Introduction to Programing 2016

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Required Reading and Course Materials:
A computer with access to the internet is required for this course . If you need help getting a computer let me know I will try to help you. All lecture notes, code samples and assignments will be posted on GitHub you will receive information on how to access my GitHub account and teaching blog during the first week of school. Your work will be stored on your own virtual server. This will also be your workstation. During the first week of school I will help you set up your virtual machine on cloud9.

Attendence Policy:

Be on-time and prepared for class.

Course Description:
This course provides an introduction to programing using python. This course not only focuses on the primary features of python but also issues of programing design and development. Some python specific topics include: control structures, primitive types, containers, functions, classes and some of python's more advanced features such as list comprehension and decorators. Students will build and maintain their own cloud servers, using them as their primary development workstation. In doing so students not only learn to write code but also gain an understanding of unix/linux operating systems. Some projects include building a web server, creating video games and exploring the world of computer vision through image recognition.

Grades:
The final grade of this course will based upon the following

Projects	50%
Homework	25%
Collaboration	25%

Course Outline(This is a tentative outline and subject to change):

Project 1: Getting started

Topics:

- Getting started
- Open source culture
- Basic Unix/Linux
- MIT license, Creative Commons license, Open BSD

Assignments:

- Build cloud server
- Set up GitHub account
- Customize cloud based work station

Project 2: Cryptography,cyphers

Topics:

- Variables
- Arithmetic
- Control statements
- Boolean logic

Assignments:

- Create a reverse cipher
- Create a caesar cipher
- Transposition cipher

Project 3: Text based adventure game

Topics:

- Strings
- Lists
- Tuples
- Dictionaries
- Sets

Assignments:

- Research examples of text base games. Oregon trails, command line games (MUD's), D and D.
- Create a text based adventure game
- Publish your code

Project 4: Twitter bot

Topics:

- Defining functions
- Default arguments
- Keyword arguments
- API's

Assignments:

- Create a twitter bot
- Publish your code

Project 5: Mad lib generator

Topics:

- Data mining
- Input/Output
- Reading from files

- Writing to files
- Form building

Assignments:

- Create mad lib generator
- Publish your code

Project 6: Computer generated poetry

Topics:

- Markov chain
- Graph theory
- Artificial intelligence
- Post modernism
- Who is Euler?

Assignment:

- Write algorithms that can create poetry using python data structures such as list and dictionaries.
- Enhance algorithms by implementing Markov chains, De Bruin graphs.
- Submit work to literary journal.

Project 7: Project Euler

Topics:

- Recursion
- Fibonacci numbers
- Largest prime factors
- Highly divisible triangular numbers
- Quadratic primes

Assignments:

- Work in teams to solve the first ten problems on project Euler
- Prizes for the best timezes.

Project 8: Rock, Paper, Scissors

Topics:

- Introduction to python classes
- Attributes
- Methods

Assignments:

- Create a rock, paper, scissors game
- Publish your code

Project 9: Classes

Topics:

- Object oriented programing
- Polymorphism
- Inheritance
- Game logic
- Expected Value

Assignments:

- Create a basic blackjack game
- Implementation for split, double down
- Publish your code

Project 10: Hello…..is there anybody out there?

Topics:

- HTML,Javascript,Flask
- Creating online forms
- AJAX
- Graphical user interfaces
- Event driven programing.
- Introduction to SQL and building databases
- Data mining and web scraping

Assignment:

- Use pythons library Flask to build a data driven web app.
- Go live with your app on your server.

Project 11: Map based video game (part.1)

Topics:

- Setting up a development environment on your own box
- Remotely connecting to your server via SSH
- Working locally storing globally
- Collision detection
- Game loop
- Finite State Machine

Assignments:

- Build local development environment on your box
- SSH into your server with SSH keys
- Create collision detection sketches using pygame :

    - point to point
    - pixel color
    - circle
    - rectangle to rectangle

Project 12: Map based video game (part. 2)

Topics:

- Creating graphics with open source free software
- Sprite sheets
- User input

Assignments:

- Create a basic level for a map based game
- Create a hero sprite sheet
- Implement user input to move character around in game

Project 13: Map based video game (part. 3)

Topics:

- Enemy sprite sheet
- Creating challenges
- Seeking algorithms
- Building a HUD

Assignments:

- Create at least three different enemies for your level
- Implement at least one shooter and one seeking algorithm
- Assign one of three states to your villains
    - seeking
    - attack
    - rest
- Design a HUD

Project 14: Map based video game (part. 4)

Topics:

- Product testing
- Debugging/troubleshooting

Assignments:

- Put it all together
- Debug troubleshoot
- Product test your game with real users

Project 15: Machine learning/Computer vision

Topics:

- Open CV
- Matrices
- Vectors
- Image based searches
- Facial recognition

Assignment:

- Design and build a facial recognition lock for your dorm room.

Project 16: Build a software solution that solves a South Kent School problem

Topics:

- Searching for potential problems to solve
- Team building
- How to pitch and idea to a group
- Building software as a group

Assignment:

- Go out into the SKS community and find problems that can be solved by creating software
- Work as a team to create a presentation of those problems and potential solutions
- Submit a first pass idea for how the problem could be solved.
- The winning idea will become the topic for a Center For Innovation class. We will work as group building your concept.

Cell Phones:

All phones must be silent and put away during class.