COURSE DETAIL

HONORS ALGEBRA
Country United Kingdom - Scotland
Host Institution University of Edinburgh
Program(s) University of Edinburgh
UCEAP Course Level Upper Division
UCEAP Subject Area(s) Mathematics
UCEAP Course Number 104
UCEAP Course Suffix
UCEAP Official Title HONORS ALGEBRA
UCEAP Transcript Title HONORS ALGEBRA
UCEAP Quarter Units 8.00
UCEAP Semester Units 5.30

Course Description
The syllabus first covers abstract vector spaces and linear transformations. It then introduces rings and modules, their quotients, and the first isomorphism theorem. The multilinear algebra of determinants is studied, together with eigenvectors and eigenvalues, culminating in the Cayley-Hamilton theorem and the Perron Frobenius Theorem. This is followed by an introduction to inner product spaces and the Spectral Theorem. The course then moves on to normal forms for linear transformations and particularly the Jordan Normal Form. Throughout the course, we will also work with a computer algebra system (e.g. Maple) to learn about programming skills and data structures which are useful in Pure Mathematics and beyond. In lab sessions, we will use these skills to investigate topics that are relevant to the theory being developed in lectures and workshops. Students will also carry out a group project which will require some computer algebra work and a short group presentation. Linear Algebra 1. Basic concepts in abstract linear algebra, abstract vector spaces, bases, linear maps, dimension, images and kernels. 2. Linear transformations, choice of basis, Smith normal form. Rings and Modules 1. Basic definitions and examples of rings, homomorphisms, kernels, images. 2. Polynomials, their Euclidean algorithm, roots and algebraically closed fields. 3. Basic definitions and examples of modules, homomorphisms, kernels, images. 4. Quotient rings, modules and vector spaces; the first isomorphism theorem. Determinants and Eigenvalues 1. Multilinear forms; characterizations of determinant. 2. Eigenvalues and eigenvectors; diagonalizable and triangularizable linear mappings; Cayley-Hamilton Theorem. 3. Perron-Frobenius Theorem and applications. Inner Product Spaces and Quadratic Forms 1. Basic definitions and examples of inner product spaces. 2. Orthogonal projection; Gram-Schmidt; 3. Adjoints of linear transformations; spectral theorem for finite dimensional inner product spaces. Jordan Normal Form 1. The Jordan Normal Form. 2. Applications of the Jordan Normal Form.

Language(s) of Instruction
English

Host Institution Course Number
MATH10069

Host Institution Course Title HONOURS ALGEBRA
Host Institution Course Details
Host Institution Campus University of Edinburgh
Host Institution Faculty
Host Institution Degree
Host Institution Department Mathematics
Course Last Reviewed

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