MPhil in Advanced Computer Science
INTRODUCTORY LOGIC

Leader:	Dr. Thomas Forster
Timing:	Michaelmas weeks 5-8
Prerequisites:	Undergraduate Computer Science Mathematical Background
Structure:	16 lectures

AIMS

The aim of the course is to equip the people who follow it with all the background Logic they might need in the other areas to which they might turn their hand.

SYLLABUS

- Wellfoundedness, Induction and Recursion.
- Propositional Logic. Completeness, interpolation.
- Natural Deduction and Sequent Calculus for Propositional and Predicate Logic
- First-Order Theories: Completeness of first order logic. Skolem-Löwenheim. Semantics. Skolemisation.
- Complete theories and categorical theories. Decidable theories.
- Lambda-calculus and Curry-Howard.
- Other sophisticated logical syntaxes: modal logic, branching quantifiers, ϵ-terms.
- Possible world semantics for constructive and modal Logics.

OBJECTIVES

This introductory course is for Master's students, so it assumes the mathematical background a computer science B.A. will have. It covers a lot of material, some of it quite basic ("advanced revision") and the pace will be stiffer than last year.

On completion of the course students should be fluent and confident in their use of logical syntax, and understand the significance of the theoretical background.

COURSEWORK & PRACTICAL WORK

No practical work; there will be exercises in the body of the online notes.

ASSESSMENT

There will be a two-hour examination at the start of the Lent term.

RECOMMENDED READING

There will be extensive online notes linked from the lecturer's home page at `www.dpmms.cam.ac.uk/~tf/cam_only/teaching.html`, and it is the lecturer's intention that the online notes should be sufficient, so students do not need to buy any books. However, there are many books with the string 'mathematical logic' in the title, and many of them—for example E. Mendelson *Introduction to Mathematical Logic*—are suitable. The lecturer's textbook *Logic, Induction and Sets* is available in most college libraries.

Last updated: May 2010