CAAP Computer Science Curriculum
June 28 - August 9
Lectures: Tuesday and Thursday 9am-10:30am
Lab: Wed 1:30-5:00
August 9 - Final Exam

High Programming Language will be used: Python and C
Textbook: John Zelle, Python Programming: An Introduction to Computer Science

Course Goals:

1. Develop an algorithm from a word problem, using pseudocode
2. Identify the language elements of a programming language
3. Perform arithmetic and other fundamental mathematical operations with variables, operators, functions, and values
4. Write programs that use control structures (selection and repetition statements) to solve problems
5. Modularize programs with functions to remove redundancy
6. Use built in functions and python libraries
7. Test and debug code
8. Know how to maintain good style and appropriately document code
9. Code development and sharing through GitHub
10. Focus is on programming and development of algorithms - not python

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Week 0 (June 28)

Thursday - Intro to the program - discussing syllabus and what we will learn, intro to computer science, examples of what its used for, why it's useful, development through the years, introduce projects
Suggested Reading: How to think like a Computer Scientist

Week 1 (July 3 - 5)

Suggested Reading: Variables, expressions and statements
Tuesday, July 3 - Program design and algorithms

No Lab - July 4

Thursday, July 5 - Variables declarations, assignments, primitive data types, operations, conditionals/selection statement

Week 2 (July 10 - 12)

Suggested Reading: Variables and strings, Other languages have "variables"
Tuesday, July 10 - Conditionals, I/O
Lab 1

Thursday, July 11 - For loops, nested loops

Week 3 (July 17 - 19)

Suggested Reading: Loops, Boolean values and expressions
Tuesday, July 17 - Booleans and conditionals
Lab 2
Thursday, July 19 - Quiz 1, Vectors

Week 4 (July 24 - 26)

Suggested Reading: Why are matrices useful?
Tuesday, July 24 - Matrices
Lab 3
Thursday, July 26 - Functional decomposition

Week 5 (July 31 - Aug 2)

Suggested Reading: Functions
Tuesday, July 31 - Functions
Lab 4
Thursday, August 2 - Recursion

Week 6 (Aug 7 - Aug 9)

Suggested Reading: 6 Surprising Ways Computer Science Benefits Society
Tuesday, August 7 - Final Review
Lab 5
Tuesday, August 9 - Final

LABS - Goals for each lab (First half written in python, second half written in C)
All labs will be placed in individual Git repo, with proper comments and README file

1. Familiarizing with the terminal and setting up GitHub repo. Projects: (1) Entering and printing your name, (2) computing prime numbers and product of primes
2. Exercises with loops: (1) Read in a sequence of positive integers, non-positive terminates the sequence, (2) Print the number of multiples of 5 found in the sequence
3. Exercises with vectors and matrices: (1) Sum of values in vectors, (2) sum up values of matrix, (3) max, mins
4. Exercises with functions: (1) Remove redundancy in code
5. Exercises with recursion: (1) Sum of values in vectors, (2) Factorial

Potential Lab/Class Projects:

1. Using Project Gutenberg, how many words are there in a specific chapter of a book?
2. Creating personal homepage using html and css
3. Probability of failure - medical devices, machinery, etc
4. Building a classifier that guesses whether a song is hip-hop or country
5. Team chooser - splits players at random into teams
6. Secrete Messages - encryption program to send and receive secrete messages

Potential Challenge Problems/Projects:

1. Messaging app between phone and laptop
2. Weather forecast with temperature corresponding to appropriate picture
3. Statistics Problems - linear regression, trees, standard deviations, etc
4. Analysis of Chicago 311 calls corresponding to data - using json files