Mathematics Honours Courses for 2010

Department of Mathematics – Macquarie University

First Half	Second Half
Algebra	Partial Differential Equations
Analysis	To be announced later
Topology	To be announced later

First Half

Algebra

Lectures will be in E7A333, on Tuesdays from 11am to 1pm, starting 2 March.

Lecturer: Michael Batanin

Office: E7A 309

This honours course devotes approximately half of its time to ring theory and half to representation theory, over the complex numbers, for finite groups. The ring theory half provides a grounding in non-commutative ring theory leading to the Wedderburn Structure Theorem for semi-simple algebras. The Wedderburn theorem is applied to representation theory, establishing the orthogonality of irreducible characters. The theory of characters is then extended, with a brief excursion into the theory of algebraic integers, to include such methods as inducing characters from subgroups. As well as gaining a good theoretical knowledge of representation theory and its place in modern mathematics students develop considerable skill in practical calculations with group characters.

Prerequisite: MATH337

Analysis

Lectures will be in the Access Grid Room (E6A 202), on Thursdays from 10am to 12 noon, starting 25 February.

Lecturer: Xuan Duong

Office: E7A 307

This course presupposes MATH 339 (Real and Functional Analysis) as the background and aims to give students a solid foundation for further study in Pure and Applied Mathematics. Some topics are treated with certain depth. We will study Lebesgue integration, positive Borel measures, and the all important function spaces L^p. Then we will study the elementary Hilbert space theory and Banach space techniques.

Prerequisite: MATH339

Text book: Rudin *Real and Complex Analysis*

Topology

Lectures will be in E7A333, on Mondays from 10am to 12 noon, starting 22 February.

Lecturer: Ross Street

Office: E7A 311

Topology is the study of continuity. The definition of topological space was conceived in order to say what it means for a function between such spaces to be continuous. There are several different ways of defining topological structure and the proofs that these are equivalent abstract many concrete results about specific kinds of spaces. Different ways of expressing continuity are obtained. Sequences are not adequate for general topological spaces, they need to be replaced by nets or filters, and we discuss convergence of those. Particular properties of topological spaces are analyzed in detail: these include separation properties, compactness, connectedness, countability conditions, local properties, metrizability, and so on. Applications to basic calculus are emphasized. A little bit of algebraic topology may be included by discussing the Poincaré or fundamental group of a space.

Prerequisite: at least one of MATH300, MATH338 or MATH339

..... The Second Half Classes will be announced later .....