Recommended Syllabus

This is the recommended syllabus for the module detailed below. The module should contain all the topics listed below in some form, but be aware that there may be additional material covered that can also be examined.

MA251 Algebra I: Advanced Linear Algebra

1. Revision of Linear Algebra, change of bases, characteristic polynomial, eigenvalues, traces.
2. Hamilton-Cayley theorem, minimal polynomial, nilpotent matrices, Jordan forms of nilpotent matrices, primary decomposition.
3. Jordan normal form, functions of matrices, norms and convergence.
4. Powers and exponents, applications to difference and differential equations.
5. Bilinear forms, Quadratic forms, GL_n- classification.
6. Orthogonal matrices, Gramm-Schmidt process, $O(n)$-classification, normal matrices.
7. Spectral theorem and applications to hypersurfaces, classifications of quadrics in R^3.
8. Hermitian, unitary and normal matrices, applications to quantum mechanics.
9. Linear algebra over $\mathbb{Z}$, abelian groups, $GL_n(Z)$ and $SL_n(Z)$, examples of quadratic forms over Z.
10. Echelon forms of matrices over Z, application to finitely generated abelian groups.

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