



RTU Course "Mathematics"

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General data

Code	DDM101
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	Inta Volodko
Academic staff	<p>Irīna Eglīte Ilze Karpinska Vera Gošteine Sarmīte Čerņajeva Vladislavs Kremeņeckis Ilona Dzenīte Valentīna Koliškina Tamāra Kabiša Sergejs Smirnovs Marija Iltiņa Aleksandrs Kovancovs Svetlana Pavlova Māra Birze Kristīne Ševčenko Līga Ramāna Ilmārs Iltiņš Evija Kopeika Tabita Treilande</p>
Volume of the course: parts and credits points	2 parts, 9.0 Credit Points, 13.5 ECTS credits
Language of instruction	LV, EN
Annotation	<p>Linear algebra: matrices, determinants, systems of linear equations. Analytical geometry: vectors, lines, surfaces. Introduction to analysis: limits, continuity. Differential calculus: derivative, differential and their applications. Integral calculus: indefinite and definite integrals, their applications. Double and triple integrals. Ordinary differential equations. Series.</p>
Goals and objectives of the course in terms of competences and skills	To develop students' understanding of basic mathematical concepts that are necessary to be able 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	<p>Twelve homework assignments are given during the study course. The topics of these assignments are as follows: linear algebra, vector algebra, analytic geometry, limits, differentiation of a function of one argument, analysis of functions, differentiation of a function of several variables, indefinite integral, applications of a definite integral, double integrals, differential equations, series. Homework assignments are 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 grades for homework assignments are taken into account for the calculation of the final grade for the course.</p>
Recommended literature	<ol style="list-style-type: none"> Inta Volodko. Augstākā matemātika. Īss teorijas izklāsts. Uzdevumu risinājumu paraugi. I daļa, Rīga, Zvaigzne ABC, 2007, 294. lpp., 2. daļa, Rīga, Zvaigzne ABC, 2009, 396 lpp. Andrejs Koliškina, Inta Volodko, Maksimilians Antimirovs. Matemātika I tehnisko augstskolu studentiem. RTU, 2004, 337 lpp., Matemātika II tehnisko augstskolu studentiem. RTU, 2005, 244 lpp. Kārlis Šteiners, Biruta Siliņa. Augstākā matemātika. Lekciju konspekts inženierzinātņu un dabaszinātņu studentiem. 1. daļa, Zvaigzne, 1997, 96 lpp., 2. daļa, Zvaigzne ABC, 1998, 115 lpp. Kārlis Šteiners. Augstākā matemātika. Lekciju konspekts inženierzinātņu un dabaszinātņu studentiem. 3. daļa, Zvaigzne ABC, 1998, 192 lpp., 4. daļa, Zvaigzne ABC, 1999, 168 lpp., 6. daļa, 2001, 208 lpp. Kronbergs E., Rivža P., Bože Dz. Augstākā matemātika. 1. un 2. daļa, Rīga, Zvaigzne, 1988, 534 lpp., 527 lpp., 2. daļa, Rīga, Zvaigzne, 1988, 527 lpp. Biruta Siliņa, Kārlis Šteiners. Rokasgrāmata matemātikā. Zvaigzne ABC, 2006, 367 lpp. Dz. Bože, L. Biezā, B. Siliņa, A. Strence. Uzdevumu krājums augstākajā matemātikā. Zvaigzne ABC, 1996, 328 lpp. Inta Volodko. Tipveida uzdevumu krājums matemātikā I. RTU, 2001, 2003, 2005, 206 lpp. I. Volodko, A. Āboltiņš, L. Biezā. Tipveida uzdevumu krājums matemātikā II. RTU, 2002, 2005, 288 lpp.
Course prerequisites	The study course is based on the knowledge of mathematics acquired at the secondary school.

Course outline

Theme	Hours
Elements of linear algebra: Determinants. Matrices, operations on them. Solution of systems of linear equations.	12
Vector algebra: Scalars and vectors. Vector projection on an axis. Operations on vectors and their applications.	12
Analytical geometry: Equation of a line in a plane. Equation of a plane and a line in three-dimensional space.	12
Introduction to calculus: Elementary functions. Sequences and their limits. A limit of a function. Continuity.	12
One-variable differential calculus: Derivative of functions. Applications of derivatives in the analysis of functions.	24
Function of several variables: Definition and geometrical meaning. Partial derivative. Tangent plane and normal line.	18
Complex numbers, operations on them.	4
Indefinite integral: Integrals of elementary functions. Methods of integration.	16
Definite integral: Definition and properties. Applications of definite integral. Improper integrals.	10
Multiple integrals and their applications.	14
Ordinary differential equations: First-order and second-order differential equations, methods of their solution.	20
Numerical and functional series. Applications of power series.	18
Numerical and functional series. Applications of power series.	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
After successful completion of the study course, a student is able to solve systems of linear equations and to perform operations on matrices.	Evaluation of students' knowledge and skills is based on the results of homework assignments, tests and final examination.
Able to find equation of a straight line in a plane and three-dimensional space; to find equation of a plane in three-dimensional space; to recognize second-order curves and plot them in a plane.	Students' knowledge and abilities are assessed based on homework assignments, tests and final examination.
Able to compute simple limits; to find derivatives of functions; to analyse the behavior of a function using limits and derivatives and to plot the graph of a function.	Two tests, two homework assignments and several assignments at the final examination are used to assess students' knowledge on these topics.
Able to find partial derivatives of a function of several variables; to find equations of a tangent plane and normal line to a surface; to determine extrema of a function of two variables.	Students' knowledge and skills are tested based on homework assignment and an assignment at the final examination.
Able to perform operations on complex numbers in algebraic, trigonometric and exponential form.	Assignments relevant to the material studied are included in the final examination.
Able to integrate simple functions; to find the area of a plane figure, length of a curve and volume of a body of revolution using a definite integral.	Three tests, two homework assignments and assignments at the final examination are used to test students' knowledge on the above-mentioned topics.
Able to compute simple double and triple integrals, to use them in order to find the area of a plane figure and volume of a body.	Students' knowledge is assessed based on homework assignment, test and assignments at the final examination.
Able to solve simple first- and second-order ordinary differential equations.	Evaluation of students' knowledge and skills is based on the results of homework assignments, tests and final examination.
Able to determine whether a series is convergent or divergent; to find the domain of convergence of functional series; to expand a function into power series; to use series in order to compute a definite integral.	Students' knowledge and abilities are assessed based on homework assignments, tests and final examination.

Study subject structure

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