

Ministry of Higher Education and Scientific research



**Physics department**

**College of Education**

**Salahaddin University-Erbil**

**Subject: Numerical Analysis**

**Course Book – (Third year Physics Student)**

**Lecturer's name: Dr. Mohammad Mustafa Dzayi**

**Academic Year: 2023/2024**

## Course Book

<b>1. Course name</b>	Numerical Analysis
<b>2. Lecturer in charge</b>	<b>Dr. Mohammad Mustafa Dzayi</b>
<b>3. Department/ College</b>	<b>Physics, Education</b>
<b>4. Contact</b>	e-mails: <a href="mailto:muhamad.othman@su.edu.krd">muhamad.othman@su.edu.krd</a>
<b>5. Time (in hours) per week</b>	Theory: <b>2 Hours</b>
<b>6. Office hours</b>	<b>Saturday: GB 8:30 AM To 10:30 AM</b> <b>Saturday: GA 10:30 AM To 12:30 AM</b>
<b>7. Course code</b>	

# Contents of Course Book

## **CHAPTER 1—Errors**

- 1.1 Introduction
- 1.2 Significant digits
- 1.3 Rounding off numbers
- 1.4 Errors
- 1.5 Relative error and the number of correct digits
- 1.6 General error formula
- 1.7 Application of errors to the fundamental operations of arithmetic

*Exercise*

## **CHAPTER 2—Solution of Algebraic and Transcendental Equations**

- 2.1 Graphical solution of equations
- 2.2 The iteration method
- 2.3 Newton–Raphson method or Newton iteration method
- 2.4 Generalized Newton’s method for multiple roots

## **CHAPTER 3—Interpolation with Equal Intervals and Unequal Intervals**

- 3.1 Newton’s forward interpolation formula
- 3.2 Newton–Gregory backward interpolation formula
- 3.3 Error in the interpolation formula
- 3.4 Newton’s general divided differences formula
- 3.5 Lagrange’s interpolation formula

*Exercise*

## **CHAPTER 4—Numerical Differentiation**

- 4.1 Derivatives using Newton’s forward interpolation formula
- 4.2 Derivatives using Newton’s backward interpolation formula
- 4.3 Derivatives using Stirling’s formula

*Exercise*

## **CHAPTER 5—Numerical Integration and Ordinary Differential Equations**

- 5.1 Trapezoidal rule
- 5.2 Simpson’s one-third rule
- 5.3 Simpson’s three-eighths rule
- 5.4 Taylor’s series method
- 5.5 Runge-Kutta method

*Exercise*

## **CHAPTER 6—Curve Fitting**

- 6.1 Introduction
- 6.2 The straight line
- 6.3 Fitting a straight line
- 6.4 Fitting a parabola
- 6.5 Exponential function  $y = ae^{bx}$

*Exercise*