



## Course Specifications

<b>Course Title:</b>	Ordinary Differential Equations
<b>Course Code:</b>	MTH 221
<b>Program:</b>	B.Sc. of Mathematics
<b>Department:</b>	Mathematics
<b>College:</b>	College of Science in Zulfi
<b>Institution:</b>	Majmaah University

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## A. Course Identification

<b>1. Credit hours:</b>	4
<b>2. Course type</b>	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> Level 4/ Second year	
<b>4. Pre-requisites for this course (if any):</b> MTH 203	
<b>5. Co-requisites for this course (if any):</b> None	

## 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	Blended	15	25%
3	E-learning		
4	Distance learning	45	75%
5	Other		

## 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	20
4	Others (specify)	10
	<b>Total</b>	<b>60</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

Basic concepts: definitions, classifications of ordinary differential equations (O.D.E.s), solutions types, origin of O.D.E.s and basic first order differential equations.

Methods of solutions: separation of variables, homogeneous equations, exact equations, first-order linear equations, Bernoulli equations, Clairaut's equations, linear differential equations of higher-order, homogeneous equations with constant coefficients, method of variation of parameters, differential equations with variable coefficients, Cauchy-Euler equations, Laplace transform, applications of Laplace transform to solve linear differential equations with constant coefficients, power series and applications of power series to solve some linear differential equations with variable coefficients.

### 2. Course Objectives

**Generally**, this course aims to make students aware of O.D.E.s and to teach them various methods for solving a great variety of differential equations.

**Specially**, study of main concepts of differential equations as follows:

- Recognizing the differential equation and its order and degree.
- Recognizing the methods of solving differential equations of the 1st order.
- Recognizing the methods of solving differential equations of higher order and the properties of solutions.
- Recognizing Laplace transform and its properties and how to use it in solving D.E.s.
- Recognizing power series and its properties and how to use it in solving D.E.s.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Recognizing the differential equation and its order and degree.	K1
1.2	Recognizing Laplace transform and its properties and how to use it in solving D.E.s.	K3
1.3		
1...		
2	<b>Skills :</b>	

CLOs		Aligned PLOs
2.1	Students should be able to solve any differential equations in an appropriate manner without predetermining them.	S1
2.2		
2.3		
2...		
<b>3</b>	<b>Competence:</b>	
3.1	Recognizing the methods of solving differential equations of the 1st order.	C4
3.2		
3.3		
3...		

### C. Course Content

No	List of Topics	Contact Hours
1	Introduction: Definitions of DEs, Order and degree. Classification of DEs. Ordinary and partial differential equations. Linear and nonlinear. General solutions and initial conditions	8
2	First order differential equations: Separable equations. Homogeneous DEs. Exact DEs and integrating factor. Linear DEs. Applications of First-Order Differential Equations.	12
3	Second order linear equations with constant coefficients: Linearly independent solutions – Homogeneous second order linear equations - Inhomogeneous second order linear equations – Higher order linear equations. Applications of Second-Order. Linear Differential Equations.	12
4	Linear second order equations with variable coefficients: Reduction of order – Variation of Parameters.	12
5	Laplace transform: The Laplace Transform of Some Common Functions. Properties of the Laplace Transform - Inverse Laplace Transforms - Solutions by Laplace Transforms	12
6	Series Solutions of Second Order Linear Equations: Series Solutions near an Ordinary Point, Regular Singular Points.	4

<b>Total</b>	60
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## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	Define the fundamental concepts in differential equations.	Start each lecture by general ideas and its benefits.	<ul style="list-style-type: none"> <li>• Homework</li> <li>• Midterms</li> <li>• Final Exam</li> </ul>
1.2	Outline the logical thinking.	Provide main ways to deal with exercises.	Homework
1.3	State the physical problems by mathematical methods.	Solve some examples in lectures	Continuous discussion during lectures
<b>2.0</b>	<b>Skills</b>		
2.1	Students will explain and interpret a general knowledge of D.E.s.	Encourage students to look for some complicated problems	Midterms Quizzes
2.2	Students ability to write analytical equations in a correct mathematical way.	Assignments	Discussions of how to simplify some problems.
...			
<b>3.0</b>	<b>Values</b>		
3.1			
3.2			
...			

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam 1	7	15

#	Assessment task*	Week Due	Percentage of Total Assessment Score
2	Midterm Exam 2	14	15
3	Homework	Through of semester	10
4	Attendance and Participation	Through of semester	10
5	Quizzes	Through of semester	10
6	Final Exam	17	40
7			
8			

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- 1- 4-office hours per week in the lecturer schedule.
- 2- The contact with students by e-mail and website.
- 3- Activation of the virtual classrooms and academic guidance via Black Board **LMS**.

## F. Learning Resources and Facilities

### 1.Learning Resources

<b>Required Textbooks</b>	- R. K. Nagle; Fundamentals of Differential Equations and Boundary Value - Earl: Introduction to O.D.E.s, 8th Edition
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	Differential Equations Group on WhatsApp

<b>Other Learning Materials</b>	<a href="https://www.nctm.org/mathforum/">https://www.nctm.org/mathforum/</a>
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## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom with capacity of 8 students Library
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	Blackboard
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	Mathematics Department
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Reference No.	27
Date	8/8/1442 H-21/3/2021 G

Head of Department

Dr. Muqrin Almuqrin

