80-150 Nature of Reason

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1 Course Description

This course provides an accessible introduction to the historical development, within the Western tradition, of philosophical ideas regarding the nature of reasoning and rationality from ancient to modern times, with a focus on mathematics and the sciences. The course is divided into three parts. The first part traces the search for deductive methods for obtaining certain knowledge, starting with Euclid and Aristotle, all the way to the work of Boole and Frege in the nineteenth century, which marks the beginning of modern logic. The second part focuses on the history of skepticism about empirical knowledge and inductive reasoning, covering the ideas of philosophers such as Descartes and Hume, along with various replies to skepticism—for instance, in the works of Bayes. The third and final part of the course is devoted to discussing the development and the basic elements of the theory of computation, as well as the most prominent theories of the nature of the mind and mental processes, culminating in the computational conception of the mind that underlies contemporary cognitive science.

2 Course Objectives

By taking this course, you will be able to

1. describe the historical development, within the Western tradition, of philosophical ideas concerning the laws of correct reasoning and the nature of rationality, as well as explain what progress has been made in our understanding of these concepts;
2. Analyze arguments and recognize common reasoning fallacies;
3. Explain the basic problems, methods, and results of (i) deductive logic, (ii) inductive logic, (iii) the theory of computation, and (iv) the theory of mind;
4. Apply the formal tools of logic and probability theory to elucidate and address long-standing philosophical questions;
5. Formulate your own arguments and present your thesis and argumentative strategy in a clear and compelling written and oral form.

3 Learning Resources

The main textbook we will be using is Thinking Things Through (TTT) by Clark Glymour. Please make sure to get the second edition (published in 2015). You can find a digital copy through the CMU library. We will also be using parts of the textbook Choice and Chance (CC) by Brian Skyrms. The relevant chapters will be made available on Canvas. Any additional reading materials will be made available on Canvas, as well.

4 Course Structure

This course typically meets five days a week. During each week, you will typically have a quiz on Wednesday, and a Homework due Friday at midnight. However, some weeks these days are different. Please see the schedule below for details. Quizzes will be completed in the first 15 minutes of class the day they are assigned. It is strongly recommended that you not put the homework assignments off until Friday or Saturday, as they are quite lengthy! Week 3 and Week 6 will each have an exam. These are takehome exams, however, you will only have 24 hours to complete them. All assignments are to be completed by uploading a pdf to canvas.

Almost every day there are assigned readings. Please have these readings finished BEFORE coming to class. Discussion of the readings and debate about the material therein will constitute your participation grade. These readings will also be essential for your ability to complete the assignments.

The grade breakdown for this course is as follows:

- Homework: 50%
- Quizzes: 10%
- Midterm Exam: 15%
- Final Exam: 20%
- Participation: 5%

My latework policy is to remove 20% of your final grade for each day an assignment is late. That said, please feel free to request an extension if you require one - I will generally grant them, but for the sake of getting things graded promptly, please try to request extensions before assignments are due.

Extensions for the midterm and exam are more difficult to grant, barring extreme circumstances. Feel free to ask for one, but I may be unable to grant it.

5 Schedule

- Week 1
  - M: Overview of the course/Different forms of reasoning
  - T: the idea of proof/Euclid's Geometry/Infinity
    Readings: TTT, Chapter 1, pp. 3-15
  - W: Aristotle's conception of scientific inquiry/Aristotle's logic
    Quiz 1 in class
    Readings: TTT, Chapter 2, pp. 33-58
  - R: Aristotle's Logic
  - F: Leibniz' Logic
    Homework 1 due at midnight
    Readings: TTT, Chapter 3, pp. 63-86
- Week 2
  - M: Boole and the laws of thought
    Readings: TTT, Chapter 4
  - T: Boole's logic, part 2
  - W: Frege's theory of logic
    Quiz 2 in class
    Readings: TTTm Chapter 5, pp. 111-146
  - R: Frege's theory of logic, part 2
  - F: Propositional Language
    Homework 2 due at midnight
- Week 3

  - M: No Class
  - T: Propositional Natural Deduction
  - W: Propositional Semantics
  - R: Quantifiers
    Quiz 3 in class
  - F: Conclusion of Modern Logic
    Homework 3 due at midnight
    Midterm Sunday 9AM to Monday Midnight

