MAT 534, ALGEBRA I, FALL 2000

Course web page: http://www.math.sunysb.edu/~mde/534F_00/534F_00.html

LECTURES: Tu-Th 11:20-12:40, PHYSICS P128

INSTRUCTOR: Mark de Cataldo; Office: MAT 3-115 (math building, third floor, room 115); Phone: 2-8262; e-mail: *mde@math.sunysb.edu*

OFFICE HOURS: By appointment.

TEXTBOOK: T.W. Hungerford, *Algebra*, GTM 73, Springer-Verlag New York 1974. Other typical references: Michael Artin, Algebra, Prentice Hall, Englewood Cliffs, NJ 1991. Serge Lang, Algebra, 2nd ed.; Addison-Wesley, Menlo Park, CA 1984. Nathan Jacobson, Basic algebra, vol. 1, 2nd ed. W.H. Freeman and Co, San Francisco 1985. Van der Waerden, Algebra 1, 9th ed.; Springer-Verlag, 1994.

TENTATIVE SYLLABUS (subject to changes):

1. Vector spaces over R and C

Subspaces, quotient spaces, linear maps, kernel, image. Linear dependence and independence, bases, dimension. Matrices of linear maps, base change, solving systems of linear equations. Homomorphism theorem, sum formula for dimensions. Dual spaces, duality theorem for finite-dimensional vector spaces. Direct sums and products. Determinants.

2. Groups and group actions

Division and Euclidean algorithms, unique factorization. Groups and subgroups. Examples: permutation groups, general linear groups, orthogonal groups. Cayley's theorem. Orbits and cosets, Lagrange's theorem. Homomorphisms, normal subgroups, isomorphism theorem. Group actions, examples. Simple groups.

3. Theory of a single linear transformation

Eigenvectors and characteristic polynomial. Triangular form. Cramer's Rule. Cayley-Hamilton Theorem, determinant-trace formula. Minimal polynomial. Projection operators. Primary decomposition. Jordan form.

4. Inner product spaces

Inner products and orthonormal sets. Diagonalization of symmetric forms and normalization of alternating forms. Hermitian forms, spectral theorem. Orthogonal and unitary groups.

5. Multilinear algebra

Multilinear maps and tensor products. Tensor, symmetric and exterior algebras as vector spaces. Induced linear maps on tensor, symmetric and exterior powers, eigenvalues.

FINAL EXAM: There will be a final examination. Date, place and format to be announced.

HOMEWORK: Homework will be assigned and graded weekly.

GRADE: Based on the final, homework and participation.

SPECIAL NEEDS. If you have a physical, psychiatric, medical, or learning disability that may affect your ability to carry out the assigned course work, please contact the office of Disabled Student Services (DSS), Humanities Building, room 133, telephone 632-6748/TDD. DSS will review your concerns and determine, with you, what accomodations are necessary and appropriate. All information and documentation of disability is confidential.