Subject code	ECTS credits
MAT 3004	6

Course title in Lithuanian

SKAITINIAI METODAI IR OPTIMIZAVIMAS

Course title in English

NUMERICAL METHODS AND OPTIMIZATION

Short course annotation in Lithuanian (up to 500 characters)

Funkcijų interpoliavimas algebriniais daugianariais, Lagranžo ir Niutono interpoliacinės formulės, interpoliavimo paklaida. Interpoliavimas splainais. Kubinio interpoliacinio splaino radimo formulės, interpoliavimo paklaida. Apytikslės integravimo formulės: stačiakampių, trapecijų, Simpsono, aposteriorinis paklaidos įvertis, adaptyvinės skaitinio integravimo formulės. Netiesinės lygties sprendimas. Niutono metodas ir jo modifikacijos, sprendinio paklaidos įvertis. Iteraciniai metodai tiesinių algebrinių lygčių sistemoms spręsti. Jakobio, Zeidelio, paprastosios iteracijos, relaksacijos ir neišreikštiniai iteraciniai metodai. Matricos tikrinių reikšmių ir tikrinių vektorių radimo metodai, laipsnių metodas ir jo modifikacijos, atvirkštinės iteracijos metodas. Vieno ir kelių kintamųjų funkcijos optimizavimo metodai

Short course annotation in English (up to 500 characters)

This course aims to develop understanding in numerical methods and optimization. The content includes: Functions interpolation. Cubic spline. Numerical integration. Solving of nonlinear equation and system of linear algebraic equations. Algebraic eigenvalue problem. Teaching methods are lectures and practical works.

Prerequisites for entering the course

Mathematical Analysis, Algebra

Course aim

Course aim is to provide understanding of Numerical Methods and Optimization.

Links between course outcomes, criteria of learning achievement evaluation, study methods and methods of learning achievement assessment

No	Course outcomes	Criteria of learning achievement evaluation	Study methods	Methods of learning achievement assessment
1	Knowledge and understanding to solve the practical problem by spline interpolation	Student is able to solve problem using spline interpolation.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
2	Understanding the methods to evaluate the error of numerical integration	Student demonstrates the ability to evaluate the error of numerical integration.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
3	Provide knowledge of use the basic methods for determination of roots of nonlinear functions	Student is able to determine roots of nonlinear functions.	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
4	Understanding the methods to solve the system of linear algebraic equatons	Student is able to solve system of linear algebraic equation using different methods.	Lectures, practical works, individual	Mid-term exam, Assessment of practical works

			work, consulting	
5.	Understanding the methods to determine approximately the eigenvalues and egenvectors of matrices	Student can determine eigenvalues and eigenvectors of matrices	Lectures, practical works, individual work, consulting	Mid-term exam, Assessment of practical works
6.	Understanding the choose of the methods for minimization of functions	Student is able to choose proper methods for minimization of functions	Lectures, practical works, individual work	Final exam, assessment of practical works

Links between study programme outcomes and course outcomes

Study programme outcomes	**Running number of course outcome**					
	1	**2**	**3**	**4**	**5**	**6**
Know and comprehend concepts and propositions of fundamental mathematical subjects, recognize and apply them solving practical/theoretical tasks	+	+	+	+	+	+
Comprehend and be able to apply classical analytical and numerical methods as well as the main algorithms for solving differential equations	+	+				+
Identify the problem, collect and analyze real/theoretical data using various mathematical methods, tools and IT technologies		+	+	+	+	
Think logically and analytically, evaluate alternative ways of task solving and implement optimal solutions	+	+	+	+	+	+

Content

No	**Content (topics)**
1.	Interpolation of functions, spline interpolation.
2.	Numerical integration.
3.	Solution of nonlinear equation, Newton method and its modifications.
4.	Solution of the system of linear algebraic equations, Gauss-Seidel and Cholesky methods, iterative methods.
5.	Algebraic eigenvalue problem, power and inverse iteration methods.
6.	Methods of minimization of functions.

Distribution of workload for students (contact and independent work hours)

Lectures	**45 hours**
Practical work	**30 hours**
Individual students work	**85 hours**
Total:	**160 hours**

Structure of cumulative score and value of its constituent parts

Final assessment sums the assessments of written final examination (50%), written mid-term examination (25%) and assessment of practical works (25%).

Recommended reference materials

No	**Publication year**	**Authors of publication and title**	**Publishing house**	**Number of copies in**		
				University library	*Self study rooms*	*Other libraries*
Basic materials						

1.	1997	Čiegis R., Būda V. Skaičiuojamoji matematika	Vilnius , TEV	15	3	
2.	1992	Buchanan J.L., Turner P.R. Numerical Methods and Analysis	McGraw-Hill Itern		1	
3.	2005	Sapagovas M. Skaitiniai metodai	Kaunas, VDU		1	Free access in VMU Moodle system for students of this study subject

Course programme designed by

Prof. habil. dr. Vytautas Kleiza