Math 27700: Mathematical Logic 1

Autumn 2020

Instructor	Benedict Morrissey (First two weeks were covered by Denis Hirschfeldt)
Email	bmor@uchicago.edu
Course Website	TBA
Synchronous Sessions	Tuesday, Thursday 1PM [Chicago time] on Zoom
Course Assistants:	Alex Burka alexandertburka@uchicago.edu Spencer Dembner spencer.wd@hotmail.com
Office Hours	Benedict Morrissey T 5:00-7:00 Alex Burka M 3:30 - 5:30 Spencer Dembner Th 9:00 - 11:00

Course Overview: Propositional and First order Logic. Compactness, Completeness and applications.

Method of Delivery:

Primarily via lectures given synchronously, and then recorded (zoom links on Canvas). There may also be some asynchronous recorded lectures, and some of the synchronous sessions may be used for problem solveing/discussion.

There is a discussion forum for this site on the Piazza platform. See section below.

Recordings:

There are university wide Recording and Deletion Policies which can be found in the Student Manual under Petitions, Audio Video Recording on Campus. Namely do not "(i) record, share, or disseminate University of Chicago course sessions, videos, transcripts, audio, or chats; (ii) retain such materials after the end of the course; or (iii) use such materials for any purpose other than in connection with participation in the course." Furthmore do "not share links to University of Chicago course sessions with any persons not authorized to be in the course session. Sharing course materials with persons authorized to be in the relevant course is permitted."

The Zoom cloud recordings are automatically deleted 90 days after the recording.

Piazza:

The Piazza site (link on Canvas) is a forum primarily for you to discuss mathematics related to this course with other students. I will be checking on it every few days.

All discourse must be at least as respectful as it would be in person.

Complete solutions should not be posted, but it is fine if they emerge during discussion.

Material: We will cover at least the majority of the following:

- Cardinals and Ordinals
- Propositional Logic
- First Order Logic
- Ultrafilters, Ultraproducts, Łos Theorem, Categorical Interpretation.
- Compactness and Applications (Non-standard Analysis, Löwenheim–Skolem)
- Completeness
- Stone Duality in Propositional Logic

Text: There is no set text. However it is highly recommended that you regularly consult at least one of the following resources frequently to reinforce topics in lectures. The first three books are available via Canvas, under the library reserves tab.

References for specific sections will be recommended.

- Yu. I. Manin, *A Course in Mathematical Logic for Mathematicians*, $\geq$ 2nd Edition.
- Herbert B. Enderton, *A Mathematical Introduction to Logic*, 2nd Edition
- C.C. Chang and H. Jerome Keisler, *Model Theory*, 3rd Edition

The following two *draft* texts may also be helpful:

- The draft Joseph R. Mileti, *A Mathematical Introduction to Mathematical Logic*. Available at `https://mileti.math.grinnell.edu/MathematicalLogic.pdf`
- Jeremy Avigad, *Mathematical Logic* (available under "Files" on Canvas)

Late Homework, Missed Class

If for whatever reason [e,g. Illness, Family emergency] you will miss a significant amount of time, or miss some homework assignments please let me know as soon as is reasonably possible so that we can arrange how to deal with this.

For individual missed class sessions, watch the recorded video, and come to office hours if you want to discuss it.

Late Homework will not be accepted in the absence of an acceptable reason. For technical difficulties resulting in Homework being a few hours late you can email this to the course assistants with a note about said difficulties. For longer delays/other reasons I should be contacted as far in advance as is reasonably possible.

Grade Components:

- 100 % Homework

There will be weekly Homework. The lowest two homework grades will not be counted. All other Homeworks will contribute equally to the final grade.

Some proportion of the Homework questions will be clearly labelled as "Take Home Test Questions." These must be worked on individually, see the Homework Policy session for more details.

Collaboration, Homework Policy, and Academic Integrity: Working together on Homework questions (With the exception of the take home test questions) is encouraged. You are also encouraged to discuss these problems in office hours. However I ask that

- You write up solutions individually, and do not look at other students fully written solutions prior to submitting homework.
- Include on the Homework a list of people you discussed the problems with.
- More details are in the Table 1.

The spirit of this policy for regular Homework questions to encourage collaboration and discussion while making sure that you are involved in solving the problems, and understand all solutions well enough to independently explain them. For "Take Home Test" questions it is to make sure you can solve questions on your own. Clarification on the policy can be provided as needed.

Table 1 summarizes what is allowed/not allowed for Homework questions, and for the "Take Home Test" questions. This is course policy from Homework 3 onwards, for Homework 1 and 2 whatever instructions Denis set are policy.

Getting Help: I would like to encourage everyone to come to office hours when you have questions about course material.

If you have concerns about falling behind, or otherwise, please email me.

Disabilities: If you require special accomodation you should contact UChicago Student Disabilities Services (SDS) as soon as possible. For more information, see `https://disabilities.uchicago.edu/`. Please also contact me to say that you are doing this. If you have already contacted Denis Hirschfeldt please contact me anyway to make sure I'm not missing anyone.

Important Dates:

- Add/Drop Deadline Week 3. Email mathadvising@math.uchicago.edu for departmental approval of course change requests, with the exception of requests for simultaneous enrolment.

  If you want to discuss this please email Denis and I.

- The end of Week 9 is the deadline for P/F grading.

Activity	Homework Q's	Take Home Test Q's
Discussing Problems with other people (includes Students, Course Assistants, Me).	Allowed	Not Allowed
Discussing Questions on Piazza	Allowed	Not Allowed
Post Complete Solution on Piazza[1]	Not Allowed	Not Allowed
Asking Me for Clarification	Allowed	Allowed
Write Up Homework with another person/student	Not Allowed	Not Allowed
Look at final written Solutions of other students (not including partial work from problem discussion)	Not Allowed	Not Allowed
Look at Communally created Materials written while discussing Problem	Allowed	Not Allowed
Post Problem Online	Not Allowed	Not Allowed
Use any Textbook	Allowed	Allowed
Look up concepts online	Allowed	Allowed
Search for solution to specific Problem online[2]	Not Allowed	Not Allowed

Table 1: Allowed Activities on Homework

[1]It is fine for solutions to emerge in course of discussion.

[2]It is of course easy to inadvertently find solutions when looking at resources on the topic. Do not be concerned about this, but the point is that you should be working out solutions to the problems not finding them.