MATH3710: A Tentative Syllabus

Examples of Groups
Lecture 1: How do mathematicians study symmetry?
Lecture 2: Matric groups. Basic properties. Subgroups.
Lecture 3: Permutation groups.
Lecture 4: Generators.
Lecture 5: Abelian groups. Review of equivalence relations.

Basic Concepts and Constructions
Lecture 6: Cosets and Lagrange’s theorem.
Lecture 7: Normal subgroups and quotient groups.
Lecture 8: Isomorphisms and homomorphisms.
Lecture 9: Universal property of quotient groups.
Lecture 10: First isomorphism theorem.
Lecture 11: Second and third isomorphism theorems.
Lecture 12: Products.

Symmetry of polygons and polyhedra.
Lecture 13: Dihedral groups.
Lecture 14: Group operations, orbits and stabilisers.
Lecture 15: Operation on the space of cosets.
Lecture 16: Counting formula and permutation representations.
Lecture 17: Finite subgroups of $SO_3$.
Lecture 18: Finite subgroups of $SO_3$ continued.

Finer theory of groups.
Lecture 19: Class equation and consequences.
Lecture 20: Statement and application of Sylow theorems.
Lecture 21: Proof of Sylow theorems.
Lecture 22: Structure theorem for finitely generated abelian groups.
Lecture 23: Proof of the structure theorem.
Lecture 24: Free groups.
Lecture 25: Nielsen-Schreier theorem.
Lecture 26: Proof of Nielsen-Schreier theorem continued.
Lecture 27: Todd-Coxeter algorithm.
Lecture 28: Group of deck transformations.