Salisbury University Department of Mathematical Sciences
MATH 472/572 : Numerical Linear Algebra
Syllabus (Tentative)

Description: Numerical methods and analysis applied to linear systems. Computer arithmetic and error analysis, direct methods for solving linear systems, iterative techniques in matrix algebra, approximating eigenvalues. 4 Hours Credit: Meets four hours per week.

Prerequisites: C or better in COSC 117, COSC 118 or COSC 120; MATH 202; MATH 306.

Intended Audience: Majors in Science, Technology, Engineering, and Mathematics (STEM) who wish to solve multidimensional real-world problems through modern computational mathematical techniques, as well as to better understand potential errors which may arise in such computational techniques and results.

Objective: To learn to explore and to solve Multidimensional Systems using modern Computational and Numerical Analyses. Such complicated systems now arise in most areas of STEM. Indeed, in the era of Big Data, such work in STEM fields requires a deep understanding of both the mathematical and computational requirements in dealing with large data sets and the associated analyses.

Textbooks: *An Introduction to Numerical Methods and Analysis*, 3rd edition by James F. Epperson; Wiley. ISBN: 9781119604693. There will also be extensive class notes.

Technology: Octave (Matlab) and computer programming will be used extensively.

Topic	Weeks
Python Preliminaries, Solutions of Multidimensional Systems, Error Analysis	2
Computer arithmetic and Linear Algebra Review, Newton's Method, Errors in scientific computation.	
Numerical Methods for the Solution of Multidimensional Systems	5
Gaussian Elimination, Operations counts, Factorization of Matrices, Perturbation, Conditioning and Stability.	
Approximate Solutions of the Eigenvalue Problem	5
Eigenvalue Review, Hessenburg Form, Power Methods, iterative solution techniques, Applications: Roots of Polynomials, Multidimensional System Solution, and solutions to Partial Differential Equations (PDE).	
Optional Topics	1
Tests and Review	1
Total	**14**

Evaluation

Assignments and Projects	$25 - 30\%$
Tests	$45 - 55\%$
Final Examination	$20 - 25\%$

- Graduate students will be assigned special homework/test problems or projects.
- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.
- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**
- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.