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

If you have a disability-related request regarding accessing an assignment or the final exam, please contact mitx-accessibility@mit.edu as early in the course as possible or at least 2 weeks prior to exam start date to allow time to respond in advance of course deadlines. Requests are reviewed via an interactive process to meet accessibility requirements for learners with disabilities and uphold the academic integrity for MITx.

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:

- >= 80%: A
- >= 65%: B
- >= 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 **Midterm** will take place from Friday Nov 24 (14:00 UTC) – Tuesday Nov 28 (23:30 UTC). The **Final Exam** will take place from Friday Dec 15 (14:00 UTC) – Tuesday Dec 19 (23:30 UTC). The exams will take place online, on the course website. **Exams are timed** – once you begin during the exam period, you will have 8 hours to complete it.

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.

If you have a disability-related request regarding accessing this course or the exams, please contact edX Accessibility http://www.edx.org/accessibility as early in the course as possible to allow time to respond in advance of course deadlines.

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