptx	Midterm test 1. (Möbius T.A.) 08_Indefinite integral.mw Ch08_09 Indefinite integral (Möbius T.A)	
9.	Autumn break			
10.	Integration by parts. Integral of rational functions by a partial fraction.	08_Indefinite integral.pptx	08_Indefinite integral.mw	
11.	Definite integral, Riemann-sum, numerical integration, Newton-Leibniz theorem. Applications of integral: the area between curves, volume, length, areas of surfaces, Fourier series.	09_Definite integral.pptx 10_Applications of definite integral.pptx	09_Definite integral.mw 10_Applications of definite integral.mw Ch10_ Definite integral Ch10_Application of definite integral (Möbius T.A)	
12.	The function of two variables. Partial derivatives, directional derivatives. Gradient vector, tangent plane	11_Functions_two_variables.pptx	11_Functions_two_variables.mw Ch11_Function of two variable-derivation (Möbius T.A)	
13.	First- and second-order linear Ordinary Differential Equations, solution using Laplace transform	13_Differential_equations.pptx	Homework 2. (Möbius T.A.) 13_Differential_equations.mw Ch12_Linear differential equations (Möbius T.A)	Next week
14.	**Midterm test 2.**		Midterm test 2. (Möbius T.A.)	

2. ASSESSMENT AND EVALUATION

(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System)

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

Attending is required for 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.

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ASSESSMENT

Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.

Course resulting in mid-term and the final* grade *grade *(PTE TVSz 40§(3))*

Mid-term assessments, performance evaluation, and their ratio in the final grade *(The samples in the table to be deleted.)* *

Grading will follow the course structure with the following evaluations:

1. Two homework using Möbius-test and assessment system.
2. Two Midterm Tests and exam 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 homework with a weighting factor of 30%	2. Two homework with a weighting factor of 20%
	3. Exam test with a weighting factor 50%

Opportunity and procedure for re-takes (PTE TVSz 47§(4))

The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.

The student can re-take the midterm test passed less well in the first week of the exam period.

Exam grade calculation as a percentage

based on the aggregate performance according to the following table

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

3. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1] Tests and assessments are on Teams platform in pdf, Maple and Möbius.

RECOMMENDED LITERATURE AND AVAILABILITY

[2.] Joel Hass, Christopher Heil, Maurice D. Weir: Thomas's Calculus, PEARSON (13th Edition) 2015.

[3] Anthony Croft, Robert Davison, Mathematics for Engineers, PEARSON EDUCATION LIMITED, (Fourth Edition) 2015.

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