



RTU Course "Computerization of Mathematical Tasks in Electrical Engineering"

11213 Elektrisko mašīnu un aparātu katedra

General data

Code	EEM208
Course title	Computerization of Mathematical Tasks in Electrical Engineering
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Power and Electrical Engineering
Responsible instructor	Sandra Vītolīņa
Academic staff	Andrejs Zviedris Raisa Smirnova Svetlana Zimina Andrejs Podgornovs Genadijs Zaļeskijs Eduards Rēns
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Possibility of distance learning	Not planned
Abstract	Electrotechnical tasks for numerical methods and their features. Main algorithms of numerical methods for systems of equations, non-linear equations and differential equations. Numerical methods of differentiation and integration.
Goals and objectives of the course in terms of competences and skills	The goals of the course: - to master numerical methods for solving problems in the field of electrical engineering; - to learn practical use of numerical methods for solving various tasks on computer. The objectives of the course: - to have a good knowledge about the most common numerical methods for solving mathematical tasks in the field of electrical engineering; - to know how to choose the most appropriate solving method for particular problem and to be able evaluating acquired results; - to combine various numerical methods for gaining the optimal solution of the given task.
Structure and tasks of independent studies	It includes: - making acquaintance with proper theoretical material, choosing necessary solving algorithms, and performing preliminary calculus; - solving tasks in accordance with issued work task (in MS Excel).
Recommended literature	1. Zviedris A. Datorrealizācijas matemātiskās metodes. RTU, R.:2004. – 77 lpp. 2. Faires D.J., Burden R.L. Numerical methods. Third edition. Brooks Cole, 2002. – 640 p. 3. Chapra S.C., Canale R.P. Numerical methods for Engineers. Fifth edition. The McGraw-Hill Companies, Inc., 2006. – 927 p. 4. Данилина Н.И., Дубровская Н.С., Кваша О.П., Смирнов Г.Л. Вычислительная математика. М.: «Высшая школа», 1985. 5. Данилина Н.И., Дубровская Н.С., Кваша О.П., Смирнов Г.Л., Феклисов Г.И. Численные методы. М.: «Высшая школа», 1976.
Course prerequisites	Knowledge about concepts of higher mathematics (rows, derivative, integrals, differential equations etc.). Practical skills of the main elements and functions in software MS Excel).

Course outline

Theme	Hours
Introduction – short description of the discipline and the role of numerical methods in solving mathematical problems in	2
Solving of linear equation system with matrix method	2
Solving of linear equation system with method of iterations	2
Solving of non-linear equations. Bisection method	2
Solving of non-linear equations. Secant method, the Newton method, iteration method	2
Interpolation and extrapolation	2
Newton's interpolating polynomials	2
Trigonometric interpolation	2
Mathematical analysis of data	3
Syntesis of empirical equations for non-linear functions	2
Numerical differentiation	2
Numerical integration	2
Approximate analytic solving methods for ordinary differential equations	2
Euler's method and Runge-Kutta method for solving differential equations	2
Boundary- value of ordinary differential equations	3

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to assess input data, to choose appropriate solving method and to draw conclusions on precision of the gained results.	Test on theory issues, evaluation of accomplished laboratory works
Ability to solve mathematical problems in the field of electrical engineering using numerical methods	Exam, evaluation of accomplished laboratory works
Ability to combine solving methods to gain the optimum of the solution.	Exam, evaluation of accomplished laboratory works

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	1.5	0.0	1.5		*	