UNDERGRADUATE STUDY:

TRANSPORT, ITS AND LOGISTICS, AERONAUTICS

SEMESTER (I)

Syllabus

Academic year 2024/2025

Course:	**Mathematics I**					
Head of course: Asst. Prof. **Tomislav Fratrović**, Ph.D. **Marijana Greblički**, Ph.D., Senior Lecturer						
Co-lecturers: **Radomir Lončarević**, mag. educ. math. et phys. **Jelena Rupčić**, Ph.D.						
Semester: **W**	Course code: **19121**	Lectures: **45**	Auditory exercises: **45**	Laboratory exercises: **0**	Seminars: **0**	ECTS credits: **8**
Group for lectures: **150 students**			Group for auditory and laboratory exercises: **50 students**			

Objective of the course:

- Introduce students to the basics of vector algebra, differential and integral calculus of functions of one variable, and their applications.

Learning outcomes:

After the completion of the course the students will be able to:

1. Use algebraic operations with vectors in 2D and 3D Euclidean space or coordinate system after coordination.
2. Define the concepts of function, domain and graph and reproduce graphs of elementary functions.
3. Determine the natural domains of simpler elementary functions
4. Use tabular derivations and derivation rules when deriving complex functions, products and quotients.
5. Apply the derivation of the function to find the tangent, local extremes and solve the limits by L'Hospital's rule.
6. Distinguish the concepts of definite and indefinite integrals and use the Newton-Leibniz formula using tabular integrals.
7. Solve the integral by the method of substitution and the method of partial integration.
8. Connect the notion of a definite integral and the area between two curves.

LECTURES, EXERCISES and SEMINARS

Week	Syllabus	Form of classes	Performed by	Lessons	Remark
1.	▪ INTRODUCTION TO THE COURSE ▪ DEFINITION OF FUNCTION AND DOMAIN ▪ FUNCTION GRAPH ▪ FUNCTION COMPOSITION	L	Marijana Greblički	3	
	▪ VECTORS IN THE PLANE AND SPACE ▪ ADDITION AND MULTIPLICATION BY SCALAR, COORDINATIZATION ▪ LINEAR INDEPENDENCE	AE	Marijana Greblički	3	
2.	▪ BIJECTIVITY AND INVERSE FUNCTION ▪ EVALUITY, ODDNESS AND PERIODICITY OF THE FUNCTION ▪ GROWTH AND FALL OF FUNCTION ▪ CONVEXITY AND CONCAVITY	L	Marijana Greblički	3	
	▪ SCALAR PRODUCT ▪ VECTOR PRODUCT	AE	Marijana Greblički	3	
3.	▪ INTRODUCTION TO ELEMENTARY FUNCTIONS ▪ POLYNOMY ▪ RATIONAL FUNCTIONS ▪ EXPONENTIAL AND LOGARITHMIC FUNCTIONS	L	Marijana Greblički	3	
	▪ VECTOR PRODUCT ▪ MIXED PRODUCT	AE	Marijana Greblički	3	
4.	▪ GENERAL POTENTIAL ▪ TRIGONOMETRIC FUNCTIONS ▪ CYCLOMETRIC FUNCTIONS ▪ HYPERBOLIC AND AREA FUNCTIONS	L	Marijana Greblički	3	

