

6.00.2x Syllabus

Welcome to 6.00.2x! In this course you'll be learning the basics of computer programming in Python and the fundamentals of computation, as well as getting the opportunity to implement your own Python functions.

This course is offered online and we understand that there are many opportunities available to cheat. We caution you to not do so. You will learn less and only harm yourself by cheating. We ask that you review our collaboration and forum guidelines, available on the course handouts page, to understand how we expect our students to conduct themselves in this course. Additionally all students are expected to follow the edX Honor Code, available at <https://www.edx.org/honor>

Grading Policy

In this course there will be many types of assignments. Your final grade will be a weighted average of the following:

- Finger exercises (available within each lecture video sequence) – 10%
- Problem sets – 40%
- Quiz – 25%
- Final exam – 25%

In order to earn a certificate for 6.00.2x, students must pass the course with a grade of C or better. The following grading breakdown will apply:

- $\geq 80\%$: A
- $\geq 65\%$: B
- $\geq 55\%$: C

Exercises and Exams

All course material will be released at 15:00 UTC. Finger exercises have no due date, but we encourage students to complete them as they view the lectures. See the Calendar tab for Problem Set due dates. **Regrettably, extensions are unavailable for any assignment.**

All problem sets will be due at **23:30** or **11:30 pm UTC**. This is the Coordinated Universal Time, also known as the Greenwich Mean Time. Convert to your local time zone using an online converter such as this one:

<http://www.timeanddate.com/worldclock/converter.html>

Exams are scheduled in advance. The **Quiz** will take place from April 3 (14:00 UTC) – April 6 (23:30 UTC). The **Final Exam** will take place from May 1 (14:00 UTC) – May 5 (23:30 UTC). The exams will take place online, on the course website.

During the exam period, the forums will be shut down. You will still be able to read posts but you will not be able to post any questions. The honor code prohibits students from communicating with one another during the exam period in any way whatsoever – so please don't discuss the exam on any other forum, website or in person with anyone else.

List of Lecture Topics

Lecture 1 – **Plotting:**

- Plotting using PyLab
- Plotting Mortgages

Lecture 2 – **Simulations and Random Walks:**

- Random Walks
- Drunken Walks
- Drunken Tests
- Drunken Simulations

Lecture 3 – **Probability:**

- Rolling a Die
- Hashing
- Using hashing to look up Information

Lecture 4 – **Stochastic Programming and Hashing:**

- Law of Large Numbers
- Standard Deviations
- Histograms

Lecture 5 – **Monte Carlo Simulations:**

Lecture 6 – **Using Randomness to Solve Non-Random Problems:**

- Distributions
- Find the value of Pi

Lecture 7 – **Curve Fitting:**

- Understanding Experimental Data
- Errors in Experimental Observations
- Curve Fitting
- Goodness of Fit
- Using a Model for Predictions

Lecture 8 – **Knapsack Problem**

- 0/1 Knapsack Problem
- Greedy Algorithm
- Finding the Optimal Solution
- Expected Run Times

Lecture 9 – **Graphs and Graph Optimization:**

- Depth-first Search
- Breadth-first Search
- Weighted Graphs
- Implicit Graph Search
- Maximal Cliques

Lecture 10 – **Machine Learning:**

- Feature Vectors
- Distance Metrics
- Clustering

Lecture 11 – **Statistical Fallacies**

- Misusing Statistics
- Garbage In Garbage Out
- Data Enhancement

Lecture 12 – **Research videos**