PHIL 111 (Sect. 001-004): Introduction to Logic II Fall 2013

Catalog Description:
Philosophical foundations of inductive inference, including probability, statistics, and decision theory; application of the methods and results of inductive inference to philosophical problems such as the problem of rationality, epistemology, theory confirmation, social and political philosophy.

Learning Outcomes. Students should be able to:

- Apply, as appropriate, methods of inductive reasoning, using as a foundation the knowledge of the basic principles of statistics and probability theory.
- Recognize and use connections among mathematical, logical, and algorithmic methods across disciplines.
- Identify and describe problems using the language of statistics and probability theory and assess the appropriateness of these approaches for the available data.
- Effectively communicate the results of such inductive reasoning and problem solving.
- Identify the inductive structures of ordinary language statements and arguments.
- Define and apply a variety of statistical concepts, including mean, standard deviation, normal distribution, and correlation; use these concepts to perform and evaluate statistical inferences.
- State and explain the rules of probability theory and apply them to a variety of random processes.
- Apply the rules of conditional probability, especially Bayes Rule, to perform probabilistic inferences.
- Distinguish interpretations of probability theory, and discuss their relative strengths and weaknesses.
- Apply decision theory to a variety of situations, and explain some of the strengths and limitations of decision theory.

Carolina Core Outcome:
ARP - Students will be able to apply the methods of mathematical, statistical, or analytical reasoning to critically evaluate data, solve problems, and effectively communicate findings verbally and graphically.

Lectures: Mo, We 9:40-10:30, Gambrell 250 **Friday sections**:

001 F 8:30-9:20, Jones Physical Sci Ctr 201,

002 F 9:40-10:30, Coker Life Science 104,
003 F 9:40-10:30, Gambrell 129,
004 F 10:50-11:40, Health Sci Bldg 103,

Office Hours: You may visit the TAs during their office hours or your instructor, or make an appointment with your TA or your instructor.

Material on Blackboard: The power point slides for each lecture will afterwards be filed under 'Course Documents/Lectures held', while tentative previews will be posted under 'Previews'. Homework assignments are available under 'Assignments'. The course is based on a book manuscript in the making by Professor Michael Dickson, which is available under 'Textbook'.

Preparing for class and working through the material afterwards: To get the most out of the lectures, you should be prepared to consult the relevant PowerPoint slides before coming to class. In the past, many students have also found it helpful to read through the relevant reading in the

recommended textbook (on Blackboard) before coming to the lecture. Other students preferred to consult the reading after the lecture in order to reinforce their grasp of the content that was discussed. Whichever method you prefer, you should keep in mind that the content of this course is sometimes difficult, and you may not always fully understand the text the first time you read it. This is normal! However, if you make use of the multiple resources available to you in this course, they will reinforce one another. The reason that this course is somewhat difficult to some is that it can be taken to satisfy the "Analytical Reasoning" requirement (the math requirement), and it has to be taught at a certain level of rigor just like a course in the math department. However, your instructor and the TAs are looking forward to helping you throughout the semester and we are ready to answer all of your questions at every stage.

Course Evaluation. Your performance will be assessed by four different methods.

(i) There will be two **exams** during the term and a cumulative final exam. *All exams are closed-book*, and you are required to leave your notes in your bags. Doing otherwise will be taken as an attempt to cheat. Only simple calculators without statistics are allowed.

(ii) Each week, typically no later than Monday, you will find homework assignments on blackboard. The solutions are not to be turned in, but you should be able to present them to your fellow students in the Friday session or be at least able to point out what you had not understood. (Team work is encouraged in working on the homework.) On Monday, you will write a 10 minute **quiz** at the beginning of class that is very similar to one of the homework problems. The best five of your quizzes count for your final grade

(iii) You will write a short 3-5pp. **essay** in which you provide an example of your choice for non-trivial correlations and how they can be causally explained.

(iv) **Active participation** in the Friday sections. You will be awarded up to 15 points by your TA. They reflect whether you ask questions and present homework problems, not just whether you show up.

