Information about Senior Algebra Courses

The list below is intended to assist students who may be interested in enrolling in a senior algebra course or courses. The list below comprises all senior algebra classes offered by the Department of Mathematical and Statistical Sciences. Students with questions about any of these classes are encouraged to talk to their algebra instructor or any undergraduate advisor.

**MATH 225 Linear Algebra II**
This is the regular second linear algebra class. The main theme is linear transformations of vector spaces and all that it entails (e.g. abstract vector spaces, diagonalization of matrices, inner products, ...)

**MATH 227 Honors Linear Algebra II**
This is the second honors linear algebra class. It is about linear transformations between vector spaces, similar in content to MATH 225 but goes deeper and may introduce new algebraic structures like for instance fields other than the real numbers.

**MATH 228 Algebra: Introduction to Ring Theory**
This class introduces the concept of a ring. Beginning from the ring of integers and its main properties (prime factorization), the modular rings are constructed, and finally more abstract rings are considered. Along the way the concepts of mathematical induction are introduced.

**MATH 325 Algebra: Vector Spaces and Modules**
In a nutshell this is linear algebra over rings (as opposed to over the real numbers). Mainly focusing on principal ideal domains, the theory of modules over a ring is developed and applied in the case of polynomials, resulting e.g. in the Jordan canonical form for matrices. Along the way finitely generated abelian groups are classified.

**MATH 328 Algebra: Introduction to Group Theory**
This class introduces the most fundamental algebraic concept in mathematics, namely groups. Their basic properties are studied, as well as group actions on sets, group homomorphisms and the construction of quotient groups.

**MATH 422 Coding Theory**
Coding theory focuses on the problem how to encode information that is to be transmitted over an unreliable channel such that the original information can be recovered as long as not too many errors occur during transmission, using so called error detecting or correcting codes. For this purpose, finite fields and polynomials over finite fields are introduced and their properties developed as pertaining to coding theory.

**MATH 424 Algebra: Groups and Fields**
The main focus of this class is the theory of automorphism groups of fields and field extensions, also known as Galois theory. Prominent topics include e.g. the insolvability of the quintic equation, and constructions with ruler and compass.

**MATH 428 Algebra: Advanced Ring Theory *3 (second term, 3-0-0)**
Topics in ring theory selected by the Instructor. The topics will be chosen to illustrate the use of ring theory in another area of mathematics such as the theory of numbers, algebraic geometry, representations of groups, or computational algebra. Note: This course will normally be offered in alternate years beginning in 2000-2001.

**MATH 429 Algebra: Advanced Group Theory**
This class covers more advanced topics in group theory, for example, the Sylow theorems, p-groups. Note: This course will normally be offered in alternate years beginning in 2001-2002.
The chart below summarizes the algebra courses and indicates their algebra prerequisites. Each arrow represents a prerequisite. For example, the algebra prerequisites for Math 325 are Math 225 and Math 228. Note that in terms of prerequisites, the honors versions of linear algebra courses are equivalent to their regular counterparts. In many cases, an equivalent course (which is no longer offered) can be substituted for a prerequisite. Please see the calendar for the official description of course content and prerequisites, as these may change without being reflected here.

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