Course Specification

(Postgraduate)

Course Title: **Numerical Analysis**
Course Code:**MATH660**
Program: **Master Program in Mathematics**
Department: **Mathematics**
College: **Science**
Institution: **University of Tabuk, KSA**
Version: **2**
Last Revision Date:**1/12/1443 H**

Table of Contents

A. General information about the course:

Course Identification					
1. Credit hours:	3 H				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered: **Level 2**					
4. Course general Description					
Numerical Analysis used to solve the nonlinear equations numerically and having no exact solutions. In this course, we will study some advanced fundamentals of numerical analysis. Some important properties, theorems, problems, and applications will be also discussed.					
5. Pre-requirements for this course (if any): None					
6. Co- requirements for this course (if any): None					
7. Course Main Objective(s)					
1. Iterative solution of non- linear single equation. 2. Error Analysis. 3. Norms of Vectors and Matrices. 4. Solution of Systems of linear equations. 5. Solution of Systems of nonlinear equations.					

1. Teaching mode(mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100 %
2.	E-learning		
3.	Hybrid ● Traditional classroom ● E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	3 H /week

2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	45

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding The students will be able to:			
1.1	Demonstrate advanced concepts of numerical analysis.	K1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Research project, presentation, interactive discussion and participation, Surveys.
1.2	Describe theories and applications of numerical analysis	K2		
1.3	Enhance deep understanding methods, examples and solutions of problems of this subject	K3		
2.0	Skills The students will be able to:			
2.1	Apply numerical methods for solving problems in related fields.	S1	Lectures, Group works, Presentations, Classroom discussion, Seminar, Case study, problem solving session	Exams, Quizzes, Home works, Assignments, Research project, presentation, interactive discussion and participation, Surveys.
2.2	Solve problems using mathematical programs software.	S2		
2.3	Use the correct idea and analytical procedures to find the right solutions	S3		
3.0	Values, autonomy, and responsibility The students will be able to:			
3.1	Demonstrate and develop enhanced self-learning.	V2	Lectures, Group works, Presentations, Classroom discussion,	Research project, Home works,
3.2	Demonstrate the	V2		

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	responsibility of the working individually or as group research.		Seminar, Case study, problem solving session	Assignments, presentation, interactive discussion and participation, Surveys.

C. Course Content

No	List of Topics			Contact Hours
1	Bisection method, False position Method.			3
2	Newton-Raphson method,			3
3	Secant Method, Aitkin's delta square Method			3
4	Fixed Point Method.			3
5	Norms of Vectors and Matrices			3
6	Solution of Systems of linear equations (Direct methods)			3
7	**Mid-Exam #**	7	**Mid-Exam #**	
7	Solution of Systems of linear equations (Matrices and Factorization)			3
8	Solution of Systems of linear equations (LU Decomposition Method)			3
9	Solution of Systems of linear equations (in-Indirect methods)			3
10	Introduction to Iterative methods,			3
11	The Jacobi Techniques.			3
12	The Gauss-Siedel Techniques			3
13	Relaxation Techniques for Solving Linear Systems			3
14	Relaxation Techniques for Solving non Linear Systems			3
15	Newton's Method for solving nonlinear equations			3
16+17	**Revision & Final Exam**			
Total				**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home works and Assignments	Weekly basis	20%
2.	Mid-term exam	7th week	25%
3.	Presentation and discussion	During the Semester	15%
4.	Final Exam	At End of Semester	40 %

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. Leader, J. J . Numerical Analysis and Scientific Computation .CRC Press (2022) 2. Richard L. Burden, J. Douglas Faires, Numerical Analysis, Cengage Learning, 2010. 3. James F. Epperson , An Introduction to Numerical Methods and Analysis, John Wiley & Sons, 2013
Supportive References	Timmy Siauw, Alexandre Bayen, An Introduction to MATLAB® Programming and Numerical Methods for Engineers, Academic Press, 2014
Electronic Materials	Matlab software, Saudi digital library.
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture Room with capacity of 30 students and equipped with White Board, Library
Technology equipment (projector, smart board, software)	Overhead projector and internet connection.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct and Indirect
Effectiveness of students assessment	Teacher	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Teacher, Quality Committee	Direct and Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods(Direct, Indirect)

G. Specification Approval Data

Council / Committee	**Approval by the Department Council**
Reference No.	DEPARTMENT COUNCIL NO (26)
Date	**11/9/1444 H**