Math 380 Syllabus Fall 2017

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Format: Discussion/lecture meets 11:15 - 12:10 MWF, Lansing 301

Content. This course is an introduction to what is often considered to be one theoretical foundation of modern mathematics, first order logic or FOL. I find it useful to consider learning logic the same way one would approach learning a new language. There is a vocabulary and syntax of logic to learn but the most interesting thing about first order logic is that it is a "mathematical language." That is, it provides the connection between our traditional mathematics language symbols and the form and content of mathematical structures in all their infinite variety.

This connection or correspondence manifests itself in two ways. One, FOL is a very good language in which to express our usual mathematical notions. Two, the language of first order logic is precise enough so that we can prove mathematical theorems about the language itself and hence we can prove theorems about mathematics itself! These so-called meta-theorems include a precise analysis of truth and proof but also provide limitative results which clearly describe things we cannot express or theorems we cannot prove using first order languages. For instance, using these techniques we can prove there are precise, mathematical statements which are true but cannot be proved as theorems. A mathematical language which “curves back” upon itself in this way is one of the fascinating aspects of modern logic.

Format. The format of this class will consist of some lectures in the traditional sense but I would like to have the class members be responsible for bringing in ideas and solutions to exercises for discussion. This will require everyone to be prepared for each class discussion and not drift along in anticipation of some exam in the future. I will have students present solutions to homework exercises in the class as well so you can build up your presentation skills while learning how to field questions. One interesting thing about the material in this class is that it is very self–contained in that you will not need a large body of background material in order to make sense of it all. In fact, you can begin this journey without the usual survival skills of calculus, linear algebra, etc but such background is useful to understand how well our models faithfully represent the usual mathematical structures. As James Joyce said, “Wipe your glosses with what you know.”

Homework. A homework set will normally be given each week on Monday with your written responses due the following Monday. Late homework will not be accepted for grading or correction. Full stop. I will drop the lowest homework grade which should more than compensate for illness, defective alarm clocks, alien abductions and other extraordinary circumstances. I strongly suggest you begin work on the homework set the same day you receive it. It will be most useful if you think about the material in stages instead of all at once late at night before it is due. Each homework set will count 10 points toward your cumulative course grade.

Exams. There will be two in-class exams. These are scheduled for Monday February 13th, and Monday March 27th. Each exam will count 100 points toward your overall course grade and cover about 1/3 of the course material. Exam questions will range from short answer to take home questions given out in advance of the exam.

Projects. Each student will be responsible for a term research project and its presentation to the class. A list of possible topics is provided on a separate document. That document gives some indication of what
the topics may lead to as a project and deadlines for the project. Your individual project is worth 100 points toward your grade. You may get extra credit for your presentation if you present your project during the math department colloquium series. Additional details will be provided on these projects as the class gets underway.

**Grading.** There are about 420 points of graded material assigned in this class. This includes approximately 12 homework sets, two exams, and one individual project. Your grade will be determined on the basis of what percentage of these points you accumulate together with a bonus for class participation, extra credit work, etc. Missing more than two classes without an appropriate reason will diminish your final letter grade.

**Disability Accommodations** If you are a student with a disability for which you may need academic accommodations in this course, you should self-identify, provide appropriate documentation of your disability, and register for services with Disability Services at the Center for Teaching and Learning (CTL). Disability related accommodations and services generally will not be provided until the registration and documentation process is complete. The guidelines for documenting disabilities can be found at the following website: [http://www.hws.edu/academics/ctl/disability_services.aspx](http://www.hws.edu/academics/ctl/disability_services.aspx)

Please direct questions about this process or Disability Services at HWS to CTL@hws.edu or x3351.