Introduction to Logic

Contact Information

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Office Hours: By appointment (appointment page: https://calendar.app.google/gSC2YMyvkE5JcCuE9)

Course Description

This course will introduce you to the fundamentals of modern formal deductive logic and its powerful applications to everyday reasoning. Our main object of study will be the *argument*, which represents a chain of reasoning and consists of *premises* (or starting assumptions) followed by a *conclusion*. We will learn to determine when such arguments are *valid*—i.e., when their conclusions necessarily follow from their premises. To do so, we will translate arguments into an artificial or formal language specifically designed to check for validity: truth-functional logic (TFL). We'll thoroughly cover the syntax and semantics of TFL, translating complex natural language arguments into these formal languages, and learning to construct proofs and check for validity within them. By the end of the course, you will have a solid understanding of the notion of validity and be knowledgeable in several methods for determining whether an argument is valid.

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 Materials

The class will use two textbooks, both freely available online:

[CB] Leach-Krouse, G., & Ehrlich, J. (2024, May 21). *The Carnap Book*. https://carnap.io/book

[FC] Magnus, P. D., Button, T., Trueman, R., Zach, R., & Thomas-Bolduc, A. (2023). *forall x: Calgary. An introduction to formal logic (4th edition)*. Open Logic Project. https://forallx.openlogicproject.org/forallxyyc.pdf

Additionally, we will use a free online learning resource called Carnap: https://carnap.io/.

Technology Requirements

Students will need a computer with internet access. The main portal for the class will be Canvas (https://canvas.rutgers.edu/). We will use Carnap (https://carnap.io/) to submit some of the logic exercises.

Grading Scale

90-100: A 85-89: B+ 80-84: B 75-79: C+ 70-74: C 60-69: D 0-59: F

Grade Assessment

Homework Exercises (70%): The course is divided into four units (see below). Each unit will include a variety of homework exercises. These exercises will be completed using the free online resource, Carnap (https://carnap.io/). In the first unit, you will be guided through the process of registering on Carnap using a Gmail account and be provided the registration link for the course. Carnap allows you to receive automatic feedback, indicating which answers are correct and offering slight hints for incorrect answers. You are free to check your answers as many times as needed until you get it right. Once satisfied with your answers, ensure your answer is submitted.

Midterm Exam (10%): This exam will consist of a mix of multiple choice, short answer, and matching questions. It will assess your understanding of higher-level concepts, such as validity and soundness, covered in the first half of the course (Units 1 and 2).

Final Exam (10%): This exam will also feature various question types, including multiple choice, short answer, and matching questions. It will test your knowledge of higher-level concepts covered in the second half of the course (Units 3 and 4).

Canvas Debriefs (10%): At the end of each unit, you will post a debrief on the Canvas discussion boards. In your debrief, discuss what you struggled with, what you found interesting about the unit, and any areas where you are still unclear. This debrief is an opportunity for me to gauge how well you are grasping the course material beyond just looking at homework and exam scores. Additionally, articulating your struggles can often help clarify your thoughts and enhance your learning experience.

Course Schedule

The readings marked with "[Extra]" are complementary, and you should read them if you have any questions about the main reading or want more information. Keep in mind that *forall x: Calgary* and *The Carnap Book* use different naming conventions, especially for Natural Deduction. In the event of a conflict, please use the naming convention in *forall x: Calgary*.

Week 1 (12/23/2024–12/29/2024) Introduction, Key Logical Notions, Using Carnap

Read:	FC pp. 2–25	*"Key Notions of Logic"*
	[Extra] CB Ch. 1	*"The Subject Matter of Logic"*
Watch:	Week 1 Video: Introduction and How to use Carnap	
Do:	Week 1 Exercises [carnap]	Due 12/29/2024 11:59PM
	Week 1 Debrief [canvas]	Due 12/29/2024 11:59PM

Week 2 (12/30/2024–1/5/2025) Truth-Functional Logic (TFL)

Read:	FC pp. 27–61	*"Truth-Functional Logic"*
	[Extra] CB Ch. 2 starting from "Translation", Ch. 9	*"Translation"*
Watch:	Week 2 Video: Truth-Functional Logic	
Do:	Week 2 Exercises [carnap]	Due 1/5/2025 11:59PM
	Week 2 Debrief [canvas]	Due 1/5/2025 11:59PM

Week 3 (1/6/2025–1/12/2025) The Semantics of TFL

Read:	FC pp. 69–95	*"Truth-tables in TFL", "Semantic Concepts"*
	[Extra] CB Ch. 10	*"Truth-tables"*
Watch:	Week 3 Video: The Semantics of TFL	
Do:	Week 3 Exercises [carnap]	Due 1/12/2025 11:59PM
	Week 3 Debrief [canvas]	Due 1/12/2025 11:59PM
	Midterm Exam	Due 1/12/2025 11:59PM

Week 4 (1/13/2025–1/17/2025) Natural deduction in TFL

Read:	FC pp. 112–169	*"Proofs in TFL", "Proof-theoretic Concepts"*
	[Extra] CB Ch. 3–8	*Derivations (Proofs)*
Watch:	Week 4 Video: Natural deduction TFL	
Do:	Week 4 Exercises [carnap]	Due 1/16/2025 11:59PM
	Week 4 Debrief [canvas]	Due 1/16/2025 11:59PM
	Final Exam	Due 1/16/2025 11:59PM

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 (https://tinyurl.com/rutgersaip) for a list of examples. Any suspected violation 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, 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 me so that we can discuss potential accommodations 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.

Acknowledgements

The structure of this course is heavily inspired by the courses previously taught by Alex Skiles and Patrick Brooks. My sincere thanks to both!