	▪ OVERVIEW OF ALL ELEMENTARY FUNCTIONS ▪ SEPARATION IN PARTIAL FRACTIONS ▪ HYPERBOLIC AND AREA FUNCTIONS	AE	Marijana Greblički	3	
5.	▪ LIMIT OF A SEQUENCE ▪ LIMIT AND CONTINUITY OF A FUNCTION	L	Marijana Greblički	3	
	▪ DRAWING A TRIGONOMETRIC FUNCTIONS ▪ COMPOSITION AND INVERSE OF A FUNCTION ▪ NATURAL DOMAIN	AE	Marijana Greblički	3	
6.	▪ DEFINITION OF A DERIVATION ▪ DERIVATION RULES ▪ TANGENT PROBLEM	L	Marijana Greblički	3	
	▪ DOMAIN OF A FUNCTIONS ▪ FUNCTION LIMITS	AE	Marijana Greblički	3	
7.	▪ COMPLEX DERIVATIONS ▪ DERIVATION OF THE IMPLICATELY GIVEN FUNCTION ▪ DERIVATION OF PARAMET. GIVEN FUNCTION	L	Marijana Greblički	3	
	▪ TABLE AND DERIVATION RULES ▪ DERIVATION OF A COMPLEX FUNCTION ▪ HIGHER ORDER DERIVATIONS	AE	Marijana Greblički	3	
8.	▪ HIGHER ORDER DERIVATIONS, ▪ LOGARITHMIC DERIVATION ▪ APPLICATION OF DERIVATIONS	L	Marijana Greblički	3	
	▪ DERIVATION OF THE IMPLICATELY GIVEN FUNCTION ▪ TANGENT AND NORMAL ▪ (written examination of the 1st and 2nd hw)	AE	Marijana Greblički	3	

9.	▪ FIRST COLLOQUIUM	L	Marijana Greblički	3	
	▪ APPLICATION OF DERIVATIONS ▪ INSREASE AND DECREASE OF A FUNCTION, LOCAL EXTREMES	AE	Marijana Greblički	3	
10.	▪ ASYMPTOTES ▪ FUNCTION FLOW	L	Marijana Greblički	3	
	▪ CONVEXITY AND CONCAVITY ▪ POINTS OF INFLECTION ▪ L'HOSPITAL'S RULE ▪ ASYMPTOTES	AE	Marijana Greblički	3	
11.	▪ DEFINITE AND UNDEFINITE INTEGRAL ▪ NEWTON-LEIBNIZ FORMULA ▪ DIRECT INTEGRATION	L	Marijana Greblički	3	
	▪ ASYMPTOTES ▪ TABLE AND INTEGRATION RULES ▪ METHOD OF SUBSTITUTION	AE	Marijana Greblički	3	
12.	▪ METHOD OF SUBSTITUTION ▪ PARTIAL INTEGRATION	L	Marijana Greblički	3	
	▪ PARTIAL INTEGRATION ▪ INTEGRALS OF SOME TRIGONOMETRIC FUNCTIONS	AE	Marijana Greblički	3	
13.	▪ INTEGRATION OF RATIONAL AND IRRATIONAL FUNCTIONS ▪ INTEGRATION OF TRIGONOMETRIC FUNCTIONS	L	Marijana Greblički	3	
	▪ INTEGRALS OF RATIONAL FUNCTIONS ▪ FINITE INTEGRAL	AE	Marijana Greblički	3	

14.	▪ APPLICATION OF INTEGRALS IN GEOMETRY ▪ AREA CALCULATION ▪ IMPROPER INTEGRAL	L	Marijana Greblički	3	
	▪ APPLICATION OF A DEFINITE INTEGRAL, SURFACE CALCULATION ▪ (written examination of the 3rd and 4th HW)	AE	Marijana Greblički	3	
15.	▪ SYSTEMATIZATION OF MATERIALS ▪ PREPARATION FOR WRITTEN AND ORAL EXAM	L	Marijana Greblički	3	
	▪ SECOND COLLOQUIUM	AE	Marijana Greblički	3	

L = Lectures; **AE** = Auditory Exercises; **LE** = Laboratory Exercises; S = Seminars

STUDENT OBLIGATIONS AND EXAMS

Conditions for obtaining signatures:

The first and basic step is to meet the conditions for achieving the status of the subject "listened", which is a prerequisite for taking the exam. This is achieved if the student has fulfilled and fulfilled all obligations towards the course throughout the semester. The conditions for the case to receive the status are completed (10 + 10 + 10):
- 10 drawn of student card on the lectures
- 10 drawn of student card on the exercises
- 10 points from two written homework tests (out of a total of 20 points!)

