



Physics department

College of Education

Salahaddin University-Erbil

Subject: Numerical Analysis

Course Book – (Third year Physics Student)

Lecturer's name: Dr. Muhammed Mustafa Dzayi

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Course Book

1. Course name	Numerical Analysis
2. Lecturer in charge	Dr. Muhammed Mustafa Dzayi
3. Department/ College	Physics, Education
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5. Time (in hours) per week	Theory: 2 Hours
6. Office hours	Saturday: From 10:30 AM To 12:30 PM
7. Course code	

CHAPTER 1—Errors

1.1 Rounding off numbers

1.2 Errors

1.3 Relative error and the number of correct digits

1.4 General error formula

Exercise

CHAPTER 2—Solution of Linear Equations

2.1 Gauss–Elimination method

2.2 Fitting a straight line $y=a+bx$

2.3 Fitting a parabola $y=a+bx+cx^2$

2.4 Exponential function $y = ae^{bx}$

2.5 Exponential function $y=ab^x$

2.6 Exponential function $y=ax^b$

Exercise

CHAPTER 3—Interpolation with Equal Intervals

A- Interpolation with Equal Intervals

3.1 Linear interpolation

3.2 Divided difference interpolation

3.3 Newton’s forward interpolation formula

3.4 Newton–Gregory backward interpolation formula

3.5 Error in the interpolation formula

Exercise

B- Interpolation with unequal Intervals

3.6 Newton’s general divided differences formula

Exercise

3.7 Lagrange’s interpolation formula

Exercise

3.8 Inverse interpolation

Exercise

CHAPTER 4—Central Difference Interpolation Formulae

- 4.1 Gauss forward interpolation formula
- 4.2 Gauss backward interpolation formula
- 4.3 Bessel's formula
- 4.4 Stirling's formula
- 4.5 Laplace–Everett formula

Exercise

CHAPTER 5—system of linear equation

- 5.1 Direct method (Gauss elimination)
- 5.2 Indirect method
 - 5.2.1 Jacobi method
 - 5.2.2 Gauss-Seidel method

Exercise

CHAPTER 6—Numerical Differentiation

- 6.1 Derivatives using Newton's forward interpolation formula 164
- 6.2 Derivatives using Newton's backward interpolation formula 166

Exercise

CHAPTER 7—Numerical Integration

- 7.1 Trapezoidal rule
- 7.2 Simpson's one-third rule
- 7.3 Simpson's three-eighths rule

Exercise

CHAPTER 8—Numerical Solution of Ordinary Differential Equations

- 8.1 Taylor's series method
- 8.2 Euler's method
- 8.3 Runge-Kutta method
- 8.4 Fourier series

Exercise

Reference

- ✚ *Numerical methods with C++ Programing by Nita H. Shah, 2009.*
- ✚ *Numerical Analysis, by Richard L. Burder, Douglas J. Faires and Annette M. Burden, 2016.*
- ✚ *An introduction to numerical analysis, by Kendall E. Atkinson, 1989.*
- ✚ *Applied numerical analysis, by Curtis F. Gerald and Patrick O. Wheatley, 2004.*