This syllabus is preliminary and is subject to change.

INDUCTIVE LOGIC 3210-001 Fall 2019
Instructor: Stephen M. Downes
Email: s.downes@utah.edu
Office Hours: Thursdays 2.00 to 3.00pm and by appointment
Office Location: 457 CTIHB
Preferred Method of Contact: Via email

T Th 12.25-1.45 pm 106 BU C

COURSE DESCRIPTION
Is what that politician said supported by evidence? Should I buy a lottery ticket? Does the result of one coin toss tell me anything about the result of a future coin toss? Which of driving drunk or texting while driving is riskier behavior? Does this letter to the editor present adequate support for its conclusion? What does this sample tell us about the population as a whole?

We reason to conclusions all the time, even when we are unaware that is what we are doing. We draw conclusions and act upon our conclusions every few seconds of every day. When we are driving, we make inferences all the time based on the evidence available to us about signals, lights, pedestrians and other cars. We also, again often almost unconsciously, check other people’s reasoning: Why does so and so believe that given the evidence? For example, why believe that your losing team is going to win this time?

This course is an introduction to probabilistic and statistical reasoning. Probability and statistics both provide tools for making better inductive inferences. The companion course to this one (PHIL 3200) is an introduction to deductive inferences, which are inferences that can be assessed as valid or invalid. Inductive inferences, in contrast, are assessed in terms of strength and weakness. If I observe the same bird at my bird feeder on one hundred consecutive days, I can infer that it will show up tomorrow. This would be an inductive inference and is stronger than the inference that the bird will show up tomorrow from one sighting of the bird at the feeder. Probabilistic inferences are also inductive inferences that move from premises containing proportions or probabilities to conclusions containing probabilities. For example, we can make predictions about the probability of an outcome, such as drawing an Ace from a fair deck, based on information about the number of cards in the deck and the number of Aces. Using statistics, we can test hypotheses and assess their strength. Philosophers also consider the different ways in which we can understand probability. For example, some think that we assign probabilities to events in the world and others think that we assign probabilities to our beliefs; the higher the probability, the surer we are in a belief. Students in this class will learn how to make elementary inferences in probability relying on the rules of probability and will also learn some elementary statistics. Students will also learn how to process alternate presentations of probability using differing notations. There will also be some opportunity to discuss philosophical aspects of inductive reasoning (e.g. Hume’s problem of induction) and probability (e.g. frequentism vs Bayesianism).

This class satisfies a QI requirement. In class, in homework assignments and in exams, students will have to make use of some arithmetic, algebra and formal deductive logic. During class students will learn various ways of representing probabilities and manipulating probabilities such as probability models, Venn diagrams, probability trees and tables, along with rules of
probabilistic inference, such as Bayes’ Theorem. Students will also learn some basic statistical techniques. Homework assignments and exams will mostly consist in problem sets to test students’ mastery of these techniques but will also include some written work dealing with philosophical issues arising from the study of inductive inference.

COURSE OUTCOMES
By the end of this course and successful completion of all course requirements, the student will be able to do all of the following:

- explain the importance and relevance of the study of inductive logic to human reasoning,
- compare and contrast philosophical accounts probability,
- display an understanding and working knowledge of the formal techniques that we cover,
- display an improved ability to construct, clarify, and evaluate inductive arguments encountered in the real world.

COURSE MATERIALS
- Ian Hacking *An Introduction to Probability and Inductive Logic* (Cambridge University Press).
- Additional readings will be available through our OLI class and our class CANVAS page.

Supplementary readings are on Reserve at the Marriott Library.

Turning Technologies Response device ("clicker").
- Students may use their own phone, tablet or laptop as a response device or, if you already have a clicker, you can register it for this class. Instructions for registering your clicker or mobile device with Turning technologies will be provided on the class CANVAS page.

Carnegie Mellon University, Open Learning Initiative (OLI) https://oli.cmu.edu/
- Students must pay a $25 fee and enroll with our class through the OLI to receive credit for homework. Most homework will be done via OLI.

CANVAS <utah.instructure.com>
- I will use this resource throughout the term to keep you updated on your grades, for course communication, and for our course calendar. Class handouts and some assigned readings will be posted here as well.

ATTENDANCE/PARTICIPATION
(15% of final grade)
Learning will come much more easily and enjoyably if you’re actively participating in your education! Accordingly, I emphasize student participation and discussion in the classroom. I expect you all to bring questions, ideas, and insights to class and to be prepared to share them. Of course, if you're not attending class, then you're not participating well either; so, attendance is required. You can also enhance your participation by checking into Canvas regularly. This way you can keep up on class requirements and also find class slides from classes you missed or simply want to go over again. We will be doing problems in class and you will submit your answers using your clicker devices. Points will be assigned for all clicker participation.
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HOMEWORK
(35% of final grade)
In order to make sure that you are doing the reading carefully and understanding the material, you will have weekly homework assignments. Assignments will be due online either via OLI or via Canvas, and students may not work on their assignments during our class meetings. Students may work together on homework assignments, but each student actually needs to contribute. It should go without saying that students may not copy other students’ answers. Students who are struggling with homework assignments should not hesitate to seek help. The best solution is to talk to your fellow classmates and try to work out issues together. The next best solution is to remember which problems you struggled with; we will want to go through these as a class during our meetings. Your homework score will be the total of each of your homework scores throughout the semester. You will receive no score if you miss a homework assignment. There will be no makeup homework assignments.

