Date	**Spring 2015-2016**	Credits	**3**
Course Title	**Mathematics IV**	Course Number	**MATH 216**
Pre-requisite (s)	**MATH113**	Co-requisite (s)	**None**
Hours	**60**	Out of Class Work Hours	**120**

Place and Time of Class Meeting

Section 4		Section 2		
Monday	9:00-10:50 C303	Monday	15:00-16:50	C401
Wednesday	9:00-10:50 C303	Tuesday	11:00-12:50	C401

Name and Contact Information of Instructor

Meseret Tuba Gülpınar
tuba.gulpinar@okan.edu.tr
C-333

Book required

(The School recognizes the use of the textbook in the classroom as part of the educational methodology and strategy applied in diverse materials. The textbook is part of the curriculum and is used to reach the student in an effective manner in the classroom. Every student is expected to acquire and use the textbook.)

Elementary Differential Equations and Boundary Value Problems, 10th Edition
William E. Boyce, Richard C. DiPrima
John Wiley & Sons Pte Ltd

Classroom expectations for students

Attendance Policy

Students are liable to attend every course, practical and laboratory work of the program they are enrolled and to take the exams and participate in academic work required for achieving the course. Student attendance to all courses is compulsory. Students who do not attend a minimum 70% of the theoretical courses and 80% of the practical courses will be considered as absent for the related courses. Students who do not meet the mandatory minimum requirement of attendance will fail the course. Students who fail a course for not fulfilling minimum attendance

requirement are obliged to meet the attendance requirement when they re-take the course.

Student Tardiness Policy

Students are permitted to arrive to the class in the first 15 minutes after the scheduled start of the course; extension of tardiness time is in instructor's discretion.

Course Description (must correspond exactly to Catalog description)

This course will investigate classification of differential equations, first order differential equations: solution of separable, linear and exact differential equations, substitution methods and order reduction, higher order differential equations: linear, homogeneous equations with constant coefficients, nonhomogeneous equations, method of undetermined coefficients, method of variation of parameters, Laplace transform solution of initial value problems, linear systems of differential equations: homogeneous differential equations in R^2, homogeneous differential equations in R^3, matrix exponential and fundamental matrix solution, solution of systems of nonhomogeneous equations, Laplace transform methods, power series method: series solution near ordinary points, regular singular points, method of Frobenius.

Learning Objectives

At the end of this course the student will be able to:

- Classify the given differential equations
- Solve first order differential equations.
- Determine the general solution of the higher order homogeneous constant coefficient linear differential equations.
- Solve the problems about non-homogeneous linear differential equations with constant coefficient by using method of undetermined coefficients.
- Solve the problems about non-homogeneous linear differential equations with constant coefficient by using method of variation of parameters.
- Solve homogeneous and non-homogeneous linear differential equations with constant coefficient by using Laplace Transformation.
- Obtain the solution of the systems of the homogeneous differential equations in R^2 and R^3.
- Obtain the solution of the systems of the non-homogeneous differential equations in R^2 and R^3.
- Find the series solution of the differential equations near ordinary points.

- Find the series solution of the differential equations near regular singular points.

Topical Outline and Schedule

SPECIFIC OBJECTIVES	• Example the problems that the differential equations arose. • Solve an easy differential equation by integrating. • Classify the differential equations. • Solve a differential equation by using integrating factor. • Solve a separable equation. • Explain the solution method of the linear differential equations.
TOPIC (S)	Syllabus. Introduction and Classification of Differential Equations First Order Differential Equations: Solution of Separable and Linear Differential Equations
LEARNING ACTIVITIES	Discussion of Syllabus. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	Review the Syllabus. **Homework**: Read Chapter 2 and be prepared to discuss in class.
SPECIFIC OBJECTIVES	• Explain how to solve a differential equation by using suitable substitution. • Define exact differential equation and the solution methods. • Explain how to find the integrating factor. • Solve some examples.
TOPIC (S)	First Order Differential Equations: Substitution Methods and Exact Differential Equations Order reduction
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2,3 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**
SPECIFIC OBJECTIVES	• Define characteristic equation and how to obtain. • Explain how to find the general solution if the roots of the characteristic equation are different and real. • Explain how to find the general solution if the roots of the characteristic equation are repeated and real. • Explain how to find the general solution if the roots of the

	characteristic equation are complex.
TOPIC (S)	Higher Order Differential. Equations: Linear, homogeneous Equations with Constant Coefficients
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2,3 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**
SPECIFIC OBJECTIVES	• Define particular solution of a problem. • Explain the cases of the method of undetermined coefficients
TOPIC (S)	Higher Order Differential. Eqations: Nonhomogeneous Equations and Method of Undetermined Coefficients
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2,3 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**
SPECIFIC OBJECTIVES	• Explain the method of the variation of the parameters. • Solve some examples.
TOPIC (S)	Higher Order Differential. Equations: Nonhomogeneous Equations and Method of Variation of Parameters
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 3,4 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework II**
SPECIFIC OBJECTIVES	• Define the Laplace transformation. • Calculate the Laplace transform of the easy functions. • Explain the properties of the Laplace transformation.
TOPIC (S)	Laplace Transform: Definition and properties
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK	**Homework**: Read Chapter 3,4 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework II**

