اعتماد
NCAAA

T4

2020

# Course Specifications

| **Course Title:** | Differential Equations (1) |
|---|---|
| **Course Code:** | Math 204 |
| **Program:** | Bachelor of Science in Mathematics |
| **Department:** | Mathematics |
| **College:** | Science |
| **Institution:** | University of Tabuk |

## Table of Contents

# A. Course Identification

| | |
|---|---|
| **1. Credit hours:** 03 Hours/Week | |

**2. Course type**

a.  University ☐  College ☐  Department ☐ √  Others ☐

b.  Required ☐ √  Elective ☐

**3. Level/year at which this course is offered:** L4/Y2

**4. Pre-requisites for this course** (if any)**: Math 200**

**5. Co-requisites for this course** (if any)**:**
**None**

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

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 45 | 100 |
| 2 | Blended | | |
| 3 | E-learning | | |
| 4 | Distance learning | | |
| 5 | Other | | |

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

| No | Activity | Contact Hours |
|---|---|---|
| 1 | Lecture | 45 |
| 2 | Laboratory/Studio | |
| 3 | Tutorial | |
| 4 | Others (specify) | |
| | Total | 45 |

# B. Course Objectives and Learning Outcomes

## 1. Course Description

The course will demonstrate the usefulness of ordinary differential equations for modeling physical and other phenomena. Complementary mathematical approaches for their solution will be presented, including analytical methods, graphical analysis and numerical techniques. The basic content of the course includes.

## 2. Course Main Objective

-Students will be able to recall the basic concepts and theories of ordinary differential equations.
-Students will demonstrate proficiency in applying various techniques to solve ordinary differential equations.
-Students will be able to recognize the importance of ordinary differential equations in modeling physical problems.

## 3. Course Learning Outcomes

| CLOs | Aligned-PLOs |
|---|---|
| 1   **Knowledge and Understanding** | |

| | CLOs | Aligned-PLOs |
|---|---|---|
| 1.1 | students will be able to recall theories and concepts of differential equations. | K1 |
| 1.2 | students will be able to list analytical procedures for solving differential equations of first and second order. | K1 |
| 1.3 | students will be able to recognize the importance of differential equations of higher order and their applications in mathematics, physics, and chemistry. | K2 |
| | | |
| **2** | **Skills :** | |
| 2.1 | students will be able to analyze the correct formulas and the analytical procedures to find the right solution. | S1 |
| 2.2 | students to be able to solve the problems in an organized and systematic manner by suitable programs | S3 |
| 2... | | |
| **3** | **Values:** | |
| 3.1 | Students will be able to work independently and within a group. | V1 |
| 3.2 | Students will take responsibility for solving the given assignments on their own and submit the solution on time. | V2 |
| 3... | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Introduction to differential equations and solutions of differential equations. | 3 HRS |
| 2 | Classification of Differential Equations. | 3 HRS |
| 3 | Method for solving first-Order Differential Equations, Separable equations. | 3 HRS |
| 4 | Method for solving first-Order Differential Equations s, Exact equations. | 3 HRS |
| 5 | Method for solving first-Order Differential Equations, Homogeneous equations. | 3 HRS |
| 6 | **Mid-Exam#1** | |
| 6 | Method for solving first-Order Differential Equations Linear equations and. | 3 HRS |
| 7 | Application, Bernoulli equation | 3 HRS |
| 8 | Second- and Higher-Order Equations. | 3 HRS |
| 9 | Linear equations with constant coefficients, the auxiliary equation; Complex roots, Repeated roots, Method. | 3 HRS |
| 10 | Linear independence and Wronskian, Differential operators, some properties of differential operators. | 3 HRS |
| 11 | **Mid-Exam#2** | |
| 11 | Non homogeneous Second-Order Linear Equations with Constant Coefficients, The operator $1/f(D)$; evaluation of $[1/f(D)]\,eax$ | 3 HRS |
| 12 | Higher-Order Linear Equations with Constant Coefficients | 3 HRS |
| 13 | Flux and Divergence Complex roots, Repeated roots, Method of Undetermined coefficients, Power series, Series solutions at ordinary points, Regular point. | 3 HRS |

| 14+ 15 | **Revision & Final Exam** | 6 HRS |
|---|---|---|
| **Total** | | **45 Hrs** |

## D. Teaching and Assessment

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

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge and Understanding** | | |
| 1.1 | students will be able to recall theories and concepts of differential equations. | Introducing new ideas through case study Lectures Class Discussions | Quizzes I II Midterm Exams Final Exams Homework assignments. |
| 1.2 | students will be able to list analytical procedures for solving differential equations of first and second order. | | |
| 1.3 | students will be able to recognize the importance of differential equations of higher order and their applications in mathematics, physics, and chemistry. | | |
| **2.0** | **Skills** | | |
| 2.1 | students will be able to analyze the correct formulas and the analytical procedures to find the right solution. | Lectures Class Discussions | Quizzes I II Midterm Exams Final Exams Homework assignments. |
| 2.2 | students to be able to solve the problems in an organized and systematic manner by suitable programs | | |
| **3.0** | **Values** | | |
| 3.1 | Students will be able to respect punctual attendance of classes and tutorials | Lectures Assign tasks | Quizzes Homework assignments. |
| 3.2 | Students will take responsibility for solving the given assignments on their own and submit the solution on time. | | |

### 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 1 | Home works and Assignments and Quizzes | Weekly basis | 10% |
| 2 | Mid Exam-I | 6th week | 25% |
| 3 | Mid Exam-II | 11th week | 25% |
| 4 | Final Exam | At end of the Semester | 40% |

**\*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 :**

Six office hours per week in the lecturer schedule.

## F. Learning Resources and Facilities

### 1.Learning Resources

| Required Textbooks | A Textbook on Ordinary Differential Equations, by Shair Ahmad, Antonio Ambrosetti ,Second Edition, Springer,2015 |
|---|---|
| Essential References Materials | Courant, Richard, and Fritz John. Introduction to calculus and analysis I. Springer Science & Business Media, 2012<br><br>Elementary Differential Equations 6th ed. (1981)<br>Author; Earl D. Rainsville and Phillipe E. Bedient |
| Electronic Materials | None |
| Other Learning Materials | None |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | - Lecture Room with maximum capacity of 30 students and equipped with White Board, Overhead projector and internet connection.<br>- Library |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Projectors |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | None |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Effectiveness of teaching and assessment | Students | Direct and Indirect |
| Extent of achievement of course learning outcomes | Teachers | Direct |
| Quality of learning resources | Students | Indirect |
| | | |

**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

| Council / Committee | Program and study plan committee |
|---|---|
| Reference No. | |

| Date | 25/08/2021 |
|------|------------|