WEEK 11 (NOV 28-DEC 4)

Below is a screenshot of the calendar from the syllabus. It has been modified to take care of the fact that we have fallen behind just a bit. Note that the schedule is tentative.

Calendar

This is a tentative schedule for the term (modified on October 23).

Week	Textbook Section	Evaluation	Note
Sep 12–Sep 18	2		
Sep 19–Sep 25	2		
Sep 26–Oct 2	3	PS 1 due on Oct 2	
Oct 3–Oct 9	4.1, 5		
Oct 10–Oct 16	5	PS 2 due on Oct 16	No lecture on Oct 10
Oct 17–Oct 23	5		
Oct 24–Oct 30	5, 7	Midterm project due on Oct 24	
Oct 31–Nov 6	7, 8	PS 3 due on Nov 6	
Nov 7–Nov 13			Reading week
Nov 14–Nov 20	9	PS 4 due on Nov 20	
Nov 21–Nov 27	9		
Nov 28–Dec 4	10	PS 5 due on Dec 4	
Dec 5–Dec 9	10		Make up class on Thursday

Week 11. We will start on the last topic for this course, namely **Probability Theory**. This is Chapter 10 of the textbook. We will only loosely follow the text. The broad topics we will cover are:

1. The definitions of
   - a probability space;
   - an event;
   - an outcome.

2. Conditional probability.
3. Independent events.
4. Discrete Random variables. The expectation of a random variable. The variance of a random variable.

Tasks. To make the week easier on yourself, do the following:

- Read the definition of a **probability space**, of a **probability measure**, and of **outcomes** from § 10.1
- Read the definitions of **conditional probablitity** and **independent events** from § 10.2.

Problems worth thinking about. Here are some problems that you may wish to work on.

1. Give a combinatorial proof of the following equality

$$7^n - 5^n = 2\sum_{i=1}^{n} 5^{i-1}7^{n-i}.$$

2. Pick a map $f\colon [10] \to [7]$. What is the probability that $[4] \subset f([10])$? Assume that all possible maps from [10] to [7] have an equal probability of being chosen. **Note:** The symbol $\subset$ denotes inclusion. For strict inclusion we use the symbol $\subsetneq$.

3. Do problem 2 if we are restricting ourselves to maps such that 3 and 6 are in the image of f.

4. B is a box with 30 balls labelled $1.2, 3, \ldots, 30$. Find the probability that the balls labelled 1, 7, 12, and 22 are drawn from B if

(a) the ball selected is not returned to B before the next ball is selected;

(b) the ball is returned to B before the next ball is selected.

We are assuming that in each drawing, the probability of selecting a ball is the same for all balls currently in B.