TOROS ÜNİVERSİTESİ

Faculty Of Engıneerıng
Industrıal Engıneerıng (Englısh)

Course Information

DIFFERENTIAL EQUATIONS					
Code	**Semester**	**Theoretical**	**Practice**	**National Credit**	**ECTS Credit**
		Hour / Week			
MAT203	Fall	4	0	4	6

Prerequisites and co-requisites	
Language of instruction	English
Type	Required
Level of Course	Bachelor's
Lecturer	Asst. Prof. Çağdaş ALLAHVERDİ
Mode of Delivery	Face to Face
Suggested Subject	none
Professional practise (internship)	None
Objectives of the Course	The objectives of this course are to introduce the student with the concept of a differential equation, basic techniques for solving certain classes of differential equations, especially those which are linear, and making connections between the qualitative features of the equation and the solutions. Connections to problems from the physical world are emphasized. As well as ordinary differential equations, the course aims to introduce the students to certain partial differential equations.
Contents of the Course	First order equations and various applications. Higher order linear differential equations. Power series solutions. The Laplace transform. Solution of initial value problems. Systems of linear differential equations: Introduction Partial Differential Equations.

Learning Outcomes of Course

#	Learning Outcomes
1	Students will be able to classify and to identify different types of differential equations.
2	Students will be able to explicitly solve several important classes of ordinary differential equations and to interpret their qualitative behaviour.
3	Students will be able to apply ideas from linear algebra in order to solve single linear ordinary differential equations and systems of such equations.
4	Students will be able to model certain physical phenomena using differential equations and to reinterpret their solutions physically.
5	Students will be able to use power series methods to solve second order linear differential equations.
6	Students will be able to apply the Laplace transform for solving differential equations.
7	Students will be able to use the method of separation of variables in order to solve some basic partial differential equations via Fourier series.

Course Syllabus

#	Subjects	Teaching Methods and Technics
1	I. Introduction 1.1 Some Basic Mathematical Models; Direction Fields 1.2 Solutions of Some Differential Equations 1.3 Classification of Differential Equations	lecturing, discussing, problem solving
2	II. First Order Differential Equations 2.1 Linear Equations; Methods of Integrating Factors 2.2 Separable Equations,	lecturing,

	Homogeneous Equations 2.6 Exact Equations and Integrating Factors 2.8 The Existence and Uniqueness Theorem	discussing, problem solving
3	2.4 Differences Between Linear and Nonlinear Equations 2.5 Autonomous Equations and Population Dynamics 2.7 Numerical Approximations: Euler's Method	lecturing, discussing, problem solving
4	III. Second Order Linear Equations 3.1 Homogeneous Equations with Constant Coefficients 3.2 Fundamental Solutions of Linear Homogeneous Equations; the Wronskian 3.3 Complex Roots of the Characteristic Equation	lecturing, discussing, problem solving
5	3.4 Repeated Roots; Reduction of Order 3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients	lecturing, discussing, problem solving
6	3.6 Variation of Parameters 3.7 Mechanical and Electrical Vibrations 3.8 Forced Vibrations	lecturing, discussing, problem solving
7	IV. Higher Order Linear Equations 4.1 General Theory of nth Order Linear Equations 4.2 Homogeneous Equations with Constant Coefficients 4.3 The Method of Undetermined Coefficients	lecturing, discussing, problem solving
8	V. Series Solutions of Differential Equations 5.2 Series Solution Near an Ordinary Point Part I 5.3 Series Solution Near an Ordinary Point Part II 5.4 Euler Equation, Regular Singular Points	lecturing, discussing, problem solving
9	5.5 Series Solution Near a Regular Singular Point I 5.6 Series Solution Near a Regular Singular Point II	lecturing, discussing, problem solving
10	VI. The Laplace Transform 6.1 Definition of the Laplace Transform 6.2 Solution of Initial Value Problems 6.3 Step Functions	lecturing, discussing, problem solving
11	6.4 Differential Equations with Discontinuous Forcing Functions 6.5 Impulse Functions 6.6 The Convolution Integral VII. Systems of Linear Equations 7.4 Basic Theory of Systems of First Order Linear Equations	lecturing, discussing, problem solving
12	7.5 Homogeneous Linear Systems with Constant Coefficients 7.6 Complex Eigenvalues 7.7 Fundamental Matrices	lecturing, discussing, problem solving
13	7.8 Repeated Eigenvalues 7.9 Nonhomogeneous Linear Systems X. Partial Differential Equations and Fourier Series 10.1 Two-point Boundary Value Problems	lecturing, discussing, problem solving
14	10.2 Fourier series 10.3 The Fourier Convergence Theorem 10.4 Even and Odd Functions 10.5 Separation of Variables; Heat Conduction in a Rod	lecturing, discussing, problem solving
15		
16	Final Exam	

Course Syllabus

#	Material / Resources	Information About Resources	Reference / Recommended Resources
1	W. E. Boyce, R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition John Wiley & Sons, Inc. (2009)		
2	W. F. Trench, A. G. Cowles, Elementary Differential Equations		
3	W. A. Adkins, M. G. Davidson, Ordinary Differential Equations Springer (2012)		

Method of Assessment

#	Weight	Work Type	Work Title
1	40%	Mid-Term Exam	Mid-Term Exam
2	60%	Final Exam	Final Exam

Relationship between Learning Outcomes of Course and Program Outcomes

#	Learning Outcomes	Program Outcomes	Method of Assessment
1	Students will be able to classify and to identify different types of differential equations.	1,11	1,2
2	Students will be able to explicitly solve several important classes of ordinary differential equations and to interpret their qualitative behaviour.	1,11	1,2
3	Students will be able to apply ideas from linear algebra in order to solve single linear ordinary differential equations and systems of such equations.	1,11	1,2
4	Students will be able to model certain physical phenomena using differential equations and to reinterpret their solutions physically.	1,11	1,2
5	Students will be able to use power series methods to solve second order linear differential equations.	1,11	1,2
6	Students will be able to apply the Laplace transform for solving differential equations.	1,11	1,2
7	Students will be able to use the method of separation of variables in order to solve some basic partial differential equations via Fourier series.	1,11	1,2

PS. The numbers, which are shown in the column Method of Assessment, presents the methods shown in the previous table, titled as Method of Assessment.

Work Load Details

#	Type of Work	Quantity	Time (Hour)	Work Load
1	Course Duration	14	4	56
2	Course Duration Except Class (Preliminary Study, Enhancement)	14	4	56
3	Presentation and Seminar Preparation	0	0	0
4	Web Research, Library and Archival Work	0	0	0
5	Document/Information Listing	0	0	0
6	Workshop	0	0	0
7	Preparation for Midterm Exam	1	14	14
8	Midterm Exam	1	2	2
9	Quiz	0	0	0
10	Homework	0	0	0
11	Midterm Project	0	0	0
12	Midterm Exercise	0	0	0
13	Final Project	0	0	0
14	Final Exercise	0	0	0
15	Preparation for Final Exam	1	20	20
16	Final Exam	1	2	2
				150