Course Specification
(Postgraduate)

Course Title:	**Numerical Analysis**
Course Code:	**633 MATH**
Program:	**MSC APPLIED MATHEMATICS**
Department:	**Mathematics**
College:	**College of Science and Humanities**
Institution:	**Prince Sattam bin Abdulaziz University**
Version:	**1**
Last Revision Date:	**13-9-2024**

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A. General information about the course:

1. Course Identification:

1. Credit hours: 2 (2,1,0)				
2. Course type				
A.	☐University	☐College	☒ Department	☐Track
B.	☒ Required		☐Elective	
3. Level/year at which this course is offered: (first)				
4. Course general Description:				
Norms, Arithmetic, and well-posed computations (Norms of vectors and matrices, Floating-point arithmetic and rounding errors, Well-posed computations); Iterative solution of non- linear equations (Functional iterations for a single equation: error propagation, second and higher order iteration methods. Some explicit iteration procedures: The Chord method, Newton method, method of false position and Aitkin's delta square method, Special methods for polynomials: evaluation of polynomials and their derivatives, sturm sequence, Bernoulli's method, Bairsou's method); Solution of Systems of Nonlinear equations: Substitution, Secant and Newton Raphson method, Continuation methods.				
5. Pre-requirements for this course (if any)**:**				
Nil				
6. Pre-requirements for this course (if any)**:**				
Nil				
7. Course Main Objective(s):				

1. Objectives : To prepare the students understand various concepts of Numerical Analysis and solve problems using various methods such as iterative techniques, chord method, newton method, Bairsou Technique etc.
   ILO:

- After Completion of the course, the student shall:

- Understand the concepts of norms of vectors and matrices
- Find iterative solution of non-linear equations using various techniques
- Apply second and higher order iterations for non linear equations
- Acquire skill to apply various techniques such as the chord method, newton method, false position method and atikin’s delta square method
- Understand the principle and theory of Bernoulli method and Bairsou’s technique

- Be able to find solution of system of nonlinear equations using substitution, secant method, newton raphson method etc.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 Hours per week	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	**E-learning**: In case of suspension of regular classes due to any unforeseen eventualities	Not applicable
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	32
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	16
5.	**Others (Office Hours) .....**	16
	Total	64

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**			
1.1	Deep understanding of the concepts of Norms of vectors and matrices, floating-point arithmetic and	**K1**	1. Classroom lectures 2.Interactive sessions	1. Two Internal Exams 2.Atleast two Quiz 3.End Semester Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	rounding errors, Well-posed computations		3.Exclusive Office Hours for clearing doubts in small groups	
1.2	Able to identify the nonlinear equations, system of nonlinear equations and polynomials, and their describe suitable Iterative solution techniques	**K3**		
2.0	**Skills**			
2.1	Apply Advanced technical skills /techniques to solve nonlinear equations, system of nonlinear equations and polynomials	**S1, S2**	1. Application oriented exercises during tutorial session. 2. Homework to improve the analytical skills	1.Homework 2.Assignments 3.Quiz 4. Mid Term and Final Exam
2.2	Problem-solving and decision-making by carrying out a comparison among different techniques in solving nonlinear problems.	**S3**		
…				
3.0	**Values, autonomy, and responsibility**			
3.1	Work effectively with honesty to exhibit integrity and professional value to the assigned task	**V1**	**Group Discussion /Task Brain Storming session**	1. Seminars 2. Oral Presentation

C. Course Content:

No	List of Topics	Contact Hours
1.	Norms, Arithmetic, and well-posed computations (Norms of vectors and matrices,	6
2.	Floating-point arithmetic and rounding errors, Well-posed computations	6
3.	Iterative solution of non- linear equations (Functional iterations for a single equation: error propagation, second and higher order iteration methods	4
4.	Some explicit iteration procedures: The Chord method, Newton method,	6
5.	method of false position and Aitkin's delta square method	6
6.	Special methods for polynomials: evaluation of polynomials and their derivatives, sturm sequence	6
7.	Bernoulli's method, Bairsou's method	4
8.	Solution of Systems of Nonlinear equations: Substitution, Secant and	6
9.	Newton Raphson method, Continuation methods.	4

Total		48

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quiz 1,2	4, 10	10%
2.	Mid Term Exam I	6	15%
3.	Mid Term Exam II	13	15%
...	Continuous Assessment – Homework, Assignment, Attendance etc.		10%
	End Semester Exam	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	**B. S. Grewal , NUMERICAL METHODS IN ENGINEERING AND SCIENCE C, C++, AND MATLAB®, MERCURY LEARNING AND INFORMATION, 2019.**

Supportive References	**S. Chapra, Numerical Methods for Engineers, McGraw-Hill Education, 2015.**
Electronic Materials	**Saudi Digital Library**
Other Learning Materials	**https://ocw.mit.edu/**

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms with Smart boards with seating facilities for at least 20 students
Technology equipment (Projector, smart board, software)	• Smartboard, Internet Connection for Blackboard • Computer Lab with 40 terminals • Visual Studio software.
Other equipment (Depending on the nature of the specialty)	NIL

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students Peer Review/Classroom Observation**	**Indirect**
Effectiveness of students' assessment	**Independent member teaching staff**	**Check marking by an independent member teaching staff of samples of student work.**
Quality of learning resources	**Students**	**Indirect**
The extent to which CLOs have been achieved	Quality Assurance Committee	End Semester online survey
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	**TERM 1**
DATE	**13-9-2024**