MODULE DESCRIPTION

Module title	Module code
Mathematical modeling	

Lecturer(s)	Department where the module is delivered
Coordinator: assoc. prof. dr. Algirdas Ambrazevičius **Other lecturers:**	Department of Differential Equations and Numerical Mathematics, Faculty of Mathematics and Informatics Vilnius University

Cycle	Type of the module
First	Optional

Mode of delivery	Semester or period when the module is delivered	Language of instruction
Face-to-face	7th semester	Lithuanian

Prerequisites
Prerequisites: Mathematics for Software Engineering I and II; Differential Equations.

Number of credits allocated	Student's workload	Contact hours	Self-study hours
5	130	68	62

Purpose of the module: programme competences to be developed

Purpose of the module – to develop abilities to create and investigate mathematical models describing the various processes. Develop abstract and analytical thinking.

Generic competences:

- Communication and collaboration *(GK1).*
- Life-long learning *(GK2).*
- Social responsibility *(GK3).*

Specific competences:

- Knowledge and skills of underlying conceptual basis *(SK4).*

Learning outcomes of the module: students will be able to	Teaching and learning methods	Assessment methods
Create mathematical models of various processes, know and understand the basic concepts and methods.	Lectures, individual reading, laboratory works (problems solving)	Laboratory works, exam (written)
Formulate and solve basic mathematical models.		
Use a variety of differential equations theory methods to solve mathematical models.		
Select and apply a variety of instructional strategies and techniques.		

Content: breakdown of the topics	Contact hours							Self-study work: time and assignments	
	Lectures	Tutorials	Seminars	Practice	Laboratory work (LW)	*Tutorial during LW*	**Contact hours**	**Self-study hours**	**Assignments**
1. Application of the fundamental laws of nature to create mathematical models. The calculus of variations and its application.	8				4		**12**	**15**	Individual reading, laboratory works (problems solving)
2. The simplest model of nonlinear processes. The simplest model of the equations of mathematical physics. Environmental models.	8				4		**12**	**15**	
3. Differential equations of first and higher order. System of differential equations.	8				12		**20**	**16**	
4. Partial differential equations of the second order, their classification, reduction to canonical form, methods of solution.	8				12		**20**	**16**	
Exam (written)		2					**4**		2 hours for tutorial, 2 hours for exam
Total									

Assessment strategy	Weight %	Deadline	Assessment criteria
3 laboratory works	50	During semester	The specific mathematical models are studied. Ranked in the 10 points system, in proportion to the number of the resolved problems. Then this result is multiplied by a factor 0.5.
Exam (written)	50	During exam session	The exam consists of theoretical questions and problems. Ranked in the 10 points system. Then this result is multiplied by a factor 0.5.

Author	Publishing year	Title	Number or volume	Publisher or URL
Required reading				
Algirdas Ambrazevičius	2006	Mathematical modeling (in Lithuanian)		http://www.mif.vu.lt/katedros/dlsm/darbuotojai/algam/mm.htm
Recommended reading				
A.A. Samarskis, A.P. Michailovas,	1997	Mathematical modeling		Maskva, "FizMatLit", 270 p.
A. Ambrazevičius	1996	Equations of mathematical physics. Part I (in Lithuanian)		Vilnius, 380 p.
P. Golokvosčius	2000	Differential equations (in Lithuanian)		Vilnius, TEV, 512 p.