6.431x Spring 2020 Syllabus

Unit 0: Overview (released Mon. Jan 27)

Unit 1: Probability models and axioms (released Mon. Jan 27; Sections 1.1-1.2)
L1: Probability models and axioms
Problem Set 1 due on Tue February 4

Unit 2: Conditioning and independence (released Mon. Jan 27; Sections 1.3-1.5)
L2: Conditioning and Bayes' rule
L3: Independence
Problem Set 2 due on Tue February 11

Unit 3: Counting (released Wed. February 5; Section 1.6)
L4: Counting
Problem Set 3 due on Tue February 18

Unit 4: Discrete random variables (released Wed. February 12; Sections 2.1-2.7)
L5: Probability mass functions and expectations
L6: Variance; Conditioning on an event; Multiple r.v.'s
L7: Conditioning on a random variable; Independence of r.v.'s
Problem Set 4 due on Thur February 27

Exam 1 (Timed) : Covers material from L1 to L7 (released Thur. February 20; due on Tue. March 3)

Unit 5: Continuous random variables (released Wed. February 26; Sections 3.1-3.5)
L8: Probability density functions
L9: Conditioning on an event; Multiple r.v.'s
L10: Conditioning on a random variable; Independence; Bayes' rule
Problem Set 5 due on Thur. March 12

Unit 6: Further topics on random variables (released Wed. March 4; Sections 4.1-4.3, 4.5)
L11: Derived distributions
L12: Sums of r.v.'s; Covariance and correlation
L13: Conditional expectation and variance revisited; Sum of a random number of r.v.'s
Problem Set 6 due on Tue. March 24

Unit 7a: Bayesian inference (released Fri. March 13 Sections 3.6, 8.1-8.4)
L14: Introduction to Bayesian inference
L15: Linear models with normal noise
Problem Set 7a due on Tue. March 31

Unit 7b: Bayesian inference (Continued (released Fri. March 13 Sections 3.6, 8.1-8.4)
L16: Least mean squares (LMS) estimation
L17: Linear least mean squares (LLMS) estimation
Problem Set 7b due on Tue. April 7

Exam 2 (Timed): Covers material from L8 to L17 (released Thur. April 2; due Tue. April 14)

Unit 8: Limit theorems and classical statistics (released April 8; Sections 5.1-5.4, pp. 466-475)
L18: Inequalities, convergence, and the Weak Law of Large Numbers
L19: The Central Limit Theorem (CLT)

L20: An introduction to classical statistics
Problem Set 8 due on Tue. April 23

Unit 9: Bernoulli and Poisson processes (released Wed. April 15; Sections 6.1-6-2)
L21: The Bernoulli process
L22: The Poisson process
L23: More on the Poisson process
Problem Set 9 due on Tue. May 5

(Optional) Unit 10: Markov chains (released Fri. April 24; Sections 7.1-7-4)
L24: Finite-state Markov chains
L25: Steady-state behavior of Markov chains
L26: Absorption probabilities and expected time to absorption
(Optional) Problem Set 10 due on May 21

Final Exam (Timed) (released Thur. April. 30; due on Tue. May 12)

***Note: Problem set and exam due dates are at the end of the specified date, at 23:59 UTC.**