Program	Level	First cycle
	Name of the program	Applied Mathematics

COURSE

Course title	Introduction to Mathematical Modeling			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
AMAT 370	VI	Mandatory course	4	2+1+0
Lecturer				
Course Goals	Mathematical modeling is a combination of mathematics and other sciences. The purpose of this course is to enable the student to present various phenomena in life in mathematical language, which confirms the attitude of the role of mathematics and its broad applicability in various fields. Throughout the course, it attempts to cover as many fields of science as medicine, biology, technical and physical sciences, social sciences, psychology, economics, and to show mathematical models of particular phenomena in the mentioned areas. It will give students a broad knowledge of the applicability of mathematics and gain an opportunity to choose the application of mathematics in the field of their interest.			
Learning Outcomes	By the end of the course, the students will be able to dynamically model dynamic processes, create dynamic models using differential, partial differential and differential equations. Also, the student will be able to analyze the accuracy, as well as examine the stability of generated models.			

COURSE CONTENT

- The basics of mathematical modeling.
- Examination of the usability of the model, a priori, and posterior analysis. Dimensional analysis.
- Various model types. Modeling in biology. Logistic models. Bromsulphalein retention test.
- Logistic models with delay. The models of plant growth. Regression models.
- Modeling in medicine. The selection of models from epidemiology and physiology.
- Empirical modeling in psychology.
- Modeling of the membrane, the flow of heat through the medium and other models in physics and technique.
- Parametric assessment and sensory analysis. Kinematics of enzymes. Predator-prey interaction.
- Introduction to stochastic differential equations and delayed differential equations.
- The simulation of models in Mathematica and Matlab.

LITERATURE

[1] Y. Cherruault: Mathematical Modelling in Biomedicine: Optimal Control of Biomedical Systems, (1986), D. Reidel Publ., Dordrecht.
[2] G. A. F. Seber and C. J. Wild: Nonlinear Regression, (2003), John Wiley & Sons, New York.
[3] C. L. Dym and E. S. Ivey: Principles of Mathematical Modeling, 2nd edition, (2006), Academic Press, New York.
[4] Rubinow: Mathematical Problems in the Biological Sciences, (1973), CBMS Vol. 10, SIAM, Philadelphia.
[5] H. I. Freedman: Deterministic Mathematical Models in Population Ecology, (1980), Marcel Dekker, New York.

STUDENT WORKLOAD (hours in a semester)

Lectures	30	Exercises	15	Individual work	55	T o t a l	100

GRADING

Criterion	Maximum points	Minimum points
Midterm exams	20	11
Assigments	5	2
Projects	30	17
Seminar paper	10	6
Final exam	35	19
T o t a l	100	55

REMARKS