To expand our algebraic horizons, your final in this class will consist of a group project investigating a further topic or application of abstract algebra. Below is a list of suggested topics, but if there is something else you are interested in, I will certainly entertain the idea. Plenty of help will be provided in both finding and understanding reading on the topic of your choice.

Your grade for the project will be based on an oral presentation and a paper. The presentation will consist of 20-25 minute talk/lesson on your chosen topic. The paper should be roughly 10 pages typed (including pictures), but the actual length should be based on the content (some topics might require more or less writing).

Here is the list of topics I have thought of, but again, I'm happy to consider alternative ideas. I suggest you start by reading over the wikipedia page for these if you don't know what they are about. Or just ask me. For each of these, the goal is to see how abstract algebra relates to the topic. For example, knot theory is a large branch of mathematics, but your task would be to present the ways group theory can help understand the theory of knots.

- 15-puzzle and Rubik's cubes.
- Knot theory (the braid group).
- Algebraic coding theory (error correcting codes).
- Symmetries of polyhedra.
- Isometry groups (wallpaper and crystals).
- Algebraic number theory (Diophantine equations).
- Cayley graphs.
- Hidden subgroups and graph isomorphisms.
- Free groups and the word problem.
- Ordered groups/rings/fields.
- Structures "weaker" than groups (monoids, semigroups, magmas).
- Lattices and Boolean Algebras.
- Category theory.
- Representation theory.