MATH 110 – LINEAR ALGEBRA (4 UNITS)

COURSE OVERVIEW

SUMMARY

Math 110 is the upper division linear algebra course aimed at students who have some background in linear algebra (Math 54 or equivalent). Although this course is a requirement for the math major/minor, many other students also take the course (computer science, EECS, etc.). The course reviews many of the concepts taught in Math 54 and expands on more matrix solving methods.

PREREQUISITES

>a href="math54.html">Math 54 or equivalent;

Sometimes they require Math 53. In terms of topics, there isn't any overlap, but taking Math 53 allows for the student to gain more general experience in math

TOPICS COVERED

* indicates that the topic is most likely completely new from Math 54. Most of the topics that overlap with Math 54 are gone into at a deeper level

- Vector Spaces, subspaces
- Linear combinations and Systems of Linear Equations; Linear Dependence and Independence
- Bases and Dimension

- Linear Transformations, Null Spaces and Ranges
- Matrix Representation of Linear Transformation; Composition of Linear Transformations and Matrix Multiplication
- Invertibility and Isomorphisms*
- Change of Coordinate Matrix
- Elementary matrix operations and Elementary Matrices
- Systems of Linear Equations (Theoretical and Computation)
- Dual Bases*
- Determinants (order 2, order n) and properties
- Eigenvalues and Eigenvectors
- Diagonalizability
- Invariant Subspaces and the Cayley-Hamilton Theorem*
- Jordan Canonical Form*
- Inner Products and Nroms
- The Gram-Schmidt Orthogonalization Process; Orthogonal Complements
- Adjoint of a linear operator* (note: good for physical chemistry)
- Minimal Solutions to Systems of Linear Equations*
- Normal and Self-Adjoint Operators, Adjoint Operators*
- Inner Products, Orthonormal Bases
- Unitary and Orthogonal Operators and their Matrices*
- Orthogonal Operators on R^2; Quadratic Forms on R^2 *

WORKLOAD

COURSEWORK

- 2 midterms
- 1 Final; depending on the professor, you can use the final to replace one of your midterm scores
- Weekly quizzes (in section)
- Weekly homework sets (not mandatory)

TIME COMMITMENT

3 hours of lecture and 1 hour of discussion each week. Expect to spend around 3-4 hours a week (or less) studying course material, preparing for quizzes, etc..

CHOOSING THE COURSE

WHEN TO TAKE

Ideally you should be at least a sophomore when you take the course. It is offered in both the fall and spring.

WHAT NEXT?

In terms of pure linear algebra, this is kind of a terminal course (at the undergraduate level). This course is often used as a stepping stone of other upper division math courses.

ADDITIONAL COMMENTS AND TIPS

This course is good for those who are interested in the math behind quantum mechanics/physical chemistry

As hinted earlier, this course is often used as a stepping stone between lower division math courses and other upper division math courses (MATH 113, 104, 185, etc.). Because it is large and relatively popular, it operates more like a lower division math course (compared to other upper division courses). Furthermore, the course usually focuses on computation, and is not as proof-heavy as other upper division math courses (specifically MATH 113 or MATH 125). With that being said, chemistry majors should know that this course is primarily taken by Math and CS majors, who generally have more experience in math than the average chemistry student.

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