FEA - GENERAL EDUCATION

Date	**Spring 2017-2018**	**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 2		Section 4		
Monday	15:00-16:50 C401	Monday	09:00-10:50	C308
Tuesday	11:00-12:50 C401	Wednesday	09:00-10:50	C303

Name and Contact Information of Instructor

Meseret Tuba Gülpınar
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C-326

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 with WileyPlus Card
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

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.

DATE	WEEK 1
SPECIFIC OBJECTIVES	• Example the problems that the differential equations arose. • Example basic mathematical models and draw direction fields • Solve an easy differential equation by integrating. • Classify the differential equations.
TOPIC (S)	Syllabus. 1.1 Some Basic Mathematical Models; Direction Fields 1.2 Solutions of Sone Differential Equations 1.3 Classification of Differential Equations
LEARNING ACTIVITIES	Discussion of Syllabus. Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	Review the Syllabus. **Homework**: Read Chapter 2.1, 2.2, and 2.5 and be prepared to discuss in class.
DATE	**WEEK 2**
SPECIFIC OBJECTIVES	• Solve a separable equation. • Explain the solution method of the linear differential equations. • Solve a differential equation by using integrating factor. • Solve some examples.
TOPIC (S)	2.1 Linear Equations; Method of Integrating Factors 2.2 Separable Equations 2.5 Autonomous Equations and Population Dynamics
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 2.6, and Exercises **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**
DATE	**WEEK 3**
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. • Explain solving higher order differential equations by reducing order.
TOPIC (S)	2.6 Exact Differential Equations and integrating factors Bernoulli Equation and Homogeneous Equation. Order reduction
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 3.1, 3.2, 3.3, 3.4, 4.1 and 4.2 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**

DATE	WEEK 4
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)	3.1 Homogeneous Equation with Constant Coefficients 3.2 Solutions of Linear Homogeneous Equations; the Wronskian 3.3 Complex Roots of the Characteristic Equation 3.4 Repeated Roots; Reduction of Order 4.1 General Theory of n^{th} Order Linear Equations 4.2 Homogeneous Equation with Constant Coefficients
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 3.5, 3.6, 4.3 and 4.4 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework I**
DATE	**WEEK 5**
SPECIFIC OBJECTIVES	• Define particular solution of a problem. • Explain the cases of the method of undetermined coefficients • Explain the method of the variation of the parameters. • Solve some examples.
TOPIC (S)	3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients 4.3 The Method of Undetermined Coefficients 3.6 Variation of Parameters 4.4 The Method of Variation of Parameters
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6.1and 6.2 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework II**
DATE	**WEEK 6**
SPECIFIC OBJECTIVES	• Define the Laplace transformation. • Calculate the Laplace transform of the easy functions. • Explain the properties of the Laplace transformation. • Solve the differential equations by using Laplace transformation.
TOPIC (S)	6.1 Definition of the Laplace Transform 6.2 Solution of Initial Value Problems
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF	**Homework**: Read Chapter 6.3, 6.4 and 6.6

CLASS WORK ASSIGNMENT	**WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework II**
DATE	**WEEK 7**
SPECIFIC OBJECTIVES	• 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)	6.2 Solution of Initial Value Problems 6.3 Step Functions
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 6.4 and 6.6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
DATE	**WEEK 8**
SPECIFIC OBJECTIVES	• FIRST MIDTERM
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 1,2,3,4 and 6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
DATE	**WEEK 9**
SPECIFIC OBJECTIVES	• Solve some initial value problems with Discontinuous Forcing Functions. • Solve some examples about Convolution Integral
TOPIC (S)	6.4 Differential Equations with Discontinuous Forcing Functions 6.6 Convolution Integral
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7.1, 7.2,7.3 and 7.4 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
DATE	**WEEK 10**
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.
TOPIC (S)	7.1 Introduction of Systems of First Order Linear Differential Equations

	7.4 Basic Theory of First Order Linear Differential Equations
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7.5 and 7.6 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework III**
DATE	**WEEK 11**
SPECIFIC OBJECTIVES	• Find the general solution of a system of linear equations whose eigenvalues of the coefficient matrix are complex. • 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)	7.5 Homogeneous Linear Syatems with constant coefficients 7.6 Complex Eigenvalues
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7.7 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
DATE	**WEEK 12**
SPECIFIC OBJECTIVES	• **MIDTERM EXAM II** • Define matrix exponentials and fundamental matrix. • Explain how to obtain the fundamental solution of a system.
TOPIC (S)	7.7 Fundamental Matrix
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**Homework**: Read Chapter 7.8 and 7.9 **WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
DATE	**WEEK 13**
SPECIFIC OBJECTIVES	• Explain the Method of Undetermined Coefficients • Explian the Method of Variation of Parameters
TOPIC (S)	7.9 Nonhomogeneous Linear Systems
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
DATE	**WEEK 14**
SPECIFIC	• Solve a system of a differential equation by using Laplace transform

OBJECTIVES	
TOPIC (S)	Laplace transform methods
LEARNING ACTIVITIES	Completion of exercises and problems.
OUT OF CLASS WORK ASSIGNMENT	**WileyPLUS** (This course is based on Elementary Differential Equations and boundary Value Problems, William E. Boyce and Richard C. Prima) Doing **Homework IV**
DATE	**WEEK 15**
SPECIFIC OBJECTIVES	• **Final Exam.**
TOPIC (S)	
LEARNING ACTIVITIES	
OUT OF CLASS WORK ASSIGNMENT	

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

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Date Syllabus Was Last Reviewed: January 22, 2018