These four modes of assessment contribute to your grade as follows:

Exams 1 and 2	15 points each	30 points
Cumulative final exam		25 points
Quizzes (4 points each), best five out of seven		20 points
Essay paper (case study)		10 points
Active participation in Friday sessions		15 points

A (90-100), B+ (85-89), B (78-84), C+ (73-77), C (66-72), D+ (61-65), D (54-60), F (0-53).

Topics and Readings for the lectures (depending how fast we proceed, there might be changes)

	INTRODUCTION: WHAT IS INDUCTIVE LOGIC?
23 August	*Technicalities and required high-school mathematics*
26 August	"Why Ask Why?", "Numbers and the World"
28 August	"Deductive and Inductive Arguments"
30 August	***Homework 0 due**; Discussion of your examples*
2 September	*Labor Day, no class*
4 September	"The Problem of Induction"
6 September	***Homework 1 due**; discussion of induction*
	SURVEYS AND STATISTICS

9 September	**Quiz 1;** "Introduction to Survey Sampling",
11 September	"Distributions and Their Properties"
13 September	***Homework 2 due***
16 September	**Quiz 2;** "Averages",
18 September	"Dispersion" "Standard Deviation Units";
20 September	***Homework 3 due***
23 September	**Quiz 3;** "Precision and Bias","The Normal Distribution"
25 September	"Correlation"
27 September	***Homework 4 due***
30 September	**Quiz 4;** "Correlation and Causation"
2 October	*Exam preparation (Recap)*
4 October	*Selected problems*
7 October	**Exam 1**
	PROBABILITY, PREDICTION, AND DECISION
9 October	Gambling", "Sets and Sentences"
11 October	*Return and Discussion of Exam*
14 October	"Sets and Sentences II"
16 October	"Assigning Probabilities",
18 October	*Fall Break: No classes*
21 October	**Paper (case study) due;** "Calculating Probabilities",
23 October	Calculating probabilities 2
25 October	***Homework 5 due***
28 October	**Quiz 5** "Conditional Probability"
30 October	"Calculating Sequences"
1 November	***Homework 6 due***
4 November	**Quiz 6** "Bayes Rule"
6 November	*Exam preparation (Recap)*"
8 November	*Selected Problems*
11 November	**Exam 2**
13 November	Bayes Rule 2
15 November	*Discussion of Exam 2*
18 November	False positives and false negatives
20 November	"The Axioms of Probability Theory" Interpretations of Probability Theory,
22 November	**Homework 7 due**
25 November	**Quiz 7** "Introduction to Decision Theory,
27 November	*Thanksgiving Recess*
29 November	*Thanksgiving Recess*
2 December	"Utilities and Degrees of Belief
4 December	General review for the final exam
6 December	*Examples and questions*
14 December	**FINAL EXAM at 9 am**

Policy about absences. Attendance in this course is mandatory. In lectures where there is no quiz, attendance will be taken through a sign-in sheet. The same holds for the Friday sessions. There is a maximum of four unexcused absences. Each further absence will cost you two points. There are no excuses for a missed exam except serious illness or official events sponsored by the University that require your presence. Typically you will be able to provide a letter from the competent University official or your doctor. In the case of an official event, you must notify me beforehand. In case of a documented illness, you must contact me immediately afterwards. *Please make a note of the exam dates and do not make any personal travel plans that will prevent your presence at the exam. Any such plans will* ***not*** *be accepted as reason to miss the exam. You alone are responsible for making sure that you can be at the exam.* For the general policy of the university, see http://bulletin.sc.edu/content.php?catoid=10&navoid=1781.

Calculators and other electronics. Always turn off your cell phones and your internet connection. You are allowed to use simple pocket calculators, even though all calculations come out in simple fractions and you have answered a question completely by providing a fraction you cannot reduce easily. But you must show your work on the paper and thus prove that you have understood the problem.

These rules are there to protect your grade. This is a class which, over the years, some students have failed unnecessarily. Others have scored poorer than they should have. The reason was almost always poor attendance, sometimes the fact that those who had learned statistics in high school believed the class to be essentially a free lunch and ceased to study the material. But each lecture builds upon previous one, statistics and probability are closely intertwined. Thus once you have lost track, it might be a lot of work to come back into class during a busy term.