Course Specification
(Bachelor)

Course Title:	**Advanced Calculus**
Course Code:	**287Math-3**
Program:	**B.Sc. of Computer Science + Information Systems**
Department:	**Computer Science and Information Systems**
College:	**Computer Science and Information Systems**
Institution:	**Najran University**
Version:	**2**
Last Revision Date:	**17-05-2025**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (7/4)					
4. Course General Description:					
This course will cover the foundations of numerical methods. The main focus of this course is finding the numerical solution of :(nonlinear equation, system of linear equation, interpolations and numerical differentiation and integration).					
5. Pre-requirements for this course (if any):					
none					
6. Co-requisites for this course (if any):					
none					
7. Course Main Objective(s):					
The main objectives of the course are to familiarize the students with the essential concepts to Numerical methods and how to get the numerical solution of the equations and others					

2. Teaching mode (mark all that apply)

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

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45

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 PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Define the basic concepts and methods of numerical analysis		Lecture Cooperative learning Problem solving Brainstorming	Assignments Quiz Midterm Exam Final Exam
2.0	**Skills**			
2.1	Solve nonlinear equations and linear systems using numerical methods.		Lecture Cooperative learning Problem solving Brainstorming	Assignments Quiz Midterm Exam Final Exam
2.2	Approximate the functions with evaluating the errors			
2.3	Solve ordinary differential equations using numerical methods			
3.0	**Values, autonomy, and responsibility**			
3.1	Work effectively with in groups and independently			

C. Course Content

No	List of Topics	Contact Hours
1.	Numerical errors: absolute error – relative error – truncation error.	3
2.	Solution of nonlinear equations: Bisection Method, Newton Raphson method, Secant method and fixed-point method.	9

3.	Numerical Solution of linear system: Jacobi method – Gaussian – seidel method.	6
4.	Interpolation: Lagrange interpolation formula, divided differences, Newton interpolation.	12
5.	Numerical differentiation and Numerical integration: Trapezoidal rule - Simpson's rule.	9
6.	Introduction to numerical solutions of ordinary differential equations.	6
Total		45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exams	6-8 11-13	20 20
2.	Assignments & Quizzes	During classes	10
3.	Final Exam	16-18	50
4.	Final Exam	16-18	50

*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	• R. Burden, and J. D. Faires, Numerical Analysis, PWS-Kent Publishers, (1993).
Supportive References	• W. Cheney and D. Kincaid, Numerical Mathematics and Computing, Brooks/Cole Publishing Company, (2003).
Electronic Materials	• http://www.uaemath.com/ar/aforum. • http://www.mathramz.com/xyz/index.php
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom with 30 seats.
Technology equipment (projector, smart board, software)	- Blackboard Platform - Mathematica Program Projector
Other equipment (depending on the nature of the specialty)	**N/A**

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Student Questionnaire (Indirect)
Effectiveness of Students assessment	Peer Reviewer	Rubrics (Indirect)
Quality of learning resources		
The extent to which CLOs have been achieved	Faculty	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	