COURSE UNIT DESCRIPTION - MATHEMATICAL ANALYSIS AND DIFFERENTIAL EQUATIONS

Course unit title	Code
MATHEMATICAL ANALYSIS AND DIFFERENTIAL EQUATIONS	

Lecturer(s)	Department(s)
Coordinator: Assoc. prof. dr. Aleksas DOMARKAS	Vilnius University, faculty of Mathematics and Informatics, Naugarduko g. 24, LT-03225, Vilnius

Cycle	Level of the course unit	Type of the course unit
Full-time studies (1st stage)	1 out of 1	Compulsory

Mode of delivery	Period of delivered	Language(s) of instruction
Face to face	2nd semester, spring	Lithuanian

Prerequisites and corequisities	
Prerequisites: School level course of Mathematics; Linear Algebra	**Corequisities (if any):**

Number of credits allocated to the course unit	Student's total workload	Contact hours	Self-study and research hours
5	**134**	**64**	**70**

Purpose of the course unit: programme competences to be developed

The course unit aims to develop:

Subject specific competences:

- Competence to analyse data based on numerical analysis skills;

General competences:

- skills for self-development, learning skills in order to study both molecular biology and general science resources.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Upon the successful completion of this course, students will: • explain the concepts, methods and structure of mathematical analysis and differential equations • formulate (verbally or in text) ideas, propositions and proofs of mathematical analysis and differential equations using the appropriate language; • solve mathematical problems using techniques from of mathematical analysis and differential equations; • knows the basic information technology systems and methods applicable to solving mathematical analysis and differential equations tasks. • be able to apply methods of calculus to analyze biological data.	Lecture, Practice classes, Individual reading	Tests (written) Exam (written)

Content: breakdown of the topics	Contact hours	Self-study work: time and assignments

	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	**Contact hours**	**Self-study hours**	**Assignments**
1. The concepts of a set and a function. Sequences. Limits of a sequences and functions. Continuity of a function. Discontinuities.	2			2			**4**	**4**	Analysis of literature, solving of mathematical problems using computer packages.
2. The derivative of a functions. The technique of diferentiation. Mean value theorem. Differential. L'Hospital rule. Taylor series.	2			2			**4**	**4**	
3. Discusion of the curve defined by an explicit function. Extreme values. Convex functions. Asymptote of a function.	2			2			**4**	**4**	
4. Functions of several variables. Partial derivatives . Differential. Extreme values of a functions. The method of least squares.	2			2			**4**	**4**	
5. The indefinite integral. Table of standart integrals. The technique of integration. Integration by parts. Integration by substitution. Rational , irrational and trigonometric functions integration.	4			4			**8**	**8**	
6. The definite integral. Properties of definite integrals. Newton-Leibniz formula. Applications of definite integrals. Improper integral.	4			4			**8**	**8**	
7. Series. Convergence and divergence. Convergence tests for series. Power series. Radius of convergence. Examples.	4			4			**8**	**8**	
8. Basic concepts of first order ordinary differential equations. Direction field. Isoclines. Initial conditions. Applications of differential equations.	2			2			**4**	**4**	
9. Elementarily integrable types. Separable, homogeneous, linear , Bernoulli and exact differential diferential equations.	4			4			**8**	**8**	
10. Basic concepts of higher order ordinary differential equations. Cases of order reduction. Examples.	2			2			**4**	**4**	
11. Homogeneous linear equations with constant coefficients. Nonhomogeneous equations and the method undetermined coefficients.	2			2			**4**	**4**	
12. Systems of differential equations. Basic concepts. The method of elimination.	2			2			**4**	**4**	
Exam								**6**	Preparation for the exam
Total	**32**			**32**			**64**	**70**	

Assessment strategy	**Weight,%**	**Assessment period**	**Assessment criteria**
Tests (written)	20+20	8^{th} and 15^{th} weeks of the course	Each test consists of 5-10 problems. Pass:

			10 (excellent) - ≥92% 9 (very good) – 82 – 91% 8 (good) – 74 – 81% 7 (highly satisfactory) – 66 - 73% 6 (satisfactory) – 58 - 65% 5 (sufficient) – 50 -57% Faill: 4 (insufficient) 40 - 49% 3 – 30 - 39% 2 – 20 - 29% 1 - ≤ 19%
Exam (written)	60	January	Final exam consists of 2 theory questions and 3-5 problems. Pass: 10 (excellent) - ≥92% 9 (very good) – 82 – 91% 8 (good) – 74 – 81% 7 (highly satisfactory) – 66 - 73% 6 (satisfactory) – 58 - 65% 5 (sufficient) – 50 -57% Faill: 4 (insufficient) 40 - 49% 3 – 30 - 39% 2 – 20 - 29% 1 - ≤ 19%
Total	100		2 Accumulative score

Author	**Year of publica-tion**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsory reading				
Pekarskas V.	2005	Short Course in Mathematics (in Lithuanian)		Technologija
Rumšas P.	1976	Short Course in Mathematics (in Lithuanian)		Mintis
Pridotkas G., Švitra D.	2005	Practice in Mathematics (in Lithuanian)	1,2	TEV
Optional reading				
Pekarskas V.	2003	Differential and Integral Calculations (in Lithuanian)	1,2	Technologija
Golokvosčius .	2000	Differential equations (in Lithuanian)		TEV