# 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:

- >= 90%: A
- >= 75%: B
- >= 65%: C

## Exercises and Exams

This course is self-paced. All course materials are available right away.

The exams will take place online, on the course website, and will be timed.

- 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. **You are not allowed to post anything regarding exams. Any such posts will be removed.**
- Before each exam, you will sign an honor pledge.
- After you sign the pledge, you will have **8 hours to take the exam**. There will be no re-takes.

# List of Lecture Topics

Lecture 1 – **Optimization and Knapsack Problem**:

- Computational models
- Intro to optimization
- 0/1 Knapsack Problem
- Greedy solutions

Lecture 2 – **Decision Trees and Dynamic Programming**:

- Decision tree solution to knapsack
- Dynamic programming and knapsack
- Divide and conquer

Lecture 3 – **Graphs**:

- Graph problems
- Shortest path
- Depth first search
- Breadth first search

Lecture 4 – **Plotting**:

- Visualizing Results
- Overlapping Displays
- Adding More Documentation
- Changing Data Display
- An Example

Lecture 5 – **Stochastic Thinking**:

- Rolling  a Die
- Random walks

Lecture 6 – **Random Walks**:

- Drunk walk
- Biased random walks
- Treacherous fields

Lecture 7 – **Inferential Statistics**:

- Probabilities
- Confidence intervals

Lecture 8 – **Monte Carlo Simulations**:

Lecture 9 – **Monte Carlo Simulations**:

- Sampling
- Standard error

Lecture 10 – **Experimental Data**:

- Errors in Experimental Observations
- Curve Fitting

Lecture 11 – **Experimental Data**:

- Goodness of Fit
- Using a Model for Predictions

Lecture 12 – M**achine Learning**:

- Feature Vectors
- Distance Metrics
- Clustering

Lecture 13 – **Statistical Fallacies**

- Misusing Statistics
- Garbage In Garbage Out
- Data Enhancement