Program	Level	First cycle		
	Name of the program	All study programs		
COURSE				
Course title	**Differential Equations**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
AMAT 210	III	Mandatory course	6	3+2+0
Lecturer				
Course Goals	This course aims to introduce students to the basic principles of ordinary differential equations. The course consists of four parts, covering particular topics of ordinary differential equations. In the first three parts, the main objective is to identify the type of differential equation or system and learn how to solve them. The fourth part deals with the Laplace transform and uses this transform for solving the initial value problems for linear differential equations or systems of linear differential equations.			
Learning Outcomes	On completion of the course, the student should be able to: • explain the basic concept of differential equations; • explain the meaning of the solutions of differential equations; • express and explain the existence and uniqueness theorems; • solve first order and higher order differential equations; • solve the system of linear differential equations in normal form; • explain basic properties of the Laplace transform; • apply the Laplace transform in finding the solutions to the linear differential equations; • apply differential equations in some real-world problems.			

COURSE CONTENT

- First-order differential equations. Introduction and definitions. Initial value problem (Cauchy problem). Existence and uniqueness (Peano's Existence Theorem, Cauchy-Picard Theorem). General, particular and singular solution. Separable variables. First-order linear differential equations. Exact differential equations. Homogeneous differential equations. Bernoulli differential equation. Riccati differential equation. Applications. Implicit differential equations. Existence and uniqueness. Lagrange's differential equation. Clairaut's differential equation. Applications.

- Higher order differential equations. Definitions. Initial value problem (Cauchy problem). Existence and uniqueness. General, particular and singular solution. Linear differential equations. Linear independence and Wronskian. Existence and uniqueness. Homogeneous differential equations with variable coefficients. Nonhomogeneous differential equations with variable coefficients. Homogeneous differential equations with constant coefficients- The characteristic equation. Homogeneous differential equations with constant coefficients-The general solution. Non-homogeneous differential equations. The general solution. Euler differential equation. The method of undetermined coefficients. Variation of parameters. Applications.

- Systems of differential equations. Definitions. Linear system. Introduction to basic theory. The method of elimination. The matrix method. Nonhomogeneous systems-variation of parameters. Applications.

- The Laplace transform. Introduction. The Laplace transform and its properties. The Laplace transform applied to differential equations and systems. The unit step function. The unit impulse function. Applications.

LITERATURE

[1] W.E.Boyce, R.S.DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th edition, John Wiley&Sons, 1997.
[2] N.J.Finizio & G.Ladas, Ordinary Differential Equations with modern Applications, 3rd edition, University of Rhode Island, 1999.

[3] A.Gray, M.Mezzino. M.A. Pinsky, Introduction to Ordinary Differential Equations with Mathematica, Springer, 1997.
[4] Philip Hartman, Ordinary Differential Equations, 2nd edition, Birkhäuser, 1982.
[5] Senada Kalabušić, Esmir Pilav, Obične diferencijalne jednadžbe, PMF Sarajevo, 2014.
[6] Wolfang Walter, Ordinary Differential Equations, Readings in Mathematics, Springer 1998.

STUDENT WORKLOAD (hours in a semester)

Lectures	45	Tutorial	30	Individual work	75	T o t a l	175

GRADING

Criterion	Maximum points	Minimum points
Midterm exams	50	25
Homework assignment	-	-
Project	-	-
Laboratory assignments	-	-
Final exam	50	30
T o t a l	100	55

REMARKS

Midterm exam: only once in semester (end of November or first week of December). Students altogether write 120 minutes long test. This test is evaluated by max 50 points. The minimal score of the test is 25 points.

Final exam: Students who do not reach the midterm exam minimal score must take the entire course in the final exam. In this case, the final exam is evaluated by max 100 points. The final exam's minimal score is 55 points. Students who reach the midterm exam minimal score take only the part of the final exam that is not covered by the midterm test. In this case, the final exam is evaluated by max 50 points. The minimal score is 30 points.