Course description

Course unit (module) title		Code
Selected Chapters of Analysis		
Lecturer (s)	**Department where the course unit is delivered**	
Prof. Rimas Norvaiša	Department of Mathematical Analysis Faculty of Mathematics and Informatics Naugarduko St. 24, LT-03225 Vilnius, Lithuania	
Study cycle		**Type of course unit (module)**
Second		Compulsory
Mode of delivery	**Semester or period when the course unit (module) is delivered**	**Language (s) of instruction**
Face-to-face	1st semester (Fall)	Lithuanian, English
Requirements for students		
Prerequisites: Calculus and basic knowledge of functional analysis and differential equations	**Additional requirements (if any):**	
Course (module) volume in credits	**Total student's workload**	**Contact hours**	**Self-study hours**
5	134	40	94

Purpose of the course unit (module): programme competences to be developed		
In the course, new (comparing with bachelor course) abstract spaces will be introduced, deeper insight will be given to linear functionals and operators, and methods of investigation of nonlinear functions will be introduced. Students will be acquainted with solution of integral equations and differential heat equation.		
Learning outcomes of the course unit (module) At the end of the course a student should:	**Teaching and learning methods**	**Assessment methods**
- Know the main facts about topological spaces; - Know differentiation in normed spaces;	Traditional lectures on functional analysis. Practical training: solving problems that help to understand theory. Individual work: solving complimentary problems and studying the literature	Testing, written exam
- Be able to solve integral equations; - Understand the heat equation;		
- Be able to study the literature on functional analysis and applications; continue progress in this area.		

Content: breakdown of the topics	**Contact hours**				**Individual work hours and assignments**	
	Lectures	Consultations	Practical training	Total contact hours	Individual work hours	**Assignments**

Linear, metric and normed spaces	4		1	**5**	**10**	Homework: solving problems for each topic
Topological spaces	3		1	**4**	**12**	
Linear functionals and operators	5		1	**6**	**14**	
Generalized functions	3		1	**4**	**10**	
Differentiation in normed spaces	4		1	**5**	**12**	
Fredholm-Riesz-Schauder theory	5		1	**6**	**14**	
Newton method for solving nonlinear equations	2		1	**3**	**8**	
Heat equation	2		1	**3**	**8**	
Test and exam		4		**4**	**6**	Preparation for the test and exam
Total	**28**	**4**	**8**	**40**	**94**	

Assessment strategy	Weight %	Deadline	Assessment criteria
Test (written)	25	8-9th week	Test consists of 2 theoretical questions and 2 problems from first two topics. Each question and problem is evaluated by points, the total sum of points is equal from 0 to 25.
Exam (written)	75	January	Exam consists of 4 theory questions and 6 exercises (of diverse difficulty). Two questions require complete proof of some theorems or propositions. Exam is evaluated from 0 to 75 points. The points obtained from the test and exam are added, and the maximal possible sum is 100 points. The final mark is given according to the following principle: 10 – not less than 90 points 9 – not less than 82 points 8 – not less than 75 points 7 – not less than 65 points 6 – not less than 55 points 5 – not less than 45 points Students who collected fewer than 45 points get unsatisfactory mark (1 -4)

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsory reading				
V. Paulauskas, A. Račkauskas	2007	Funkcinė analizė (Functional Analysis)	I	Vilnius, publishing house „Vaistų žinios"
V. Paulauskas, A. Račkauskas	2007	Funkcinė analizė (Functional Analysis)	II	Vilnius, publishing house „Vaistų žinios"
A. Račkauskas, A. Skūpas, A. Zabulionis	1989	Funkcinės analizės pratybų užduotys (Exercises of Functional Analysis)	I	Vilnius University Press
A. Račkauskas, A. Skūpas, A. Zabulionis	1992	Funkcinės analizės pratybų užduotys (Exercises of Functional Analysis)	II	Vilnius University Press
Optional reading				
W. Rudin	1991	Functional Analysis, 2nd ed.		McGraw-Hill, Singapore
M. Schechter	2002	Principles of Functional Analysis, 2nd Ed.		AMS, Providence, RI, USA
V. Paulauskas	2014	Selected chapters of		A manuscript (distributed for

		mathematical analysis (lecture notes)		students)