Phil 106b: Mathematical Logic

Who, When, and Where

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Course Description

This course will provide students with an introduction to the foundational tools, concepts, and results in mathematical logic. Our goal will be to start at the very beginning—by thinking about what a formal language is and what the characteristics of formal languages are. We'll look at the syntax and semantics of formal languages and talk about logical implication and deductions or proofs. The course will work toward understanding some of the most important results in math logic, starting with Gödel's completeness theorem and concluding with his ground-breaking first and second incompleteness theorems. We'll also pay special attention to the significance of these results for mathematics.

As the authors of our textbook put it, logic (like math and philosophy) is a contact sport! Like training for a sport, it rewards practice and perseverance. Class time is part of your training: We'll spend much of class trying out the tools and ideas in the textbook, doing practice problems together, and actively working through the material. Problem sets will give you more opportunity to engage actively with the material. Lecturing will be kept to a minimum: you'll get better at logic by doing it, not just by listening to someone (me) ramble on about it. I might add that logic can also be a team sport: by working together in class and outside, you'll be able to learn more together than you can pouring over the textbook alone. And hopefully, you'll find that, like a sport, logic is (at least sometimes) fun!

No special background in logic will be presupposed, however either Introduction to Symbolic Logic or a strong background in math or computer science would be beneficial. If you have taken Introduction to Symbolic Logic, the first few weeks of class will review much of what you learned in that course, though in a more abstract and condensed way. If you haven't taken Symbolic Logic, the first few weeks of class should get you up to speed, though it may be a more challenging start.

Requirements

Students will be required to complete 10 problem sets, due at the beginning of class on Fridays. There will be a midterm, held during class, and a final exam during the exam period.

Grading
The 10 problem sets will be worth 50% of the grade for the class. The midterm will be 15% and the final exam will be 25% of the final grade. Attendance and participation will account for the remaining 10%.

Late assignments will be deducted one third of a grade (e.g. from a B to a B-) for each day they are late. No assignments will be accepted more than one week late. If you need an extension on an assignment, whether because you have work due in other classes on the same day or for personal reasons, please ask me. I am willing to grant short extensions, *provided you ask for them at least a full day in advance*. If you are unable to complete an assignment on time because of an unexpected illness, please let me know as soon as possible.

Class Participation
You are expected to attend class regularly. Good attendance is not, however, sufficient to ensure a good class participation grade. You are also expected to come to class prepared and to have done the reading. Substantial class time will be spent doing practice problems—you will frequently be asked to work in smaller groups or at the board solving problems. Bring the textbook with you to class!

Textbook
Leary and Kristiansen, *A Friendly Introduction to Mathematical Logic*, 2nd Edition, 2015.

Laptops and Cell Phones in Class
You may use a laptop to take notes during class, if you wish. However, please do not use your laptop to surf the net, answer e-mail, or do any work not directly related to the lecture during class. If I catch you using your laptop inappropriately, it will seriously affect your participation grade and I will ask you not to use a laptop in class again.

Absolutely no cell phones or text messaging during class!

Academic Integrity at Brandeis
Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. It is not acceptable to use the words or ideas of another person without proper acknowledgement of that source.

Violations of University policies on academic integrity, described in Section Three of Rights and Responsibilities, may result in failure of the course or on the assignment, or in suspension or dismissal from the University. *If you are in doubt about the*

instructions for any assignment in this course or about how to properly cite the sources you've used, it is your responsibility to ask for help. If you have questions about academic integrity, please do not hesitate to ask me, refer to the Rights and Responsibilities Handbook, or contact the office of Student Development and Conduct.

A note about collaboration on the assignments. You are encouraged to form study groups outside of class to discuss the problem sets. While you may discuss the assignment questions with others, you must cite any ideas you get from your classmates and *you must write up your answers to the assignments independently*. If I find that several students turn in inappropriately similar answers to the assignment questions, I will not hesitate to bring the matter to the Department of Student Development and Conduct.

Four-Credit Course (with three hours of class-time per week)
Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).