

# Solving Engineering Problems with Code

## ISE 499 (3 Units)

---



Spring 2017

### Description

While teaching critical thinking skills, this class will use engineering examples as a platform to introduce a programming approach to problem solving.

### Objective

This course is an introduction to the Python programming language from an engineer's perspective. By the conclusion of this course, students will have an understanding of:

1. Core Python functional programming
2. Core Python object oriented programming
3. Numerical analysis functionality available in Python
4. Data analysis tools built into Python

### Concepts

Programming fundamentals in Python, problem solving, numerical analysis, data analysis, data visualization

### Prerequisites

None.

### Instructor

Nathan Greenfield (ngreenfi@usc.edu)

### Office Hours

Wednesday 1pm to 3pm in OHE530F  
Friday 1pm to 5pm in KAP160

### Lab Assistants

Listed on Blackboard under Contacts

### Lecture

See online schedule of classes

### Textbook

*Head First Python, 2<sup>nd</sup> Edition*. Paul Barry. O'Reilly Media Inc. ISBN: 9781491919538.

*Python Data Science Handbook*. Jake VanderPlas. O'Reilly Media Inc. ISBN: 9781491912058

## Course website

All course material will be on Blackboard (<http://blackboard.usc.edu>).

We will use Piazza (<http://piazza.com/>) as an online question and discussion forum.

## Course Structure

Topics covered during lecture will be applied to 12 programming assignments spread throughout the semester. All programming assignments must be completed *individually* and outside of regularly scheduled class meetings

Regular class meetings will feature a 45-minute lecture followed by an in-class lab assignment due at the end of the class period. These “labs” will immediately apply material from lecture and serve as an introduction to the other programming assignments.

There is a midterm and cumulative final exam in this course

## Grading

The following percentage breakdown will be used in determining the grade for the course.

In-class lab assignments	10%
Take-home assignments	50%
Midterm exam	20%
Final exam	20%
<b>Total</b>	<b>100%</b>

## Grading Scale

The following shows the grading scale to be used to determine the letter grade.

93% and above	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-
67% - 69%	D+
64% - 66%	D
63% and below	F

## **Policies**

### **Labs**

There will be labs after most lectures. These labs will be immediate application of the material presented in lecture. These labs will be graded as pass/fail. For credit on each lab you must complete the lab before class time has ended. Each lab will contribute to your overall grade. There is no way to make up a missed lab, however a lab grade can be dropped provided either prior instructor approval or a documented emergency.

## **Policies (continued)**

### **Assignments**

Each assignment must be completely *individually*. There are no group projects in this class. The assignments will be posted on Blackboard in the "Assignments" section. Each assignment will include instructions, a due date, and a link for electronic submission. Assignments must be submitted using this link.

It is your responsibility to submit your assignments on or before the due date. Assignments turned in one day late will have 20% of the total points deducted from the graded score. Assignments turned in two days late will have 50% of the total points deducted from the graded score. After two days, submissions will not be accepted and you will receive a 0. All assignments must be digitally submitted through Blackboard except when otherwise specified by the course staff. Do not email assignments to the instructor or lab assistant. Assignment questions should be posted to the online question forum. Class time is for lecture and labs only. Do not send any email to the instructor regarding assignments or ask specific assignment questions during the lecture sessions. You are encouraged to attend the instructor's office hours for assignment related questions.

### **Exams**

Make-ups are only allowed under extraordinary circumstances. Students must provide a satisfactory reason (as determined by the instructor) along with proper documentation. There are two exams: a midterm and a final. These exams are comprehensive of all topics covered.

### **Lab facilities**

You are encouraged to save your work using a USB flash drive or a website such as [Dropbox](#). You must keep a copy of all coursework. You will not be able to save your work on the classroom computers. Any work saved to the computer will be erased after restarting the computer.

Course staff is not responsible for any work lost.

There will open lab hours starting the third week of the semester. The open labs may have course staff there. These lab times are there in case you need extra time to complete your work.

## Incomplete and Missing Grades

Excerpts for this section have been taken from the University Grading Handbook, located at <http://www.usc.edu/dept/ARR/grades/gradinghandbook/index.html>. Please see the link for more details on this and any other grading concerns.

A grade of Missing Grade (MG) “should only be assigned in unique or unusual situations... for those cases in which a student does not complete work for the course before the semester ends. All missing grades must be resolved by the instructor through the Correction of Grade Process. One calendar year is allowed to resolve a MG. If an MG is not resolved [within] one year, the grade is changed to [Unofficial Withdrawal] UW and will be calculated into the grade point average a zero grade points.”

A grade of Incomplete (IN) “is assigned when work is no completed because of documented illness or other ‘emergency’ **occurring after the twelfth week** of the semester (or 12<sup>th</sup> week equivalency for any course scheduled for less than 15 weeks).”

## Academic Conduct and Academic Support Systems

### Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity

<http://equity.usc.edu/> or to the Department of Public Safety

<http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>.

This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage [sarc@usc.edu](mailto:sarc@usc.edu) describes reporting options and other resources.

## **Academic Conduct and Academic Support Systems (continued)**

### **Support Systems**

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs [http://sait.usc.edu/academicssupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicssupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

### **A Further Note on Plagiarism**

In this class, all homework submissions will be compared with current, previous, and future students' submissions using MOSS, which is a code plagiarism identification program. If your code significantly matches another student's submission, you will be reported to SJACS with the recommended penalty of an F in the course.

It is okay to discuss solutions to specific problems with other students, but it is not okay to look through another student's code. It does not matter if this code is online or from a student you know, it is cheating. Do not share your code with anyone else in this or a future section of the course, as allowing someone else to copy your code carries the same penalty as you copying the code yourself.

# Solving Engineering Problems with Code

ITP 499 (3 Units)

## Course Outline

Note: Schedule subject to change

W	Topic(s)	Lab	Homework
1	Intro	None	Homework 1
	Running python	LP1	Due in week 2
2	Booleans & Conditionals	LP2	Homework 2
	More conditions	LP3	Due in week 3
3	Loops	LP4	Homework 3
	Strings	LP5	Due in week 4
4	Functions & modules	LP6	Homework 4
	Functions (cont'd)	LP7	Due in week 5
5	Lists	LP8	Homework 5
	Lists (cont'd), Tuples, Python objects	LP9	Due in week 6
6	Dictionaries	LP10	
	Dictionaries (cont'd), Sets	LP11	
7	<b>Midterm</b>		Homework 6
	Errors / Exceptions	LP12	Due in week 8
8	File I/O	LP13	Homework 7
	Parsing data	LP14	Due in week 9
9	Defining modules	LP15	Homework 8
	Classes	LP16	Due in week 10
SB	Spring Break		
10	Classes (cont'd)	LP17	Homework 9
	Object oriented programming	LP18	Due in week 11
11	NumPy	LP19	Homework 10
	NumPy (cont'd)	LP20	Due in week 12
12	NumPy (cont'd)	LP21	Homework 11
	Pandas	LP22	Due in week 13
13	Pandas (cont'd)	LP23	Homework 12
	Pandas (cont'd)	LP24	Due in week 14

<b>W</b>	<b>Topic(s)</b>	<b>Lab</b>	<b>Homework</b>
14	Visualization	LP25	Homework 13 Due in week 15
	Visualization: 2D	LP26	
15	Visualization: 3D, Geospacial	LP27	
	Where to go from here	LP28	
<b><u>FINAL EXAM – as according to the final exam schedule</u></b>			