ASSIGNMENT	
SPECIFIC OBJECTIVES	• **MIDTERM EXAM I** • Explain the properties of the Laplace transformation. • Solve the differential equations by using Laplace transformation. • Laplace transform of the unit step function and piecewisely defined functions.
TOPIC (S)	Laplace Transform (Continued)
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
SPECIFIC OBJECTIVES	• Solve some initial value problems. • Define systems of linear equations. • Review the matrices
TOPIC (S)	Solution of initial value problems Linear Systems of Differential Equations:
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
SPECIFIC OBJECTIVES	
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
SPECIFIC OBJECTIVES	• Explain how to solve systems of the first order linear differential equations. • Find the general solution of a system of linear equations whose eigenvalues of the coefficient matrix are real and distinct.

	• Find the general solution of a system of linear equations whose eigenvalues of the coefficient matrix are complex.
TOPIC (S)	Homogeneous Differential equations in R^2 Solution via eigenvalues and eigenvectors Complex eigenvalues
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
SPECIFIC OBJECTIVES	• Find the general solution of a system of linear equations whose eigenvalues of the coefficient matrix are repeated and real in R^3.
TOPIC (S)	Linear Systems of Differential Equations: Homogeneous Differential equations in R^3 Solution via eigenvalues and eigenvectors Multiple eigenvalues
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
SPECIFIC OBJECTIVES	• **MIDTERM EXAM II** • Define matrix exponentials and fundamental matrix. • Explain how to obtain the fundamental solution of a system. • Solve a system of a differential equation by using Laplace transform.
TOPIC (S)	Linear Systems of Differential Eq.: Matrix exponential and Fundamental matrix solution Solution of Nonhomogeneous Equations Laplace transform methods
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
SPECIFIC OBJECTIVES	• Define power series, and ordinary, singular and regular singular points.

	• Explain how to solve a differential equation by the aim of the series.
TOPIC (S)	Power Series Method: Series Solution Near Ordinary Points
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 5 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework V**
[redacted]	
SPECIFIC OBJECTIVES	• Solve some differential equations near a regular singular point. • Explain the method of Frobenius and solve some problems.
TOPIC (S)	Power Series Method: Regular Singular Points Method of Frobenius
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 5 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework V**
[redacted]	
SPECIFIC OBJECTIVES	• **Final Exam.**
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 5 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework V**

Instructional Methods

In developing methodological strategies, it is best to discuss them between teachers and students in an environment of freedom and mutual agreement in order to ensure that the students make them their own and take responsibility for their execution and for attaining the goals of this course.

The following strategies may be used in this class:

1. A review of the literature.

2. Analysis of assigned readings.
3. Individual and group discussions.
4. Preparation of a didactic plan.
5. Preparation of lecture notes.

Instructional Materials and References

Differential Equations for Engineers and Scientists
Authors: Yunus A. Çengel, William J. Palm III
Publisher: McGraw-Hill; International edition
ISBN-13: 978-007-131042-0 | ISBN-10: 007-131042-8

Differential Equations and Boundary Value Prpblems Computing and Modelling
Authors: C. Henry Edwards, David E. Penney
Publisher: Pearson; 4th edition
ISBN-13: 978-0-13-206115-5 | ISBN-10: 0-13-206115-5

Assessment Criteria and Methods of Evaluating Students

Grade	Coefficient
AA	4.00
BA	3.50
BB	3.00
CB	2.50
CC	2.00
DC	1.50
DD	1.00
FF	0.00
VF	0.00

Distribution of Grade Elements

In-Term Studies	Quantity	Percentage

Midterm I	1	20
Midterm II	1	20
Homework	5	20
Total	7	60
End-Term Studies	**Quantity**	**Percentage**
Final	1	40
Total	1	40
Contribution Of In-Term Studies To Overall Grade		60
End-Term Studies		40
Total		100

Date Syllabus Was Last Reviewed: December 12, 2015