- Week 4
  - M: Scientific method and the problem of induction
    Readings: TTT, Chapter 7
    Skyrms, Choice and Chance, Chapter II
  - T: The new riddle of induction
    Readings: Skyrms, Choice and Chance, Chapter IV
  - W: More on grue, and first steps towards probability
    Quiz 4 in class
  - R: Fundamentals of the probability calculus
    Readings: Skyrms, Choice and Chance, Chapter VI, pp. 109-117
  - F: Conditional probability
    Homework 4 due at midnight
    Readings: Skyrms, Choice and Chance, Chapter VI, pp. 117-136

- Week 5
  - M: Bayes' Theorem and probabilistic reasoning
  - T: Interpretations of probability
    Readings: Skyrms, Choice and Chance, Chapter VII
  - W: Interpretations of probability, part 2
    Quiz 5 in class
  - R: Bayesian solutions to the problem of induction
    Readings: Readings: TTT, Chapter 8, especially pp. 196-208
  - F: Bayesian solutions to the problem of induction, part 2
    Homework 5 due at midnight
- Week 6
  - M: Theories of mind
    Readings: Readings: TTT, Chapter 12, pp. 287-307

– T: The computational theory of mind
Quiz 6 in class Readings: TTT, Chapter 13, pp. 311-327
TTT, Chapter 14, pp. 347-358

– W: Challenges for the computational theory of mind
Homework 6 due at midnight Readings: TTT, Chapter 14, pp. 358-370

– R: No class

– F: No class
Final Exam Friday, time TBA

6 Invitation for Students with Disabilities

If you have a learning disability that could impair your progress in this course, please contact Equal Opportunity Services on campus (http://hr.web.cmu.edu/dsrg/students.htm). We can arrange to accommodate your learning style based on EOS recommendations. Please notify me at the semester's beginning of your learning needs—do not wait until the semester becomes overwhelming to acknowledge the problem.

7 Religious Observance

If classes or assignments for this course conflict with a religious holiday, please let me know in advance. We can then make alternative arrangements.

8 CMU Philosophy Department Statement on Citing and Plagiarism

"The straightforward disclosure of the sources used in completing course work is essential to the integrity of the educational process. In that way one acknowledges the ideas of others and helps to highlight what is distinctive of one's own contribution to a topic. It also enables instructors to be more effective teachers by providing an accurate sense of the student's grasp of course material.

Students are expected to use proper methods for citing sources; such methods can be found in style guides like the Chicago Manual of Style, or the most recent MLA Handbook. In general, an acceptable method of citation provides enough information to allow a reader to track down the original sources. You should consult your professor, if you have any questions about which method to use, or which kinds of collaboration or assistance to disclose.

Failure to acknowledge the ideas of others is a serious violation of intellectual integrity and community standards. It is the individual student's responsibility to be aware of university policies on academic integrity, including the policies on cheating and plagiarism. This is available online at: `http://www.cmu.edu/policies/documents/Academic%20Integrity.htm` and in the section on "University Policies" in the most recent edition of The Word: Undergraduate Student Handbook.

Students who cheat or plagiarize face serious sanctions at both the course level, and the university level. At the course level, faculty at Carnegie Mellon University have significant discretion to determine the sanctions that are appropriate to individual cases of cheating and plagiarism. Within the Philosophy Department, it is customary to give plagiarized assignments a failing grade and, where appropriate, to fail students for the course. Additionally, a letter is sent to the Dean of Students indicating that the student in question has submitted plagiarized material and received a course-level sanction. Plagiarism is also a violation of the community standards of Carnegie Mellon University. As such, allegations of plagiarism may be brought before a University Academic Review Board which will determine whether a violation of community standards has taken place and level additional sanctions if appropriate. Although this body

also has signifcant discretion over the sanctions that it levels, plagiarism can result in academic probation, suspension, and even expulsion."[1]

To add to this, I am entirely comfortable with you using AI to help you complete your assignments this semester. If you choose to avail yourself of these tools, however, I have one request. Please clearly denote which sections of your assignments have been generated with AI. This is not only necessary and honest citation (and so failure to do so may be counted as plagiarism) but furthermore, knowing when and how you are using AI will help both myself and the TA give you more thorough and specific feedback.

This syllabus borrows from elements of Dr. Joel Smith's syllabus for "Scientific Revolutions" and Dr. Francesca Zaffora Blando's and Krzysztof (Chris) Mierzewski's syllabi for "Nature of Reason".

[1] https://www.cmu.edu/dietrich/philosophy/graduate/ta-handbook/academic-honesty.html