Written Examination:

In addition to written homework tests, students also write two colloquia for exemption from the written part of the exam. Out of a total of 20 points from these two colloquia, a minimum of 10 points (50%) must be collected for exemption from the written part of the exam. In addition to the total number of points for exemption from the written part of the exam through the colloquium, the condition that the student has more than zero points in each colloquium must be met!
Exemption from the written exam is permanent and is valid for all exam terms.
Colloquia can be attended by repeaters, but only if they join the exercises at the beginning of the semester, add to the list of new students and meet all the requirements as full-time students who are taking the course for the first time (homework, attendance at exercises).
If he does not pass the colloquium, the student must access the written part of the exam during the exam deadlines consisting of 5 tasks. Then the pass is conditioned with at least 5 points obtained out of a total of 10 (50%).
The grade of the written part of the exam is obtained on the basis of the total number of points and depends on whether it is a colloquium or a written exam.

Colloquium scoring:

POINTS	GRADE
10 - 12,99	sufficient (2)
13 - 15,99	good (3)
16 - 17,99	very good (4)
18 - 20	excellent (5)

Written exam scoring:

POINTS	WRITTEN EXAM GRADE
0 - 4,99	insufficient (2)

5 - 6,49	sufficient (2)
6,5 - 7,99	good (3)
8 - 8,99	very good (4)
9 - 10	excellent (5)

Oral examination:

After successfully passing the written part of the exam, in the oral part, students also solve tasks and/or answer questions. Depending on the questions asked to the student, the grade obtained from the written part may be lowered at the final exam, and the student may be referred to retake the exam.

LITERATURE

a) Obligatory literature:

1. S. Marušić: Mathematics 1, textbook with solved examples, Faculty of Transport and Traffic Sciences, Zagreb, 2007.

b) Recommended literature:

1. B.P. Demidovič et al: Tasks and solved examples from mathematical analysis for technical faculties, DANJAR d.o.o., Zagreb, 1995.V.P. Minorski: Zbirka zadataka iz više matematike, Tehnička knjiga, Zagreb, 1971.

METHODOLOGY OF THE IMPLEMENTATION OF THE COURSE PLAN

1. LECTURES

Frontal form of teaching with the use of presentations and problem solving on the board. Individual work of students on solving simpler tasks that check the comprehensibility of the material and the possibility of further independent work.

2. AUDITORY EXERCISES

After the demonstration of solving tasks and getting acquainted with the various methods available, students solve tasks individually or in a group depending on their abilities.

3. DOCUMENTATION

Through continuous monitoring, students have access to scoring written tests of homework and colloquia, as well as course activities. Grades of written and oral exams, as well as records of the number of exam applications are available through the ISVU system.
Notices to students, presentations in pdf format and materials accompanying the course, as well as official formulas and tables that may be used in exams are available through the Merlin system and the e-course Mathematics 1.

4. SCORING SYSTEM

During the semester, students' activity is recorded through the SAN system (by dragging x-s), scoring solved tasks in colloquia and written tests of compulsory homework. In the lectures, students are given optional short homework assignments each week to check new material.
Assessment and evaluation of student work during classes and at the final exam:
Successfully passed course brings 8 ECTS credits, calculating that one ECTS credit is equivalent to approximately 25-30 hours of work**.**

Table 1 The scoring system for the monitoring of students and explained credit values in ECTS credits

no	Segment:		Required credits to be achieved: Min.	Required credits to be achieved: Max.	Remark:	ECTS credits	
*Points for the realization of the condition: Courses requirements achieved**							
1.	Realization of conditions for signature and related activities					**2**	
2.	Lectures + exercises, activities					**3**	
3.	First colloquium	= Written exam				**1**	**2**
4.	Second colloquium					**1**	
5.	Oral exam					**1**	
Σ	*Overall points:*				*Overall ECTS points:*	**8**	

Information for students (scoring system, implementation plan, learning outcomes, syllabus, literature, consulting teachers, announcement of results of examinations or colloquium, and all other information):

- **http://www.fpz.unizg.hr**