

MA4198 PROJECT PROPOSAL (PROJECT CUM SEMINAR GROUP)

SUPERVISOR'S INFO

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PROJECT ID: PS2520-05

TITLE

Topology of Numbers

BRIEF DESCRIPTION OF PROJECT

This project aims to study the theory of integral binary quadratic forms (IBQF) from a topological (visual) point of view. The student will learn about the Farey diagram, and how it can be used to visually understand equivalence classes of IBQF. They will study basic properties of IBQF like equivalence, the discriminant of a form, and classification of forms with a given discriminant. They can also explore various related topics like continued fractions, solutions to Pell's equation, and Gauss's composition law for forms with the same discriminant. The material can be found in the first few chapters of the text by Hatcher, and the student may also consult the supplementary text by Conway.

EXPECTATION/S

The student is expected to understand the material and produce a coherent and readable report. They should produce examples of concepts covered, and are also expected to write some code which will illustrate some of the results, for example to determine when two forms are equivalent; to find normal representations for a given form; to solve Pell's equation for a given discriminant; or to execute the Gauss composition law. The coding will be an integral part of the project and students should write interesting, meaningful and useful codes if they expect a good grade.

PREREQUISITE/S (at level 3000 or below, with at most one course at level 3000)

MA1100, MA2001, MA2101, MA2202, MA3211

READING REFERENCE/S

Topology of Numbers by Allen Hatcher (available online from the author's website), The sensual quadratic form by John Conway (supplementary, also available online).