MATH 130A – Suggested Syllabus
Textbook: *A First Course in Probability*, by S. Ross

Week	Chapter	Topics
1	1	INTRODUCTION: Motivating examples, some history of probability. Counting, permutations, combinations, binomial and multinomial coefficients, applications.
2	2	FOUNDATIONS: Sample spaces, events, axioms of probability, the *inclusion-exclusion principle*. Applications: matching problem, gambling probabilities.
3	3	CONDITIONAL PROBABILTIES, BAYES THEOREM, INDEPENDENT EVENTS: Two events, N events, Bayes Theorem. Examples: probabilities of disease given the results of a test, updating probabilities with new information—posterior probabilities.
4	3 (cont.)	INDEPENDENT EVENTS (cont.): Examples: parallel systems, runs, "Problem of the points", the Gamblers Ruin problem. MATLAB simulations in class. Review. MIDTERM 1
5	3-4	RANDOM VARIABLES: Definitions of a general random variable, cumulative distribution function, examples. Discrete random variables, probability mass function, expected values and variance of discrete random variables and functions of random variables. Centered and uncentered n^{th} moments.
6	4 (cont.)	DISCRETE RANDOM VARIABLES (cont.): Bernoulli and binomial random variables. Examples: genetics, utility, elections. Poisson Random variables. Applications of Poisson Random variables: approximations to Bernoulli random variables, modeling physical phenomena. Matlab Simulation in class.
7	4 (cont.)	DISCRETE RANDOM VARIABLES (cont.): Geometric, negative Bernoulli, Hypergeometric random variables with examples. Expected values of sums of random variables. Properties of CDFs. Review. MIDTERM 2
8	4 (cont.)	CONTINUOUS RANDOM VARIABLES: Probability density functions, the relationship between pdfs and cdfs. Expectation and variance of continuous random variables and functions thereof, change of variables. Uniform distributions.
9	4 (cont.)	CONTINUOUS RANDOM VARIABLES (cont.): Normal and standard normal random variables, scaling and translation. Normal approximations to binomial distributions. Examples.
10	4 (cont.)	CONTINUOUS RANDOM VARIABLES (cont.): Exponential random variables, waiting times, applications, hazard rate functions. Gamma distributions, other continuous distributions. Examples. Review.