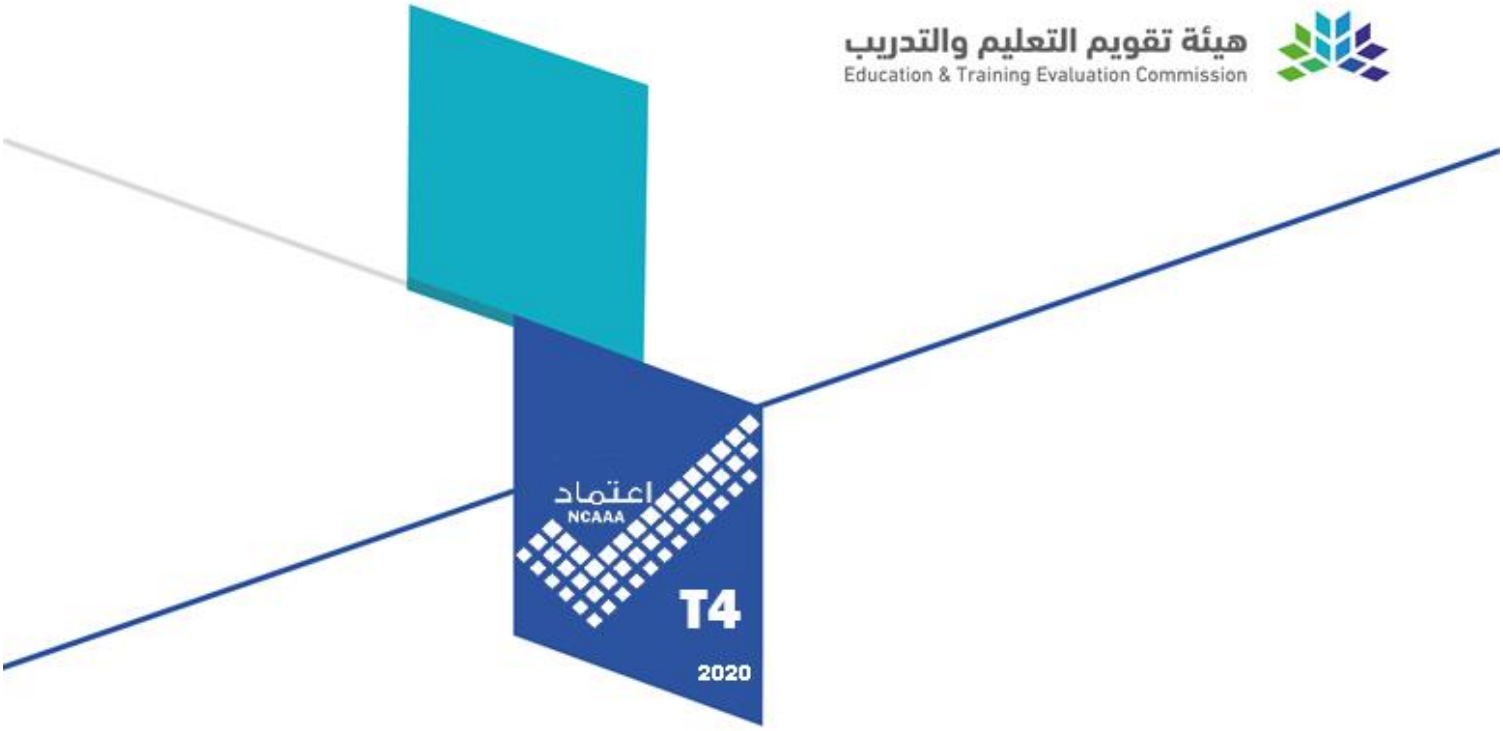
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Introduction to numerical Analysis
Course Code:	MATH 334
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: **L6/Y3**
4. Pre-requisites for this course (if any): **Math 2003; Stat 201**
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 main purpose of this course is to study nonlinear equations of one variable, the polynomial interpolation and differentiate and integrate numerically.

2. Course Main Objective

-Students will be able to recognize the importance of using numerical methods to solve problems.
-Students will be able to demonstrate proficiency in applying numerical methods to a variety of mathematical and physical problems.
- Students will be able to interpret results of numerical solutions and draw conclusions.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Students will be able to recall theories and concepts of numerical analysis	K1

CLOs		Aligned PLOs
1.2	Students will be able to recognize Numerical Methods for solving nonlinear equations- polynomial interpolation- Numerical Differentiation - Numerical Integration	K2
2	**Skills :**	
2.1	Students will be able to apply the fundamentals of numerical analysis in solving nonlinear equations	S3
2.2	Students will be able to use formulas for numerical procedures	S3
2.3	Students will be able to prove formulas of numerical analysis	S2
2.4	Communicate mathematical ideas to others clearly and accurately	S5
3	**Values:**	
3.1	Students will be able to develop enhanced self-learning.	V1
	Students will be able to work independently and in groups.	V2

C. Course Content

No	List of Topics	Contact Hours
1	Introduction To Numerical Analysis Numerical Solutions of non-linear equations in one variable – The Bisection method	3 Hrs
2	Numerical Solutions of non-linear equations in one variable – The simple fixed point iteration method	3 Hrs
3	Numerical Solutions of non-linear equations in one variable the Newton's method(for one dimensional and multidimensional)	3 Hrs
4	Numerical Solutions of non-linear equations in one variable – the secant method, the Muller's Method	3 Hrs
5	Fundamental theorem of interpolation – the Lagrange interpolation polynomial	3 Hrs
6	**Mid-Exam 1**	
7,8	Finite differences –forward differences and backward difference – Newton's forward and backward difference interpolating formulae	6 Hrs
9,10	Numerical Differentiation -Central Divide differences- Forward and Backward Divide differences interpolating formulae	3 Hrs
11	Numerical Differentiation - Forward and Backward Divide differences interpolating formulae Hermite interpolation formulae	6 Hrs
11	**Mid-Exam 2**	
12	Numerical integration– The Trapezoidal rule - The Composite Trapezoidal rule- Local truncation Error, Gaussian Quadrature	3 Hrs
13	Numerical integration- The Simpson's rule - The Simpson's 1/3 rule, The Composite Simpson's rule- Local truncation Error	3 Hrs
14	Numerical integration - The Simppson's 3/8 rule - The Composite Simpson's 3/8 rule- Local truncation Error	3 Hrs
15	**Revision & Final Exam**	3 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 numerical analysis	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 recognize Numerical Methods for solving nonlinear equations- polynomial interpolation- Numerical Differentiation - Numerical Integration		
2.0	**Skills**		
2.1	Students will be able to apply the fundamentals of numerical analysis in solving nonlinear equations	Lectures Class Discussions	Quizzes I II Midterm Exams Final Exams Homework assignments.
2.2	Students will be able to use formulas for numerical procedures		
2.3	Students will be able to prove formulas of numerical analysis		
2.4	Communicate mathematical ideas to others clearly and accurately		
3.0	**Values**		
3.1	Students will develop enhanced self-learning.	Lectures Class Discussions Group discussion	Quizzes Homework assignments Group work
3.2	Students will be able to work independently and in groups.		

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	Richard Khoury and Douglas Wilhelm Harder, Numerical Methods and Modelling for Engineering, Springer, International Publishing Switzerland, 2016
Essential References Materials	Graham de Vahl Davis, Numerical Methods in Engineering & Science, Springer, 1986
Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1.Lecture room with maximum capacity of 30 students and equipped with White Board, Overhead projector and internet connection. 2.Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Projectors
Other Resources (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