# CS 4995 – Fall 2022
# Logic and Computability

**Lectures:** Wednesday 4:10-6:30, 331 URIS
**Instructor:** Toniann Pitassi, toni@cs.columbia.edu
**TA:** Yasaman Mahdaviyeh
**Office hours:** Tuesday 2:45-3:45 (Yasaman), Monday 5-6 (Toni)
**Web Page:** http://www.cs.columbia.edu/ toni/Courses/Logic2022/4995.html

**Course Notes:** PDF files for course notes, lecture notes and other handouts will be available on the course webpage.

**Office Hours:** Monday office hours via zoom (see Courseworks for link). Please email ahead of time if you plan to attend office hours (on either day).

**Topics:**

Propositional logic: syntax and semantics, Resolution and Propositional Sequent Calculus soundness and completeness. First order logic: syntax and semantics, First Order Sequent Calculus soundness and completeness. Godel's Incompleteness theorems. Computability: Recursive and recursively enumerable functions, Church's thesis, unsolvable problems

**Marking Scheme:**

2 assignments (each worth 20% of final grade)
First Term test (20% of final grade)
Second Term Test (20% of final grade)
Class participation (10% of final grade)

**Due Dates:**

First Test (In Class): Wednesday Oct 19, 4:10-6:30pm
Second Test (In Class): Wednesday, Dec 7, 4:10-6:30pm
Assignment 1 due date: Tuesday Oct 11 11:59pm
Assignment 2 due date: Tuesday Nov 29 11:59pm

*The work you submit must be your own.* You may discuss problems with each other; however, you should prepare written solutions alone.

**Optional Supplementary References:**

S Buss: Chapter I: An introduction to proof theory, in **Handbook of Proof Theory**, S Buss Ed., Elsevier, 1998, pp1-78. (grad)
J Bell and M Machover: **A Course in Mathematical Logic**. North-Holland, 1977. (grad)
H.B. Enderton, **A Mathematical Introduction to Logic** (undergrad)
G Boolos and R.C. Jeffrey, **Computability and Logic** (undergrad)

E. Mendelson, **Introduction to Mathematical Logic**, 3rd edition (undergrad/ grad)

J.N. Crossley and others, **What is Mathematical Logic?** (informal, readable)

A.J.Kfoury, R.Moll, and M. Arbib, **A Programming Approach to Computability** (undergrad)

M.Davis, R. Sigal, and E. Weyuker, **Computability, Complexity, and Languages: Fundamentals of Theoretical Computer Science** (undergrad/grad)