Introduction to Logic

Instructor

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Course description and learning goals

This course will introduce you to the basics of modern formal deductive logic and its applications to everyday reasoning, to philosophy, and to the numerous theoretical and practical disciplines that draw upon it (e.g. mathematics, computer science, and linguistics). Topics to be covered include: basic notions in formal logic such as validity, soundness, the logical modalities, ambiguity, and the use vs. mention distinction; truth-functional connectives; using a formal language to represent patterns of deductive reasoning in natural languages; the syntax, semantics, and basic metatheory of truth-functional logic and first-order logic; constructing proofs in Fitch-style natural deduction systems, and rudimentary set theory.

SAS Core Curriculum

This course satisfies the SAS Core Curriculum requirement **Cognitive Skills and Processes: Mathematical or Formal Reasoning [QR]**, since one of the main learning goals of the course is to '[apply] effective and efficient mathematical or other formal processes to reason and to solve problems'.

Course prerequisites

None, although credit will not be given for both this course and 01:730:202.

Course assessments

There will be three types of assessment in this course.

One component of your grade will be based on **your attendance during the in-person sessions (Thursdays at 11am to 12:20pm in B6 Hardenbergh Hall).** This will be worth **5 points**; each session that you do not attend from start to finish without an official excuse will result in a deduction of 1 point.

Another component of your grade will be your performance on **weekly problem sets.** These will be worth **45 points of your final grade.** Most of these will be submitted through Carnap.io, which is a free, interactive online software framework for studying logic. It provides quick and helpful feedback as you work through the problem set, and automatically grades your submission; I think you will like it. I will provide instructions on how to register and use Carnap.io once the course begins.

The last component of your grade will be **an in-class midterm exam** (worth **20 points**) and a comprehensive **in-class final exam** (worth **30 points**).

Online content

At the beginning of each week, I will be posting a number of documents to help you work through the course readings: sometimes these will be detailed handouts, sometimes these will be narrated slides, and sometimes both.

I will also be regularly conducting *optional* synchronous lectures on Zoom, which I will record and post to the Canvas website. To help facilitate your attendance, I will do my best to schedule these at the beginning of the week based on your availabilities, which I will poll the week before. To help entice your attendance, I will offer bonus points for those who attend (though these cannot be used towards your attendance grade).

Course texts

Most (if not all) of the readings for the course will come from the following textbook, which is freely available online:

- ■ P. D Magnus and Tim Button, *forall x: Calgary – An Introduction to Formal Logic*, Fall 2021 edition, https://forallx.openlogicproject.org/forallxyyc.pdf

You might also find the following textbook useful, which accompanies the Carnap.io software and is also freely available online:

- ■ Graham Leach-Krouse, *The Carnap Book*, https://carnap.io/book

Provisional course reading schedule

I will likely shorten or lengthen how much time we spend on certain sections depending on how we are progressing through the course. But this will give you an idea of what we will be covering,

in what order. The dates in blue are when the Thursday in-person sessions will occur. Readings must be finished by the in-person session, although ideally you will read them along with when I conduct the optional synchronous sessions and/or post asynchronous material earlier in the week. Occasionally, you will be assigned course notes written by yours truly; these will be found in the relevant modules and in the "Files" section on the Canvas course website.

Week 1 2 September	**Key notions in logic** *for all x*, pp. 1–25
Week 2 9 September	**Truth-functional connectives in English** *forall x*, pp. 27–48
Week 3 16 September	**The vocabulary and grammar of the language TFL** *forall x*, pp. 49–67
Week 4 23 September	**The semantics of TFL** *forall x*, pp. 69–84
Week 5 30 September	**The semantics of TFL** *forall x*, pp. 85–107
Week 6 7 October	**Natural deduction for TFL** *forall x*, pp. 109–140
Week 7 14 October	**Natural deduction for TFL** *forall x*, pp. 141–160 and 169–172
Week 8 21 October	**Names, predicates, variables, and quantifiers in English** *forall x*, pp. 191–213
Week 9 28 October	**IN-CLASS MIDTERM EXAM**
Week 10 4 November	**Names, predicates, variables, and quantifiers in English** *forall x*, pp. 214–234
Week 11 11 November	**The vocabulary and grammar of the language FOL** *forall x*, pp. 235–256
Week 12 18 November	**The semantics of FOL** *forall x*, pp. 258–276

THANKSGIVING BREAK

22 - 26 November   I will likely host an optional synchronous lecture that covers the material on the semantics of FOL assigned for next week. Whether you attend or not, it would be a good idea to get started on that material this week!

Week 13   **The semantics of FOL and natural deduction for TFL**
2 December   *forall x*, pp. 277–290 and 292–307

Week 14   **Natural deduction for TFL**
9 December   *forall x*, pp. 308–327

Week 15
16 December   **IN-CLASS FINAL EXAM**
                               8am to 11am

Academic integrity policy

Cheating, plagiarism, and other forms of academic malfeasance come in many forms—if you haven't already, I would recommend familiarizing yourself with the Academic Integrity Policy (http://academicintegrity.rutgers.edu/academic-integrity-policy/) for a list of examples. Any suspected violation—and I am quite talented at detecting these—will be automatically referred to the Office of Judicial Affairs, and can carry penalties up to and including a failing grade in the course or expulsion from the university. Note: ignorance about what counts as academic malfeasance, or carelessness in acting in accordance with this policy, is *not* a defense. Thus, if you have any questions about whether you are toeing the line, please do not hesitate to consult with me *before* you submit your work.

University disability statement

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation. For more info, please visit https://ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please register by following this link: https://webapps.rutgers.edu/student-ods/forms/registration.