



# Course Specification

— (Bachelor)

Course Title: **Ordinary Differential Equations**

Course Code: **MATH26223**

Program: **BSc in Mathematics**

Department: **Mathematics**

College: **Science**

Institution: **University of Bisha**

Version: **3**

Last Revision Date: **25 July 2023**



## Table of Contents

<b>A. General information about the course:</b> .....	3
<b>B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods</b> .....	4
<b>C. Course Content</b> .....	5
<b>D. Students Assessment Activities</b> .....	6
<b>E. Learning Resources and Facilities</b> .....	6
<b>F. Assessment of Course Quality</b> .....	7
<b>G. Specification Approval</b> .....	7



## A. General information about the course:

### 1. Course Identification

1. Credit hours: ( ٣ )

#### 2. Course type

A.  University  College  Department  Track  Others  
B.  Required  Elective

3. Level/year at which this course is offered: ( ٤<sup>th</sup> Level / 2<sup>nd</sup> year )

#### 4. Course general Description:

Perhaps the most important of all the applications of calculus is the differential equations. This course is designed as an introduction course of ordinary differential equations for students of mathematics, physics, chemistry and engineering. The topics covered here are Introduction of DEs, First Order Differential Equations, Higher Order Differential Equations, Series Solutions of Linear Equations and The Laplace Transform

#### 5. Pre-requirements for this course (if any):

**MATH26221**

#### 6. Co-requirements for this course (if any):

**Nil**

#### 7. Course Main Objective(s):

The main purpose for this course is to provide students with fundamental knowledge, skills, attitudes related to solving ordinary differential equations and linear systems of differential equations.

### 2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning	--	--
3	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> </ul>	--	--



No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning	--	--

### 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	--
3.	Field	--
4.	Tutorial	--
5.	Others (specify)	
<b>Total</b>		<b>45</b>

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.1	State the basic concepts and theorems about first and second order differential equations of homogeneous and nonhomogeneous types.	K2	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests
1.2	State the basic concepts related to higher order ODEs.	K2	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests
1.3	Classify ordinary and singular points and recognize power series solutions and related theorems.	K2	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests
<b>2.0</b>	<b>Skills</b>			
2.1	Find the general solution of first and second order	S2	Lecture Discussion	Exercises or Written Tests





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	differential equations of homogeneous and nonhomogeneous types.		Active Learning Cooperative Learning	
2.2	Solve ODEs with higher order.	S2	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests
2.3	Solve linear systems of ODEs.	S2	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.1	Apply theoretical ideas in real life problems.	V1	Lecture Discussion Active Learning Cooperative Learning	Exercises or Written Tests

### C. Course Content

No	List of Topics	Contact Hours
1.	Classification of DEs (Ordinary and Partial), classification by order, degree, linearity (homogeneous and nonhomogeneous),.	3
2.	Solutions, IVP, BVP and some applications of DE (in Biology, Chemistry, Engineering, Physics), elimination of constants, existence and uniqueness of solution.	3
3.	<b>First Order Differential Equations (DE)</b> Separable, exact, non-exact.	3
4.	Linear and Bernoulli equations.	3
5.	equations solved by substitutions.	3
6.	<b>Higher Order Differential Equations</b> Existence and uniqueness of solution, superposition principle, Wronskian, fundamental set of solutions.	3
7.	Solution of homogeneous equations with constant coefficients.	3
8.	Solution of Cauchy-Euler equation, solution by reduction of order.	3
9.	General solution of nonhomogeneous equations, particular solutions by undetermined coefficient.	3
10.	Applications	3
11.	<b>Series Solutions of Linear Equations:</b> Review of power series, solutions about ordinary points.	3
12.	<b>Series Solutions of Linear Equations:</b> Review of power series, solutions about ordinary points.	3
13.	Frobenius theorem and solutions about regular singular points.	3





14.	Frobenius theorem and solutions about regular singular points.	3
15.	Applications.	3
<b>Total</b>		<b>45</b>

### The matrix of consistency between the content and the learning outcomes of the course

Course Learning Outcomes							
Topics	1.1	1.2	1.3	2.1	2.2	2.3	3.1
1	√			√			
2	√			√			√
3	√			√			√
4	√			√			√
5	√			√			√
6		√			√		√
7		√			√		√
8		√			√		√
9		√			√		√
10		√			√		√
11			√			√	√
12			√			√	√
13			√			√	√
14			√			√	√
15			√			√	√

### D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Exercises	6 <sup>th</sup> , 13 <sup>th</sup>	10%
2.	Exam I	7 <sup>th</sup>	15%
3.	Exam II	12 <sup>th</sup>	15%
4.	Quizzes	5 <sup>th</sup> , 10 <sup>th</sup>	10%
5.	Final Exam	End Semester of	50%

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

### E. Learning Resources and Facilities

#### 1. References and Learning Resources





<b>Essential References</b>	Dennis G. Zill "A First Course in Differential Equations with Modeling Applications" 11th Ed., Brooks/Cole, Cengage Learning, USA, 2018.
<b>Supportive References</b>	1. R. Kent Nagle, Edward B. Saff, Arthur David Snider "Fundamentals of Differential Equations" 9th Ed., Addison Wesley Longman, Inc., New York, 2018. 2. Dennis G. Zill , " Differential equations with boundary-value problems" 9th Ed., Brooks/Cole, Cengage Learning, USA, 2018.
<b>Electronic Materials</b>	
<b>Other Learning Materials</b>	

## 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms for 30 students.
<b>Technology equipment</b> (projector, smart board, software)	Smart board.
<b>Other equipment</b> (depending on the nature of the specialty)	-----

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students.	Indirect.
Effectiveness of Students assessment	Peer Reviewer.	Indirect.
Quality of learning resources	Students.	Indirect.
The extent to which CLOs have been achieved	Program Leaders	Direct.
Other	-----	-----

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

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	<b>FACULTY COUNCIL</b>
<b>REFERENCE NO.</b>	<b>20</b>
<b>DATE</b>	<b>17 AUGUST 2023</b>



