

DIVISION OF MATHEMATICAL AND PHYSICAL SCIENCES

**MSc in Mathematics and the Foundations of Computer Science
Report of the Examiners (2011-2012)**

Part I

1. Results

Entries	16
Passed	4
Distinctions Awarded	12
Failed	0

2. Vivas

Sixteen candidates who submitted dissertations had vivas.

3. Number of scripts multiply marked

Each written assignment (mini-project) was marked by the lecturer for that course (who was therefore appointed as an assessor if he was not already an examiner) and moderated by the examiners. Each dissertation was marked by one reader, and then moderated by the examiners taking into consideration comments supplied by the dissertation supervisor.

4. Distribution of topics

Of the 32 topics available, the numbers taken were as follows:

<i>Michaelmas Term</i>	<i>Passed</i>	<i>Failed</i>
Algebraic Topology	0	0
Analytic Number Theory	1	1
Analytic Topology	1	1
Introduction to Representation Theory	3	0
Lie Algebras	1	0
Lambda Calculus & Types	2	0
Model Theory	1	0
Algebraic Geometry	2	0
Building Infinite Groups	0	0
Applied Probability	3	1
Categories Proofs & Processes	8	0
Communication Theory	2	0
Graph Theory	10	0
Foundations of Computer Science	4	1
Probability & Computing	7	1

<i>Hilary Term</i>	<i>Passed</i>	<i>Failed</i>
Algebraic Number Theory	0	0
Axiomatic Set Theory	1	0
Godels Incompleteness Theorems	0	0
Group Theory and an Intro to Character Theory	2	0
Finite Group Theory	0	0
Recursion Theory	2	0
Representation Theory of Symmetric Groups	2	0
Computational Complexity	4	0
Concurrency	0	0
Knowledge Representation & Reasoning	0	0
Automata Logic & Games	3	0
Computational Algebraic Topology	0	0
Elliptic Curves	1	0

Probabilistic Combinatorics	9	1
Quantum Computer Science	7	0
Categorical Quantum Mechanics	3	0
Theory of Data & Knowledge Bases	0	0
Machine Learning	4	0

<i>Trinity Term</i>	<i>Passed</i>	<i>Failed</i>
Computational Number Theory	3	0
Additive Combinatorics	2	0

5. Assessors

There were 40 assessors appointed to help with the examination. Of these, 6 were not required at all and 9 were called upon to assess dissertations (including taking part in vivas).

A. Changes in examination methods and procedures this academic year

None

B. Changes in examining methods and procedures envisaged

Each written assignment (mini-project) will be marked independently by two assessors: the lecturer for the corresponding course, and a second assessor appointed by the examiners. The examiners will determine final USMs based on marks (or ranges) provided by the assessors, comments from the assessors, and any necessary moderation to ensure comparability between assignments.

Part II

35 courses were offered. 9 courses failed to attract any students. The performance was of a high standard, with 12 mini-project scripts receiving marks of 90 and above, 22 receiving 80 and above, 37 receiving 70 and above, 13 receiving 60 and above, 4 receiving 50 and above, and 4 failures. The overall standard of dissertations was very high this year. Three were awarded a grade of 90 and above, eight at 80 and above, one at 70 and above, two at 60 and above and two at 50 and above.

The dissertation topics, which all had some (theoretical or practical) computing aspect to them, were as follows:-

- Verification of Two Variable First Order Logic and related logics over trees
- Stability-optimization of community structure in networks
- Analyzing Separable Queueing Networks
- Extremal H-saturated Graphs
- Completeness Results for the Graphical Language of Dagger Compact Closed Categories
- Fixed Point Combinators in a Typed Lambda Calculus
- Circuit Identity Testing and Automaton Equivalence
- Commitment Algorithms
- Discrimination Nets: Improvement and Extension to Bang Graphs
- Constraint satisfaction and perfect graphs
- Completeness Thresholds for Bounded Model Checking
- The chromatic number of random graphs
- Causal Theories: A Categorical Perspective on Bayesian Networks
- On the Decomposition Numbers of The Symmetric Group
- Statistical Arbitrage using Machine Learning
- Genericity and Universality in Topological spaces

Each candidate showed a good knowledge of his or her chosen area in the oral examination.

O Riordan (Chairman)
A Jung
A Wilkie
B Coecke