

Mathematics B

Determinants, Eigenvalues and Diagonalization

Course Information

School year: 3rd, Required for all departments

Semester/Term: Full year (April - August, October - February)

Schedule: 90 minutes, once a week (total 30 lectures)

Credit hours: 2

Prerequisites: Introductory linear algebra such as:

Euclidean vectors; inner product; vector equations of lines, planes and spheres; addition, multiplication, transposed, inverse and rank of matrices; enlarged coefficient matrices and Gaussian elimination

Course Description

Determinant, Laplace expansion, cofactor; adjugate matrix, Cramer's rule; geometric interpretation of the determinant; linear transformation; orthogonal transformation; orthonormalization of Gram-Schmidt; eigenvalues and eigenvectors; diagonalization; symmetric matrices and quadratic forms.

Instructors

Hitoshi Saitoh (saitoh@), Yasuhiro Kaminaga (kaminaga@), Tadashi Taniguchi (tani@), Hisashi Usui (usui@), Han Yoshida (han@), Shin'ya Fujita (fujita@) (Put "nat.gunma-ct.ac.jp" after "@.")

Course Outcomes

Upon completion of this course/program a student will be able to:

1. Evaluate signatures of even and odd permutations and understand the definition of determinants.
2. Evaluate values of determinants using fundamental properties of determinants.
3. Determine if a matrix is nonsingular.
4. Find inverse matrices using minors, cofactors and adjugate matrices.
5. Solve sets of linear equations with Cramer's rule.
6. Demonstrate linear independence or linear dependence of a set of vectors.
7. Solve simple problems concerning linear transformations in Euclidean space.
8. Determine rotated coordinates of a point in the xy-plane.
9. Find images of lines and curves under linear transformations.
10. Find eigenvalues and eigenvectors of matrices.
11. Determine if a matrix is diagonalizable.
12. Diagonalize a symmetric matrix finding a suitable orthogonal matrix.
13. Find a diagonal form of a quadratic form.

Textbook

Linear Algebra (Second Edition)

by K. Arai, H. Usui, H. Saitoh, M. Suzuki, S. Takato and S. Yamamoto

Dainippon tosho, Tokyo, 2003.

pp.84-156 (in Japanese)

http://www.dainippon-tosho.co.jp/textbook/hs_uc/university_02.html

Grade Distribution

First Midterm Exam: 20%

Second Midterm Exam: 20%

Third Midterm Exam: 20%

Final Exam: 20%

Assignments, Quizzes: 20%

Grading Policy and Criteria

Final grades will be a percentage of points earned versus points possible.

80 - 100%	A
70 - 79%	B
60 - 69%	C
Below 60%	D (disqualified)

Questions

Please contact one of the instructors listed above if you have questions or suggestions concerning the syllabus.