RTU Course "Supplementary Mathematics (for mechanical engineering)"

12501 Inženiermatemātikas katedra

General data

Code	DIM208
Course title	Supplementary Mathematics (for mechanical engineering)
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	Dzenīte Ilona
Academic staff	Koliškins Andrejs Smirnovs Sergejs Kabiša Tamāra Orbidāne Natālija Birze Māra Volodko Inta
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Fourier series. Line and surface integrals. Elements of complex variable theory: Complex variables and functions of complex variable. Cauchy's theorem and Cauchy's integral formula. Elements of field theory: Scalar and vector field. Directional derivatives, gradient, vector field flux, work, circulation, divergence, rotor, Gauss-Ostrogradsky and Stokes' formula. Operator calculus: Laplace transform, its properties and applications.
Goals and objectives of the course in terms of competences and skills	To enable students to acquire basic knowledge of mathematical concepts necessary for the understanding of processes and algorithms in professional subjects. To develop students' logical thinking and skills to be able to analyse more complicated problems related to study courses of professional specialization.
Structure and tasks of independent studies	There are two mandatory individual homework assignments on the following themes: Fourier series and Laplace transform; and two assessment tests on the following themes: Elements of complex variable theory and Elements of field theory. In order to get the permission to take the exam, students must receive a positive evaluation of their individual homework assignments and assessment tests.
Recommended literature	1. K.Šteiners. Augstākā matemātika. Lekciju konspekts inženierzinātņu un dabaszinātņu studentiem. 5. daļa, Zvaigzne, 2000, 130 lpp., un 6. daļa, Zvaigzne, 2001, 208 lpp. 2. Inta Volodko. Augstākā matemātika. 2. dala, Rīga, Zvaigzne ABC, 2009, 396 lpp. 3. T. Kabiša, V. Gošteina. Matemātikas papildnodaļas. Metodiskais līdzeklis. Rīga, RTU Inženiermatematikas katedra, 2009, 144 lpp. 4. Antimirovs M., Panfjorova A., Volodko I. Vairākkārtīgie integrāļi un lauku teorija. Rīga, RTU, 1998, 226 lpp. 5. Antimirovs M., Panfjorova A., Liepiņa V. Kompleksā mainīgā funkcijas un konformie attēlojumi. Rīga, RTU, 1990, 81 lpp. 6. N. Orbidāne, Dz. Lūse, I. Volodko. Tipveida uzdevumi matemātikas papildnodaļās transporta un mašīnzinību specialitātēm. Rīga, RTU, 2003, 50 lpp. 7. Kronbergs E., Rivža P., Bože Dz. Augstākā matemātika. 2.d., Rīga, Zvaigzne, 1988, 527 lpp. 8. T. Cīrulis, O. Dzenītis. Kompleksā mainīgā funkciju teorija piemēros. Zvaigzne, 1983. 9. I.Egle, B. Siliņa, A. Strence. Uzdevumu krājums augstākās matemātikas speciālajā kursā. 1976.
Course prerequisites	Single variable and multivariable differential calculus. Indefinite and definite integral. Double and triple integral. Numerical and functional series.

Course outline

Theme	Hours
Fourier series	4
Line and surface integrals	5
Elements of complex variable theory	10
Elements of field theory	8
Laplace transform	5

Learning outcomes and assessment

Learning outcomes	Assessment methods
Based on the acquired knowledge of Fourier series, a student is able to analyse periodic processes that take place in engineering and physics, for instance, in signal theory.	Evaluation of students' knowledge is based on the results of final examination and homework assignments.
Able to find line integrals and solve related problems on vector field work and circulation, and weight of material line.	Evaluation of students' knowledge is based on the results of final examination and assessment tests.

Able to find surface integrals and solve related problems on vector field flux through different shape surfaces, and weight of material surface.	Evaluation of students' knowledge is based on the results of final examination and assessment tests.
Able to find basic characteristic values of scalar and vector field: directional derivatives, gradient, vector field flux, work, circulation, divergence, rotor, and able to check if the vector field is potential.	Evaluation of students' knowledge is based on the results of final examination and assessment tests.
Able to use the acquired knowledge of elements of complex variable theory to solve problems that arise in theoretical physics, hydromechanics, elasticity theory and radio engineering.	Evaluation of students' knowledge is based on the results of final examination and assessment tests.
Able to use Laplace transforms to solve differential equations and systems of differential equations in electrical engineering and automatic control theory.	Evaluation of students' knowledge is based on the results of final examination and homework assignments.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.0	1.0	0.0		*	