Programming Foundations in Python

Upward Bound

Introduce Yourself

Name

What would you like to study in College? Okay if you have not made up your mind

What this course is about

This course is an introduction to an essential aspect of computer science: Problem solving and Computer programming.

We're going to come up with algorithmic solutions to problems?
- What is an algorithm?

We will communicate our algorithms to computers using the Python programming language.

Programming techniques covered by this course include modularity, abstraction, top-down design, code re-use and code readability.

The core material for this course includes control structures, functions, lists, strings, file I/O, and recursion.

Course Objectives:

By the end of the class, the students should be able to:

- Use an algorithmic approach to solve computational problems
- Break down complex problems into simpler ones.
- Write and debug programs in the Python programming language

Time and Sequence:

55 minutes for class lectures and live coding examples.

Why learn to Program?

Programming skills are useful across a wide range of fields and applications:

- Many scientific professions utilize programming.
- Programming skills allow you to understand and exploit "data"
- Logical thinking learned from programming transfers to many other domains.

Submission and Late Policy

It is not recommended that you submit close to the deadline
- Developing programs can be tricky and unpredictable

Start early and submit early (and often!)

Assessment

For the first week:
  Home-work exercises will be given daily.
For the second week and beyond:
  Home-work exercises will be given every 2 days and are due by the end of the second day.

Mini-projects will be given at the end of each week (every Friday) to assess knowledge so far.
  You will have till Tuesday morning to finish mini-project.

Final week will be used for general review and a major programming project will be released to evaluate all you have learned.

Grading Criteria

Type	Quantity	Percentage
Homework	12	24%
Mini-Project	4	36%
Major Project	1	20%
Quizzes & Class Participation	5	20%

90 % & above: A

80 - 89% : B

70 - 79% : C

60 - 69: D

59 & below: F

Academic Integrity

All examinations and labs must be done individually unless specified otherwise.

Cheating or plagiarizing will result in a zero.

You are encouraged to work together on homework assignments, but discuss problems in a general manner to understand concepts and ideas.

Do not copy or allow others to copy your work.

We will start today's lecture with a few questions

What do you think Computer Science is?

Computer Science is the study of computers.

True or False?

Raise your hand if you agree.

What do you think Computer Science is?

Computer Science is the study of software.

      True or False?

      Raise your hand if you agree.

What do you think Computer Science is?

Computer Science is the study of how to write computer software

True or False?

Raise your hand if you agree.

What do you think Computer Science is?

Computer Science is the study of the uses and applications of computers and software for example, how to use Facebook or Twitter or Microsoft Word or Photoshop

True or False?

Raise your hand if you agree.

Computer Science is NOT

Computer science is NOT the study of computers

Computer science is NOT the study of software.

Computer science is NOT the study of how to write computer programs.

Computer science is NOT the study of the uses and applications of computers and software such as Photoshop or Twitter.

Computer Science is

In simple terms, Computer science is the study of algorithms

So what is an algorithm?

A **well-ordered** collection of **simple** and **computable** operations that when executed **produces a result** and **halts in a finite amount of time**.

An example of an algorithm

Shampoo Instructions:

1. Wet your hair.
2. Apply shampoo to hands
3. Lather your hair.
4. Rinse your hair.
5. Stop.

Observe:

Operations need not be executed by a computer only by an entity capable of carrying out the operations listed.
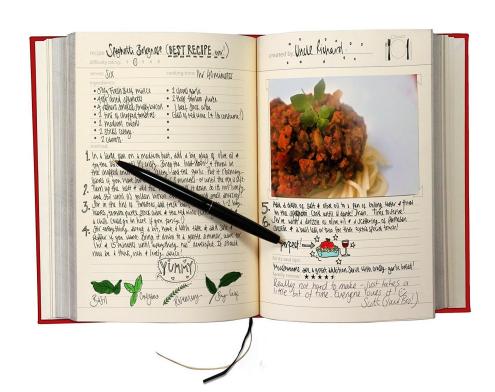
We assume that:
The algorithm begins executing at the top of the list of operations.
The "Stop" can be omitted if we assume that the last line is an implied "Stop" operation.

Another good example of an algorithm

A Recipe!

Recipe: How to boil rice!

Directions

1. In a saucepan with a good fitting lid, bring water, salt and optional ingredients if desired to a **boil**.
2. Add **rice** and stir.
3. Cover and reduce heat to medium low. ...
4. **Cook** for 20 minutes.
5. Remove from heat and fluff with fork.
6. END!

   Extra Information:

1. DO NOT LIFT LID!
2. The **steam** that is trapped inside the pan is what allows the **rice** to **cook** properly.

INGREDIENTS

- 1 cup long grain rice
- 2 cups water
- 1 teaspoon salt
- 1 teaspoon butter(optional)
- 0.5 teaspoon white vinegar (optional)

A simple demo of why algorithms are important

Applications

What are some applications of computers in current use:
- Modeling and Simulation
- Information Retrieval
- Numerical Problem Solving
- Telecommunications
- Artificial Intelligence
- Networking
- Graphics

Homework #01

Watch this video:

https://www.youtube.com/watch?v=SzJ46YA_RaA

Choose a field of computer science mentioned in the video and write a short paragraph explanation of what that field does.

By short paragraph, I mean in 5 sentences or less.

Work together as a group and each person choose a unique field and write about it independently.

Why Study Computer Science?

Great Job Prospects

What field has…
- …the best-rated job, and 5 of the top 10 highest paid, highest growth jobs?
- …shown strong job growth in the face of outsourcing?
- …a looming severe shortage in college graduates?

Computer Science!

Great Job Prospects

5 computing jobs are in the top 10 salary jobs from the Bureau of Labor Statistics' list of the 30 fastest growing jobs through 2014. (Morsch, Laura. CareerBuilders.com, Jan. 27, 2006.)

1. Computer systems software engineer: $81,140
2. Computer applications software engineer: $76,310
6. Computer systems analyst: $67,520
7. Database administrator: $61,950
9. Network systems and data communication analyst: $61,250

Salaries are given as mean annual salaries over all regions.

Summary

Course Overview

Definitions of Computer Science and Algorithms

Why Algorithms are important

Fields of Computer Science

Great Job Prospects