RTU Course "Mathematics"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	DIM701
Course title	Mathematics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Inta Volodko
Academic staff	Aleksandrs Kovancovs Irina Eglīte Ilona Dzenīte Valentīna Koliškina Marija Dobkeviča Sergejs Smirnovs Jeļena Mihailova Tabita Treilande Kaspars Krauklis Jeļena Liģere Vaira Buža Olga Kozlovska
Volume of the course: parts and credits points	2 parts, 13.5 credits
Language of instruction	LV, EN
Annotation	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. Multiple integrals. Ordinary differentialequations. The Laplace transform. Series.
Goals and objectives of the course in terms of competences and skills	Deliver basic mathematical concepts that are necessary to understand data handling processes and algorithms. Develop students' logical thinking and skills to analyze basic aspects of special subjects with the objective to analyze more complicated problems.
Structure and tasks of independent studies	Eleven homework assignments are given during the course. The topics of these assignments are: 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, differential equations, series. Homework assignments are submitted before the deadline indicated by a professor. Student has an opportunity to re-submit the work once after it has been corrected by the professor. The grades for homework assignments are taken into account for the calculation of the final grade for the course.
Recommended literature	Obligātā literatūra: 1. 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. 2. Dz. Bože, L.Biezā, B.Siliņa, A.Strence. Uzdevumu krājums augstākajā matemātikā. Zvaigzne ABC, 1996, 328 lpp. 3. 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. 4. 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. Papildus literatūra: 5. Andrejs Koliškins, Inta Volodko, Maksimilians Antimirovs. Matemātika I tehnisko augstskolu studentiem. RTU, 2004, 337 lpp., Matemātika II tehnisko augstskolu studentiem. RTU, 2005, 244 lpp. 6. 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. 7. Biruta Siliņa, Kārlis Šteiners. Rokasgrāmata matemātikā. Zvaigzne ABC, 2006, 367 lpp. 8. Inta Volodko. Tipveida uzdevumu krājums matemātikā I. RTU, 2001, 2003, 2005, 206 lpp. 9. I. Volodko, A. Āboltiņš, L. Biezā. Tipveida uzdevumu krājums matemātikā II. RTU, 2002, 2005, 288 lpp.
Course prerequisites	Course is based on knowledge that is acquired in secondary school.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Elements of linear algebra: Determinants. Matrices, operations on them. Solution of systems of linear equations.	14	10	0	0
Vector algebra: Scalars and vectors. Vector projection on an axis. Operations on vectors and their applications.	12	10	0	0
Analitical geometry: Equation of a line in a plane. Equation of a plane and a line in three-space.	14	12	0	0

Introduction to calculus: Elementary functions. Sequences and their limits. A limit of a function. Continuity.	14	14	0	0
One-variable differential calculus: Derivative of functions. Applications of derivatives in an analysis of functions.	24	22	0	0
Function of several variables: Definition and geometrical meaning. Partial derivative. Tangent plane and normal.	12	8	0	0
Complex numbers, operations on them.	4	4	0	0
Indefinite integral: Integrals of elementary functions. Methods of integration.	16	14	0	0
Definite integral: Definition and properties. Applications of definite integral. Improrer integrals.	14	12	0	0
Multiple integrals and their applications.	4	0	0	0
Ordinary differential equations: First order and second order differential equations, methods of their solution.	20	16	0	0
The Laplace transform. Solving linear constant coefficient differential equations using the Laplace transform.	6	6	0	0
Numerical and functional series. Applications of power series.	14	12	0	0
Review.	8	0	0	0
Consultations	36	0	0	0
Exam	8	0	0	0
Total:	220	140	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
After successful completion of the course students will be able to solve systems of linear equations and perform operations on matrices. Can perform operations on vectors.	Evaluation of students' work is based on the results of homework assignments, tests and the final exam.
Can find equation of a straight line in a plane and three-dimensional space; Find equation of a plane in three-dimensional space; Recognize second-order curves and plot they in a plane.	Students' knowledge and abilities are assessed using homework assignments, tests and final exam.
Can compute simple limits; find derivatives of functions; can analyze the behavior of a function using limits and derivatives and plot the graph of a function.	Two tests, two homework assignments and several problems on the final exam are used to assess students' knowledge on these topics.
Can find partial derivatives of a function of several variables; find equations of a tangent plane and normal line to a surface; determine extrema of a function of two variables.	Students' work is tested using homework assignment and problem on the final exam.
Can perform operations on complex numbers in algebraic, trigonometric and exponential form.	Corresponding problems are included in the final exam.
Can integrate simple functions; find the area of a plane figure, length of a curve and volume of a body of revolution using definite integral.	Three tests, two homework assignments and problems on the final exam are used to test students' knowledge on the above mentioned topics.
Can solve simple first and second order ordinary differential equations. Can solve ordinary differential equations by means of the method of the Laplace transform.	Students' knowledge is assessed using homework assignment, test and problems on the final exam.
Can determine whether a series is convergent or divergent; find the domain of convergence of functional series; expand a function into power series; use series to compute a definite integral.	One test, one homework assignment and a problem on the final exam are used to assess students' knowledge on these topics.
Can evaluate more complicated integrals, solve ordinary differential equations and other problems using Mathematica 5.	Students' knowledge is tested on the pass/fail system. The test consists of six problems, three points maximum for each problem. Students' have to score at least 10 points in order to pass the course.

Evaluation criteria of study results

Criterion	%
Homework	10
Tests	25
Labs	10
Theory tests	5
Exam	50
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	7.5	3.0	2.0	1.0		*	
2.	6.0	2.0	2.0	1.0		*	