

Course Title: Introduction to Linear Algebra (IAI Code: MTH 911)

Course Description: *IAI Description:* A first course in vectors, matrices, vector spaces, and linear transformations. The ideas in this course serve not only as an introduction to more abstract mathematics courses at the junior-senior level, but also have many useful applications outside mathematics. The course is not intended to replace a more complete linear algebra course at the junior-senior level. The course should be taken concurrently with, but not replace, the last course in the calculus sequence. It should cover the following topics: vectors; operations on matrices; matrices; in-verse of a matrix; solution of systems of linear equations; rank of a matrix; vector spaces and subspaces; linear dependence and independence; basis and dimension; linear transformations; sums, composites, inverses of linear transformations; range and kernel of a linear transformation. Further topics could include: determinants; eigenvalues and eigenvectors; orthogonality and inner product spaces; and quadratic forms.

Semester Credit Hours: 3-4

Prerequisite: Appropriate Calculus Course With a Grade of C or Better

Course Objectives/Standards:

based on the Illinois Mathematics Standards (IMS) for Teachers

Upon completion of this course a student should be able to:

Knowledge Objectives

- Solve problems using vectors. (IMS 2A, 3A, 8B4, 9C2)
- Prove properties of vector spaces. (IMS 9C2)
- Operate on matrices. (IMS 6A4, 8B4)
- Solve problems using matrices. (IMS 2A, 3A, 6A4, 8B4)
- Find the inverse of a matrix. (IMS 2A, 6A4, 8B4, 9C2)
- Solve systems of linear equations. (IMS 2A, 3A, 6A4, 8B4)
- Determine linear dependence and independence. (IMS 3A, 8B4, 9C2)
- Solve sums, compositions, and inverses of linear transformations and determine properties such as range and kernel. (IMS 2A, 3A, 8B4, 9C2)

AAT Sample Course Syllabus – September 2003

- Solve determinants. (IMS 2A, 8B4)
- Solve eigenvalue problems. (IMS 2A, 9C2)
- Determine orthogonality and inner product spaces. (IMS 2A, 9C2)
- Solve quadratic forms. (IMS 2A, 9C2)

Performance Objectives

- Solve problems using vectors. (IMS 2C, 3B, 7C8)
- Operate on matrices. (IMS 3B)
- Solve problems using matrices. (IMS 2C, 3B, 7C8)
- Find the inverse of a matrix. (IMS 2C)
- Solve systems of linear equations. (IMS 2C, 3B, 7C8)
- Determine linear dependence and independence. (IMS 3B)
- Solve sums, compositions, and inverses of linear transformations and determine properties such as range and kernel. (IMS 2C, 3B)
- Solve determinants. (IMS 2C, 3B)
- Solve eigenvalue problems. (IMS 2C, 3B)
- Determine orthogonality and inner product spaces. (IMS 2C)
- Solve quadratic forms. (IMS 2C)

Sample of Acceptable Course Assignments/Assessments/Artifacts by Standard and Indicator

2A

- Evaluations of homework problems;
- Class discussions;
- Problem/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise;
- Written analysis of videos modeling problem solving;
- Reflective writing on problem solving;
- Writing/analyzing multiple solution strategy problem solving;
- Peer tutoring on problem solving strategies.

2C

- Evaluations of homework problems;
- Class discussions;
- Problem/project presentations;

AAT Sample Course Syllabus – September 2003

- Quizzes/exams that demonstrate the ability to generalize mathematical properties from specific cases/problems and formulate theorems or discover more general situations where such properties apply.

3A

- Evaluations of homework problems;
- Class discussions;
- Problem/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise;
- Reflective writing on reasoning;
- Completion of proofs;
- Peer tutoring on reasoning.

3B

- Evaluations of homework problems;
- Class discussions;
- Problem/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise;
- Reflective writing on reasoning with technology;
- Completion of proofs;
- Peer tutoring on reasoning with technology.

6A4

- Evaluations of homework problems;
- Class discussions;
- Problems/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise.

7C8

- Evaluations of homework problems;
- Class discussions;
- Problems/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise.

8B4

- Evaluations of homework problems;
- Class discussions;

AAT Sample Course Syllabus – September 2003

- Problem/project presentations;
- Quizzes/exams;
- Computer/calculator programming exercise;
- Written analysis of videos modeling problem solving;
- Reflective writing on problem solving;
- Writing/analyzing multiple solution strategy problem solving;
- Peer tutoring on problem solving strategies.

9C2

- Evaluations of homework problems;
- Class discussions;
- Problem/project presentations;
- Quizzes/exams;
- Reflective writing on proofs;
- Completion of proofs;
- Peer tutoring of proofs.