3801 (Logic)

Year:	2012–2013
Code:	MATH3801
Level:	Advanced
Value:	Half unit (= 7.5 ECTS credits)
Term:	1
Structure:	3 hour lectures per week
Assessment:	90% examination, 10% coursework
Normal Pre-requisites:	Mathematical maturity, that is ability to cope with proofs and definitions
Lecturer:	Dr I Strouthos

Course Description and Objectives

In this course, we will aim to introduce a language for (first order predicate) mathematical logic and proceed to study the interplay between the notions of 'truth' and 'provability' in the propositional and first order predicate 'versions' of logic. We will then aim to study computability, via register machines, recursive functions and coding, and try to use these concepts to show that first order predicate logic is undecidable.

Recommended Texts

There is a number of textbooks covering the subject area(s) studied in this course. We will aim to make the course self-contained, but a list of relevant textbooks will be mentioned during the lectures. Please feel free to contact the lecturer if you would like to obtain some further clarification, or information regarding suitable textbooks for the course.

Detailed Syllabus

Language: Description and construction of a formal language of first order predicate logic, defined first with a bracket free notation, and then as a more readable version, also including functionals.

Propositional Logic: A study of the semantic and syntactic aspects of propositional logic, including the semantic tableaux method, leading to the completeness theorem for propositional logic.

Predicate Logic: A study of the semantic and syntactic aspects of first order predicate logic, leading to the completeness theorem for first order predicate logic. A description of some of the consequences of completeness, and of mathematical examples of first order languages and theories in mathematics, with particular reference to Peano arithmetic.

Computability: An introduction to the notions of register machines, recursive functions and coding, and a description of the halting problem, which leads to the undecidability of first order predicate logic.