Models and Simulations

Course Mechanics

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Course Description Logic, set theory, and probability theory are critical tools for philosophers, and there continues to be active research, debate, and discovery at the foundations of these disciplines. This course is an introduction to the these three areas of mathematics, with the aim of providing students with the necessary formal skills and domain knowledge to complete the masters degree in logic and philosophy of science at LMU. Although I assume students have some passing familiarity with propositional logic, no background in mathematics is assumed. So please do not worry, and leave your anxiety with respect to mathematics at the door.

Course Goals The course has two central goals. First, students should be able to define and explain the importance of certain mathematical terms that occur regularly in logic, philosophy of science, and philosophy of mathematics. Such topics include, for example, completeness, decidability, uncountable vs. countable sets, the probability axioms, and conditional probability. Second, students should be able to to explain how logic, set theory, and probability theory been used to address long-standing problems in analytic philosophy, and they should begin to be able to apply these tools to philosophical problems in their own area of research.

Requirements There are problem sets due every week and a final exam. Some of you may find these exercises and the exam difficult. Please do not worry. Many philosophy students are not accustomed to struggling with weekly exercises, some of which they cannot complete. This is because active discussion sessions and writing papers are, perhaps, the best ways to learn most areas of philosophy. In contrast, the best way to acquire formal skills is by repeatedly practicing such skills and by studying definitions and proofs. For the overwhelming majority of people, mathematical ability is learned; it is not innate. If you practice problem-solving and if you study the arguments and definitions that we discuss in class, you will learn the material. By the end of the class, you will be able to accomplish the above outlined goals. Conversely, if you do not solve problems and study, there is a non-trivial chance that you will not learn the material.

Grading Your final grade will be calculated via a weighted average using the following weights:

- Final Exam - 25%
- Weekly Problem Sets (weighted evenly) - 75%

If you earn between 95% and 100%, your grade will be 1.0; between 90% and 95% will constitute a 1.3, and so on.

Assignments Each week, you must turn in your problem set at the beginning in class. Unless you are granted an extension (see below), late work will be penalized 10% for every day that it is late. You are permitted to work with other students on the assignments, and feel free to ask for my help as well. However, you should always write the final copy of your problem set alone; doing so ensures that **you** understand the material. If you collaborate with other students, please write the names of the other students with whom you worked at the top of your problem set.

Twice during the course of the semester, I will grant you a two-day an extension on your problem set, no questions asked. That is, instead of turning the problem set in on Tuesday, you may turn it in some time on Thursday by bringing it to my office or Maria Csauscher in Room 134 in Ludwigstraße 31. If you need more than two additional days to complete an assignment, please talk to me.

Schedule

Abbreviations:
L&P = *Logic and Proofs*. Sieg, et. al.
F&C = *Functions and Computations*. Sieg, et. al.
H&J = *Introduction to Set Theory*. Hrbacek and Jech.
Degroot = *Probability and Statistics*. Second Edition. DeGroot.

Date	**Topic**	**Readings**
15/10	Propositional Logic: Semantics	L&P: Chapters 1-3
22/10	Propositional Logic: Syntax	L&P: 4-6
29/10	Metamathematics: Soundness and Completeness	L&P: 7; Online Notes
5/11	Predicate Logic: Semantics	L&P: 8-9
12/11	Predicate Logic: Syntax	L&P: 10-11
19/11	Introduction to Set Theory: Axioms, Boolean Algebra, Natural Numbers	H&J: 1; 3.1-3.2
26/11	Orderings, Equivalence Relations, and Functions	F&C: 2-3
3/12	Functions and Sizes of Sets	F&C: 4
10/12	Predicate Logic: Metamathematics I	Online Notes
17/12	Predicate Logic: Metamathematics II	Online Notes
7/1	Probability: Axioms and Combinatorics	DeGroot: 1.1-1.8
14/1	Conditional Probability and Independence	DeGroot: 1.10-1.11, 2.1-2.2
21/1	Random Variables and Special Distributions	DeGroot: 3.1-3.5
28/1	Expectation, Variance, and Covariance	DeGroot: 4.1-4.3, 4.6, 4.8-4.9
4/2	**Final Exam**	