EXAMS
(50% of final grade — Midterm Exam: 20%, Final Exam: 30%)
Exams will cover significant ideas, principles, and methods treated in the course — i.e., those covered in the readings, homework, and especially in class times. We will spend one full class time reviewing the relevant material together before each exam. Check the course calendar and schedule for exam dates, times. All exams will be in our classroom (459 CTIH).
UNIVERSITY POLICIES

The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677 (COPS).

University Safety Statement. The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

Drop/Withdrawal. Last day to Add/Drop this class: Friday Sept. 1st. Last day to withdraw from this class: Oct 21st.

University Policies and Procedures:

Student Code: http://regulations.utah.edu/academics/6-400.php (Links to an external site.)

Accommodation Policy (see Section Q): http://regulations.utah.edu/academics/6-100.php (Links to an external site.)

General Education Statement: This course contributes to the University of Utah’s Quantitative Reasoning requirement. For such courses, academic units must identify three essential learning outcomes (ELOs) that are relevant to university general education objectives. The ELOs for this course are: Inquiry and Analysis, Quantitative Literacy and Foundations and Skills for Lifelong Learning.

COURSE POLICIES

Attendance & Punctuality: According to University policy, “Instructors must communicate any particular attendance requirements of the course to students in writing on or before the first class meeting” (PPM, Policy 6-100III-O)]. Attendance is mandatory in this class. Attendance will count for a portion of your participation grade. Points will be deducted for non-attendance.

Participation: A component of your grade will be based on participation. Participation includes contributions to in-class discussion, regular visits to the class Canvas site and contribution to discussions on the class site and discussion with the instructor in office hours.

Food & Drink: If you bring food or drinks to class, please tidy up and be respectful of your classmates.
Electronic Devices in Class: You may use a laptop or tablet to take notes on the lecture in class and you may use a calculator. You must also bring your response device (Clicker) to every class. Otherwise, no electronic devices may be used in class. If you use your laptop or tablet to check Facebook etc., play games or engage in other non-class activities you will be asked to turn those applications off. Repeat offenders will be asked to leave class.

Canvas: All information about this class will be posted on Canvas. Please consult the class Canvas page regularly. Your Canvas activity for each class is logged automatically. The system detects every time you log on and records how long you visited for. Your participation through Canvas is measured this way.

COURSE SCHEDULE

**Week 1 (Aug 20 and 22)**
Course Introduction: From Logic to Probability
Reading: Hacking, chs. 1 & 2 plus OLI reading.
Register clickers and register for OLI course (instructions on CANVAS)

**Week 2 (Aug 27 and 29)**
The Gambler’s Fallacy and introducing Probability
Reading: Hacking, chs. 3 & 4 plus OLI reading.

**Week 3 (Sept 3 and 5)**
Conditional Probabilities and Independence (Part 1)
Reading: Hacking ch. 5 plus OLI reading.

**Week 4 (Sept 10 and 12)**
The rules of probability
Reading: Hacking ch. 6 plus OLI reading.

**Week 5 (Sept 17 and 19)**
Random Variables and Independence (Part 2)
Reading: Giere (online) plus OLI reading.

**Week 6 (Sept 24 and 26)**
Bayes’ Rule/Bayes’ Theorem
Reading: Hacking ch. 6 plus OLI reading.

**Week 7 (Oct 1 and 3)**
Interpretations of Probability
Reading: Hacking chs. 11 & 12 plus Earman and Salmon (online).

**Week 8 (Oct 8 and 10)**
NO CLASSES all week — Fall Break!!

**Week 9 (Oct 15 and 17)**
TEST WEEK
REVIEW SESSION: Tuesday
EXAM 1: Thursday, regular class time

**Week 10 (Oct 22 and 24)**
Sampling and Frequencies
Reading: TBA

**Week 11 (Oct 29 and 31)**
Hypothesis Testing
Reading: TBA

**Week 12 (Nov 5 and 7)**
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The Problem of Induction
Reading: Hume (of course) and more TBA

**Week 13 (Nov 12 and 14)**
Probability and the Problem of Induction
Reading: TBA

**Week 14 (Nov 19 and 21)**
Differing Approaches to Hypothesis Testing and Confirmation (Part 1)
Reading: TBA

**Week 15 (Nov 26)**
No class Nov 28th Thanksgiving.
Differing Approaches to Hypothesis Testing and Confirmation (Part 2)
Reading: TBA

**Week 16 (Dec 3 and 5)**
Differing Approaches to Hypothesis Testing and Confirmation (Part 3)
Reading: TBA

**FINAL EXAM REVIEW SESSION**: Thursday Dec 5th.

**Finals Week**
EXAM 3, FINAL: Friday Dec 13th 10.30am to 12.30pm

Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements and in the Calendar.