RTU Course "Supplementary Mathematics (for electrical engineering)"

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General data

Code	DIM205
Course title	Supplementary Mathematics (for electrical engineering)
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Marija Iltiņa
Academic staff	Irina Eglīte Vera Gošteine Ilmārs Iltiņš Jeļena Liģere Marija Dobkeviča Sergejs Smirnovs Māra Birze Vaira Buža Evija Kopeika Jeļena Mihailova
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Annotation	The study course deals with the methods used in the implementation of electrical technologies in various sectors of economy. The study course deals with methods for solving line integrals and surface integrals. Field theory and complex variable function theory are considered in the study course. An insight in integral transforms, its basic properties and applications are given in the study course.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to provide basic knowledge in a complex theory of variable functions, field theory and operator calculations, which are necessary for successful acquisition of specialty study courses. The tasks of the study course are to develop students logical thinking and application of skills in connection with specialty study courses and their basic objects in order to develop students ability to analyse solutions to the most complex tasks to be performed in the future.
Structure and tasks of independent studies	Within the framework of the study course, a student has to accomplish 3 home assignments on the following themes: the theory of functions of a complex variable, Laplace transform, field theory. Assignments are to be submitted to an instructor at the given time and they can be corrected only once. Student is allowed to take the examination if all home assignments are submitted and the positive assessment is received.
Recommended literature	Obligātā/Obligatory: 1. Antimirovs M., Panfjorova A., Volodko I. Vairākkārtīgie integrāļi un lauku teorija. Rīga, RTU, 1998, 226 lpp. 2. Antimirovs M., Panfjorova A., Liepiņa V. Kompleksā mainīgā funkcijas un konformie attēlojumi. Rīga, RTU, 1990, 81 lpp 4. https://estudijas.rtu.lv/course/view.php?id=63844 5.Andrejs Reinfelds, Kompleksā mainīgāfunkciju teorija, 2009. http://docplayer.lv/180617534-Kompleks%C4%81-main%C4%ABg%C4%81-funkciju-teorija.html Papildu/Additional: 6. Kronbergs E., Rivža P., Bože Dz. Augstākā matemātika. 2. daļa, Rīga, Zvaigzne, 1988, 527 lpp. 7. https://www.cambridge.org/lv/academic/subjects/physics/theoretical-physics-and-mathematical-physics/classical-field-theory?format=HB 8. https://www.cambridge.org/lv/academic/subjects/mathematics/real-and-complex-analysis/introduction-complex-variables-and-applications?format=PB 9. https://education-online-courses.com/integral-transforms/#1 6. https://www.coursary.com/search?fromfld=lpnxt&q=Lina+and+surface+integrals&act=1642081051®=wst&tpl=a100456 7. https://education-online-courses.com/integral-transforms/#26
Course prerequisites	Mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Line integrals of the first and second type.	5	5	3	7
Function of a complex variable. Continuity, limit, derivative. Cauchy-Riemann conditions.	5	5	3	7
Cauchy' s theorem. Integral. Series. Taylor and Laurent series.	5	5	3	7
Residue. Application of residues for calculation of integrals.	5	5	3	7
Laplace transform. Inverse transform. Application of Laplace transform to the solution of differential equations.	5	5	3	7
Surface integrals of the first and second kind.	5	5	3	7

Scalar field. Directional derivative. Gradient. Vector field. Flux and divergence of a vector field.	5	5	3	7
Circulation of a vector field. Stokes' formula. Curl of a vector field. Potential, divergence-free and curl-free fields.	5	5	3	7
Total:	40	40	24	56

Learning outcomes and assessment

Learning outcomes	Assessment methods
After successful completion of the study course a student is able to calculate line integrals of the first and second type, to apply the Green's formula.	Evaluation of students' knowledge and skills is based on the results of homework assignments, test and final examination.
Able to calculate the value of complex variable function, to check Cauchy-Riemann conditions, to find an analytical function by either its real or imaginary part.	Evaluation of students' knowledge and skills is based on the results of homework assignments, test and final examination.
Able to calculate an integral of complex variable function, to apply Cauchy's theorem, to expand a function in Taylor and Laurent series.	Evaluation of students' knowledge and skills is based on the results of homework assignments, test and final examination.
Able to calculate a residue and integrals with the aid of residues.	Evaluation of students' knowledge and skills is based on the results of homework assignments and final examination.
Able to find a Laplace transform of a function and an inverse transform, to solve differential equations using Laplace transform.	Evaluation of students' knowledge and skills is based on the results of homework assignments and final examination.
Able to calculate surface integrals of the first and second kind.	Evaluation of students' knowledge and skills is based on the results of homework assignments, test and final examination.
Able to calculate a directional derivative and a gradient of a scalar field, to calculate flux and divergence of a vector field, to apply the Gauss-Ostrogradsky formula.	Evaluation of students' knowledge and skills is based on the results of homework assignments and final examination.
Able to calculate the circulation and curl of a vector field, to apply Stokes' formula, to calculate the potential of a field.	Evaluation of students' knowledge and skills is based on the results of homework assignments and final examination.

Evaluation criteria of study results

Criterion	%
Homeworks	10
Test	40
Exam	50
Total:	100

Study subject structure

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