Course Specification
(Postgraduate)

Course Title: Numerical **Linear Algebra**
Course Code: **Math626**
Program: *Enter Program Name.*
Department: **Mathematics**
College: **College of Science and Humanities in Alkharj**
Institution: **Prince Sattam bin Abdulaziz University**
Version: **2024**
Last Revision Date: *Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☒ Required		☐Elective	
3. Level/year at which this course is offered: (……)				
4. Course general Description:				
Direct solution of linear equations: Elimination and Factorization method, Ill-conditioning, Iterative refinement, Orthogonal Factorizations: (Jacobi, Gauss-Seidel, SOR, Conjugate Gradients, Pre-conditioning, Chebyshev semi-iteration methods). Matrix Eigenvalue Problems: Power method and inverse iteration, Jacobi, Givens and Householder methods, Sturm Sequence and QR method, Singular value decomposition.				
5. Pre-requirements for this course (if any)**:**				
NIL				
6. Pre-requirements for this course (if any)**:**				
NIL				
7. Course Main Objective(s):				
To provide an in-depth knowledge in system of linear equations and various methods for solution of system of linear equations.				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 hrs a week	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	In case of any closures, classes to be held remotely in Blackboard	--
4	Distance learning	--	--

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

No	Activity	Contact Hours
1.	**Lectures**	32
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	16
5.	**Others (specify)……**	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	**Gain an in-depth knowledge about the basic concepts underlying the algorithms for various methods of solutions linear equations.**	**K1**	1. Class Room Lectures 2.Interactive sessions 3.Exclusive Office Hours for clearing doubts in small groups	1. Two Internal Exams 2.At least two Quiz 3. End Semester Exam
1.2	**Describe the algorithms for various methods such as elimination, factorization, partition, iteration, SOR methods for solution of linear equations.**	**K3**		
…				
2.0	**Skills**			
2.1	**Able to apply the various algorithms for finding solution of a**	**S1**	**Lectures Application oriented exercise during tutorials**	**Application oriented assignment to improve**

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	system of linear equations			cognitive skills of students Mid and Final exams
3.0	Values, autonomy, and responsibility			

C. Course Content:

No	List of Topics	Contact Hours
1.	System of linear equations Direct methods for solution : forward substitution, back substitution	3
2.	Elimination methods :, Gauss elimination, pivoting, Gauss Jordan elimination.	6
3.	Factorization methods : Doolittle's method, Crout's method, Cholesky's method.	6
4.	Partition method, Error Analysis.	6
5.	Iteration methods : Jacobi iteration method, Gauss Seidel iteration method.	6
6.	SOR method, convergence analysis.	3
7.	Iterative method to find inverse of a matrix.	3
8.	Eigen values and eigen vectors, bounds on eigen values.	3
9.	Sturm sequence, Jacobi method.	3
10.	Given's method and Householder's method.	3
11.	Rutishauser method	3
12.	Power method and inverse power method.	3
Total		48

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid Term Exam I	6	15%
2.	Quiz (Atleast 2 quiz)	4 & 10	10%
3.	Mid Term Exam II	13	15%
4.	Continuous Assessment – Homework, Assignment, Attendance etc.	--	10%
5,	End Semester Exam	17	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	**1. Numerical linear algebra : Theory and Applications, by Larisa Beilina, Evgenii Karchevskii, and Mikhail Karchevskii, Springer, 2017.**
Supportive References	**Linear Algebra by Vashishta and Sharma** **Advanced Abstract Algebra by H.K Pathak** **Linear Algebra, Schaums outline series** **Texts in Applied Mathematics : Numerical linear algebra by Grégoire Allaire and Sidi Mahmoud Kaber**
Electronic Materials	
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms with Smartboards with seating facilities for at least 30 students
Technology equipment (Projector, smart board, software)	Smartboard, Internet Connection for Blackboard
Other equipment (Depending on the nature of the specialty)	

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students Peer Review/Class Room 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	Faculty Member Quality Unit of College and department	Direct Learning outcomes assessment.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	