



## RTU Course "Mathematics"

12501 Inženiermatemātikas katedra

### General data

Code	DMF101
Course title	Mathematics
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Mathematics and Statistics
Responsible instructor	Marija Iltiņa
Academic staff	Līga Biezā Sarmīte Veģere Jeļena Liģere Irīna Eglīte Evija Kopeika Ilona Dzenīte Natālija Orbidāne Tamāra Kabiša Valentīna Koliškina Sergejs Smirnovs Vera Gošteine Ilze Karpinska Aleksandrs Matvejevs Ilmārs Iltiņš Svetlana Pavlova Māra Birze Jeļena Mihailova Vaira Buža Vladislavs Kreņeckis
Volume of the course: parts and credits points	2 parts, 9.0 Credit Points, 13.5 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Introduction. Analytical geometry: vectors, lines, surfaces. Linear algebra: matrices, determinants, systems of linear equations. Introduction to analysis: limits, continuity. Differential calculus: derivative, differential and their applications. - Integral calculus: indefinite and definite integrals, their applications. Ordinary differential equations. Series. Double and triple integrals.
Goals and objectives of the course in terms of competences and skills	To develop students' understanding of basic mathematical concepts that are necessary to comprehend processes and algorithms in professional study courses. To develop students' logical thinking and skills necessary to analyse solutions of problems when performing more complicated tasks within the framework of study courses of professional specialization.
Structure and tasks of independent studies	12 home assignments are to be fulfilled within the framework of the study course on the following themes: linear algebra, analytical geometry, vector algebra, limits, differential calculus of one variable function, indefinite integrals, appliance of definite integrals, double integrals, differential equations, series. Home assignments are to be submitted before the deadline indicated by an instructor. Student has an opportunity to re-submit the homework assignment once after it has been corrected by the instructor. The grade of the homework assignment influences the final grade for the study course.
Recommended literature	1. Kronbergs E., Rivža P., Bože Dz. Augstākā matemātika. 1. un 2. daļa, Rīga, Zvaigzne, 1988, 534 lpp., 527 lpp. 2. K.Steiners, B.Siliņa. Augstākā matemātika. Lekciju konspekts inženierzinātņu un dabaszinātņu studentiem. 1. daļa, Zvaigzne, 1997, 96 lpp., 2. daļa, Zvaigzne, 1999, 115 lpp. 3. K.Steiners. Augstākā matemātika. Lekciju konspekts inženierzinātņu un dabaszinātņu studentiem. 3. daļa, Zvaigzne, 1998, 192 lpp., 4. daļa, Zvaigzne, 1999, 168 lpp. 4. M.Buiķis, B. Siliņa. Matemātika. Definīcijas. Formulas. Aprēķinu algoritmi. Zvaigzne, 1997, 288 lpp. 5. Dz. Bože, L.Biezā, B. Siliņa, A. Strence. Uzdevumu krājums augstākajā matemātikā. Zvaigzne, 1996, 328 lpp. 6. I. Volodko. Tipveida uzdevumu krājums matemātikā I. RTU, 2001, 204 lpp. 7. I. Volodko, A.Āboltiņš, L.Biezā. Tipveida uzdevumu krājums matemātikā II. RTU, 2002, 288 lpp.
Course prerequisites	The study course is based on the knowledge of mathematics acquired at the secondary school.

### Course outline

Theme	Hours
Introduction to analysis. Elementary functions. Limits. Continuity.	12
Differential calculus of one variable functions. Derivatives. Applications.	24
Differential calculus of two variable functions.	18
Linear algebra. Matrix notation. The determinant. Operations with matrices. Simultaneous equations.	12
Vectors. Operations with vectors.	12

Analytical geometry. Line in a plane. Line and plane in a space.	12
Complex numbers. Operations with complex numbers in Cartesian and in polar form.	4
Integral calculus. Methods of integration.	16
Definite integrals. Improper integrals of 1st and 2nd kind.	10
Double integral and triple integral. Applications.	14
Differential equations. Family of solutions. Methods of solutions.	20
Series. Convergence tests. Power series. Taylor series.	18
Fourier series.	4

### ***Learning outcomes and assessment***

Learning outcomes	Assessment methods
Student is able to perform operations with matrices, to solve simultaneous equations.	Home assignment. Test. Task in the exam.
Student is able to perform operations with vectors, can form an equation for a line in a plane and for a plane in a space, can identify a curve of a second kind and can draw it. .	Home assignment. Test. Task in the exam
Student is able to solve simple limits, can find derivatives of a function. Student can explore a function and can draw its graph.	Home assignment. 2 tests. Task in the exam.
Student is able to find derivatives of two variable functions, can calculate extrema.	Home assignment. Test. Task in the exam.
Student is able to perform operations with the complex numbers in Cartesian form and in polar form.	Home assignment. Test. Task in the exam.
Student is able to integrate simple functions, can calculate an area between two curves, can calculate arc's length and volume of a rotational solid.	Home assignment. 2 tests. Task in the exam.
Student is able to calculate double and triple integrals and is able to apply them to calculate areas and volumes.	Home assignment. Test. Task in the exam.
Student is able to solve simple differential equations.	Home assignment. Test. Task in the exam.
Student is able to determine the convergence of a series, can determine the interval of convergence. Student can apply series in simple problems.	Home assignment. Test. Task in the exam.
Student is able to expand simple functions in Fourier series.	Home assignment. Task in the exam.

### ***Study subject structure***

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	5.0	7.5	3.0	3.0	0.0		*	
2.	4.0	6.0	2.0	3.0	0.0		*	