Philosophy 132A: Infinity
Palle Yourgrau (Yourgrau@brandeis.edu) 332 Rabb Graduate Center
Office hours: Wed 2:15 – 3:30, and by appt.

Principal text:
A. W. Moore, *The Infinite*

Additional readings, selections from:
P. Yourgrau, *Gödel Meets Einstein: Time Travel in the Gödel Universe*
Wittgenstein, *Philosophical Remarks*
Aristotle, *Physics*

Prerequisites:
A course in logic recommended, but not required.

Course description:
An investigation of the nature and existence of infinity from multiple perspectives. Questions addressed include (but are not limited to) the following:

- Is infinity the subject of theology, or rather, psychology, or mathematics, or physics, or philosophy?

- Can there even be a proper theory of infinity, or is the concept itself paradoxical? (Zeno's paradoxes; Galileo's paradoxes.)

- Is infinity exclusively *potential* (Aristotle, Kant, Wittgenstein; the calculus and limits), or can it be *actual* (Cantor, Frege; set theory) ?

- Are there different "sizes" of infinity? (Cantor’s “diagonal argument” for the existence of different sizes of infinity is arguably one of the great achievements in intellectual history. No one, said the great mathematician, Hilbert, will ever drive us out of “Cantor’s Paradise” [of actual infinities]. Wittgenstein, however, said he won’t try to drive you out; when he’s done, you’ll leave of your own accord.)

- Is anything in the "actual" world actually infinite? (the structure of space-time? the size of the universe? the number of points on a line ? Etc.)

- Can one prove that the infinite exists, or must it always be an axiom or first principle that must simply be accepted or rejected?

- Can *finite beings* like us ever truly grasp the infinite? (Is mathematics itself proof that we can?)

Writing assignments:
Three short papers, 3 - 5 ppg.
Learning Goals:
Students will become acquainted with the problem of how finite beings, like us, can achieve knowledge of an infinite domain like the natural numbers, and with possible ways to solve this problem.

The course will also provide knowledge of the distinction between potential infinity and actual infinity and of the significance of this distinction for mathematics, physics, and philosophy. The revolutionary work of Georg Cantor in arguing for the reality of actual infinity will be explored, as well as the philosophical underpinnings of the modern theory of number developed by Gottlob Frege, and how it dovetails with Cantor’s mathematical writings in set theory.

Students will acquire knowledge of the different “sizes” of infinity that were introduced by Cantor, and on the way these different sizes are “measured”. The course will look at particular examples of infinite sets, such as the set of the finite natural numbers (the counting numbers) and the set of real numbers (the measuring numbers).

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.).

Attendance:
Attendance is mandatory. Roll will be taken, and there will be a grade penalty for each unexcused absence, after the first.

Three Notes:
- Laptops, iPhones, iPods, iPads, etc. are not allowed in the class. The only “I” permitted in the classroom is yourself.

- If you are a student with a documented disability on record at Brandeis and need to have special accommodations for this class, please see me immediately.

- Also please note that any case of dishonesty (cheating on a test, using materials, including from the internet, and failing to cite its origin) is a serious academic infraction and is subject to disciplinary action.