

**MATH/PPE 180: ANALYTIC METHODS IN  
ECONOMICS, LAW, AND MEDICINE**

**Instructor:** Andreea Nicoara  
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Office hours: Tue 11am-12, Thu 4:30-5:30pm

**Lectures:** TTh 12:00-1:30pm in DRLB 4C2

**Required Text:** Jackson, Howell E. etc. *Analytic Methods for Lawyers*,  
1st edition, Foundation Press, 2003

**Optional Texts:** will be put on reserve in the library. Once the reserve list is processed by the library, an announcement will be made in class.

**Attendance and Course Notes:** It is in your best interest to attend each lecture and take accurate notes. You will be tested on the material **as it is covered in class**. If you miss a lecture, make sure that you copy from a classmate and review the notes from that day.

**Exams:** There will be three in-class midterms on October 7 (Thursday), November 10 (Tuesday), and December 3 (Thursday). There is no final exam. Please make sure you can sit in all three exams before enrolling in the course. Make-up exams will only be administered for medical reasons with a doctor's note. All exams are closed-book and closed-notes.

**Homework:** will be assigned but not collected or graded. You are urged to form study groups to discuss the homework. No solutions will be posted, but some of the exam problems will be taken from the homework.

**Grading:** Course grades will be computed roughly based on class participation (10%), midterm 1 (30%), midterm 2 (30%), and midterm 3 (30%).

**Course content:** The primary goal of this course is to improve students' abilities to think analytically and communicate their reasoning effectively. We will be covering the following topics:

- (1) Decision Analysis
  - (a) expectation and the Law of Large Numbers,
  - (b) drawing and solving decision trees,
  - (c) applications to economics, law, and medicine
- (2) Game Theory
  - (a) pure strategies for zero-sum games: elimination of dominated strategies, maximin/minimax, saddle points
  - (b) mixed strategies for  $2 \times 2$  and  $3 \times 3$  games, graphical representation of Nash equilibria
  - (c) variable-sum games: prisoners' dilemma, arms race, chicken, stag-hunt and the theory of social contract
  - (d) applications of game theory: auctions and bidding, brinkmanship, pooling and manipulating risk, signaling and screening
- (3) Introductory Probability: counting versus set theoretic representation of probabilities
- (4) Conditional Probability, Bayes' Theorem, and Applications
  - (a) false positives in medical tests
  - (b) the prosecutor's fallacy and reliability of DNA matches
  - (c) case study: arguments in the O. J. Simpson's case involving conditional probabilities
- (5) Introductory Finance
  - (a) simple versus compound interest, nominal versus effective rates, add on versus discounted loans
  - (b) qualitative discussion of issues surrounding the pricing of options, the Black-Scholes equation, and Gaussians versus fractional laws

**Course website:** exact URL to be announced, but the course site will be on Blackboard.