1. Algebraic Geometry

   (a) Varieties: Quasi-projective varieties, regular and rational maps, definition of singularities and analytic isomorphism, abstract nonsingular curves, intersections in projective space.

   (b) Schemes: Sheaves, schemes, basic definitions and properties, separated and proper morphisms (more generally, the idea of relative geometry), sheaves of modules, divisors and vector bundles (the Picard Group in all its forms), projective morphisms, differentials.

   (c) Cohomology: Lightly on the formalism of derived functors, Cech Cohomology, vanishing theorem for Noetherian affine schemes, cohomology of projective space, Serre duality (with minimal sampling from Ext Groups).

   (d) Curves: Focus on Riemann Surfaces, Hurwitz theorem, local complete intersections, resolution of curve singularities, elliptic and hyperelliptic curves, group actions, Riemann-Roch with applications, degree of projective curves, the Abel-Jacobi map and Abel's Theorem

2. Algebraic Topology

   (a) Fundamental Group: definition, induced homomorphisms, Seifert-van Kampen, fundamental group of a surface, covering spaces, monodromy representation of covering spaces, monodromy of branched coverings (ie, holomorphic maps of Riemann surfaces)

   (b) Homology: Simplicial and Singular, exact sequences, excision, isomorphism theorems, Mayer-Vietoris, coefficients other than $\mathbb{Z}$.

   (c) Cohomology: Definition, universal coefficients, isomorphism theorems, cup product and ring structure, Künneth formula, Poincare duality, orientation classes, Spectral Sequences

   (d) Whitehead's Theorem

   (e) Hurewitz's Theorem

References: primarily Hartshorne, Miranda and Hatcher, but a bit of Griffiths and Harris as well (mostly on curves)