FACULTY OF ARTS & SCIENCE
NEW PROGRAM FORM for 2010-2011 CALENDAR

1. Department or Program	Mathematics

Mathematics and Philosophy (Science program)

Consult the Undergraduate Coordinators of the Departments of Mathematics and Philosophy.

Specialist program:

(12 full courses or their equivalent including one full course at the 400-level)

First Year:
MAT157Y1, MAT240H1, MAT247H1; PHL245H1

Higher Years:
1. MAT257Y1, MAT327H1, MAT347Y1, MAT354H1/MAT357H1

2. One full course from PHL200Y1/(PHL205H1, PHL206H1)/PHL210Y1

3. PHL232H1, HPS250H1/PHL246H5, PHL265H1/PHL275H1

4. PHL345H1, MAT309H1

5. Two of: PHL331H1, PHL342H1, PHL351H1, PHL355H1/PHL356H1

6. Two of:MAT409H1, PHL480H1, PHL481H1, PHL482H1
PHL404H1, PHL411, PHL451

7. 1.0 additional PHL or MAT full course to a total of 12.0

Note:

1. Students planning to take specific 4th year courses should ensure they have the necessary 2nd and 3rd year prerequisites
2. If a course number ends in H5, the course is offered only at UTM in Mississauga

2. Academic Rationale

Mathematics is a central discipline in the liberal arts and sciences and an extremely vibrant area of contemporary scientific research, with profound and historical connections to philosophy. What distinguishes philosophy from the physical sciences is its concern not only with the truths which are discovered by means of specialized methods of investigation, but with the implications that such discoveries have for human beings in their relations with one another and the world.

This program prepares students for further study leading to research careers in mathematics, logic, and philosophy.

3. Learning Outcomes

The program will provide students with in-depth knowledge and expertise in the area of mathematical and formal logic. Students will acquire the skills to analyze arguments and construct formal proofs, to test the soundness and completeness of logical systems. With mastery of these areas, students will be able to move on to study topics in the more advanced field of metamathematics, which considers the relationship between logic and mathematics, the status of mathematical objects, and the nature of mathematical truth. At the same time, requirements in the history of philosophy and moral/political philosophy will provide students with an understanding of the way that formal techniques of reasoning have influenced broader currents of thought from Aristotle to the present.

In particular, they develop a solid foundation in core areas of mathematics including Analysis (MAT157Y1, MAT257Y1, MAT267H1, MAT327H1, MAT357H1/MAT354H1) and Algebra (MAT240H, 247H, 347Y).

Students acquire a general introduction to philosophy in (PHL200Y1/(PHL205H1, PHL206H1)/PHL210Y1) and to ethics in PHL265H1/PHL275H1.

There are two sequences of increasing sophistication ending in 300 level courses:

1. Metaphysics (PHL232H1, PHL331H1)
2. Minds and Machines (the 200 level PHL courses, PHL342H1)

And four sequences ending in 400 level courses:

1. Set Theory (one full MAT course, PHL245H1, PHL345H1, MAT309H1, MAT357H1, MAT409H1)
2. Advanced Topics in Logic (one full MAT course, PHL245H1, PHL345H1, PHL480H1)
3. Advanced Topics in the Philosophy of Language (PHL232H1, PHL245H1, PHL351H1, PHL481H1)
4. Advanced Topics in the Philosophy of Natural Science (HPS250H1/one full course in MAT or PHL, PHL355H1/PHL356H1, PHL482H1)

There is sufficient flexibility in the program for students to achieve familiarity with other areas of mathematics and philosophy, depending on their interests.

4. Degree Objectives

a. DEPTH OF KNOWLEDGE

Please state how particular courses and/or course sequences in your program achieve depth as defined in the attached Depth of Knowledge definition and guidelines.

This question has been fully addressed under Learning Outcomes (Heading 3 above).

b. COMPETENCIES

Please describe how each of the following competencies (as defined in the attached Competencies: Definitions and Guidelines) is developed within the program to the degree relevant to the area/discipline. If the program does not address a particular competency, please explain why that competency is not relevant to your area/discipline and how students in your program are expected to attain that competency within their overall degree program.

i. Critical and Creative Thinking

Every Mathematics and Philosophy course demands and develops the ability to analyze logical arguments, and moreover assigns students from time to time problems unlike any that they have seen before. Solving such problems and assignments is a challenge that requires creative thinking.

Requirement 2 has students doing one Y course in ancient, medieval, or early modern philosophy. The surface goal is to instil a comprehensive understanding of the Western philosophical tradition. In philosophy, however, the past is always relevant to the present, and critical engagement with the texts is presupposed. Thus students will acquire competence in careful textual analysis, research and critical reading and thinking skills.

ii. Communication

Communication skills (in particular, the ability to express mathematical and philosophical insights clearly and correctly, in the form of rigorous proofs, and substantial essays) are developed throughout the curriculum and are explicitly emphasized in the core analysis and algebra sequences, and in the philosophy sequences (listed under Learning Outcomes).

Apart from heavy emphasis upon effective writing and argumentation in philosophy, most of the courses listed in requirements 2 and 3 have small group (20) tutorials, always with a participation grade. Thus students must learn to express their understanding of philosophical ideas and argument verbally, as well as to engage with fellow students.

Currently, extra TA hours have been assigned in MAT157Y1 and MAT246H1 to help students with their proof-writing skills.

iii. Information Literacy

References for research in Mathematics, as in other fields, now include not only traditional sources, but also a tremendous range of online resources, including searchable review databases (MathSciNet), preprint servers (arXiv.org), specialized Math Wikis (such as the Dispersive PDE Wiki, housed at the university of Toronto Math Department), wiki-style online pedagogical resources (eg the Tricki, initiated by Fields medallist Tim Gowers) and Math Blogs (e.g. that of Fields Medalist Terence Tao). Students gain familiarity with these resources in the 300- and 400-level courses of the program.

Apart from the need to master the usual research tools offered through the library and information commons (e.g. online journal articles access), PHL245 is now taught using an interactive web-based system (Logic 2000), which students must master.

iv. Quantitative Reasoning

Quantitative reasoning is a central part of all Mathematics courses.

v. Social and Ethical Responsibility

A fundamental respect for honest argument is omnipresent in mathematics courses.

Students are required to take PHL265H1/PHL275H1 (Introduction to Political Philosophy / Introduction to Ethics). Through these courses, students develop ethical reasoning skills.

c. AN INTEGRATIVE, INQUIRY-BASED ACTIVITY

The 4th year courses in this program have intertwining sequences of prerequisites from both mathematics and philosophy. Any one of them thus provides an integrative experience for the program. 400-level courses in philosophy are small-group seminars (20 cap) or cross-listed graduate courses. The standard requirement in such courses is an in-depth research essay (20-25 pages).

5. Departmental/College Resource Implications The Office of the Dean requires a statement of the resource requirements for the proposed program, and an indication of whether you can meet these requirements through your existing resources, or have received additional resources from the Dean. Please give details of the resource areas below.	
Estimated Enrolment per Academic Year in this program (please explain)	All years, including 1st and 2nd round = 19 This figure is taken from total POST enrolment supplied by the Faculty of Arts and Science.
New courses necessary to mount for this program	0
Additional Instructor(s) Requirements	0
Teaching Assistant(s) Requirements	0
Laboratory Equipment Requirements	0
Computing Resources Requirements	0
Other	0

DELETE the statement that DOES NOT apply:	
I will provide these resources required for this Program from my existing budget.	
DATE : October 7, 2009	***Name of Chair/Program Director:*** Kumar Murty (Professor)