INDUCTIVE LOGIC 3210-001 Fall 2020

Instructor: **Stephen M. Downes**
Email: **s.downes@utah.edu**

IVC class via Zoom M,W,F 11:50am to 12:40pm

A full syllabus and schedule of class topics and exam dates will be available at the beginning of Fall semester. The following details what to expect from this course. (This document has three pages, please read all three carefully.)

COURSE DESCRIPTION

Is my test for Covid-19 accurate? What is my chance of contracting Covid-19? Is what our Governor said about health policy 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? What does this sample tell us about the population as a whole? Questions like these can all be addressed by using inductive logic.

We reason inductively 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 do they believe that their losing team is going to win their next game?

This course is an introduction to probabilistic and statistical reasoning. Probability and statistics both provide tools for making better inductive inferences. Inductive inferences 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

Students must have a copy of the course text:

- Ian Hacking *An Introduction to Probability and Inductive Logic* (Cambridge University Press).

Students must purchase a Turning Technologies Response device license.

- Students must use their own phone, tablet or laptop as a response device. Instructions for registering your mobile device with Turning technologies will be provided on the class CANVAS page.

Students must register with Carnegie Mellon University, Open Learning Initiative (OLI) https://oli.cmu.edu/

- You will pay a $25 fee and enroll with our class through the OLI to receive credit for homework. Most homework will be completed 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 on Canvas and some homeworks and all exams will be administered through our course Canvas page.

ATTENDANCE/PARTICIPATION

(10% of final grade)

Attendance is required in this class. We will be doing problems in class and you will submit your answers to these problems using your mobile response devices during class time. Points will be assigned for all mobile response participation. You should also regularly check the class Canvas page, this way you can keep up on class requirements and also find slides from classes you missed.

HOMEWORK

(35% of final grade)

All homework assignments will be due online either via OLI or via Canvas. 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
(55% of final grade —Exam 1:10%, Exam 2:15%, Exam 3:15% Exam 4:15% weightings may be adjusted as semester progresses.)
Exams 1, 2 and 3 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 of Exams 1, 2 and 3. Exams 1, 2 and 3 will mostly involve formal reasoning, including applying your probability rules, using probability trees, annotating distribution curves and calculating mean, variance and standard deviation. Exam 4 will be a take home essay exam but you will be required to use and explain formal tools in your answer. Sample exam questions will be available from the beginning of the semester. Check the course calendar and schedule for exam dates, times. All exams will take place during an assigned class time or during finals week. Missing an exam will result in a failing grade for that exam. **There will be no make-up exams.**

GRADING POLICY

Final grades are assessed as follows:		**% points translate to grades as follows:**	
		93% and above	**= A**
Attendance/participation	**10**	**90-92%**	**= A-**
(includes online participation)		**88-89%**	**= B+**
Homework	**35**	**83-87%**	**= B**
		80-82%	**= B-**
Exams	**55**	**78-79 %**	**= C+**
Total	**100**	**73-77%**	**= C**
		70-72%	**= C-**
		etc.	
		Below 60%	**= E**

In previous versions of this class taught by this instructor, students have received grades ranging from A to D. Students who complete all homework assignments and exams and attend 90% of class sessions will pass this class. D's awarded in previous classes resulted from failure to complete homework assignments, failure to take exams, poor attendance or all of the above.