Course Syllabus

> ✎ **Edit**

INST326: Object-Oriented Programming
Fall 2018, Section 101 • TuTh 12:30-1:45 pm • PHY 4221

Instructor

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Office hours (tentative):

> Hornbake Building, room 4117M
> Tu: 4:15-5:15
> Th: 2:00-3:00
> or by appointment

Catalog Description

This course is an introduction to programming, emphasizing understanding and implementation of applications using object-oriented techniques. Topics to be covered include program design and testing as well as implementation of programs. *Prerequisite: (must have completed or be concurrently enrolled in INST201; or INST301); and (INST126; or CMSC106; or CMSC122). Or permission of instructor. Credit only granted for: INST326 or CMSC131.*

Extended Course Description

This course introduces object-oriented design and programming concepts and methods using the Python programming language. Object-oriented programs are built as collections of "objects", which are software representations of real-world entities and concepts. Objects combine data (attributes) with functionality (methods), and work through communicating with each other as the code is executed. By encapsulating code complexity within objects, OOP allows use and reuse of existing code in a relatively simple and easy manner. Advanced OOP concepts such as inheritance facilitate development of complex code without sacrificing robustness and possibility of code reuse. We apply computational thinking approaches such as abstraction, decomposition, algorithmic design, generalization, evaluation, and debugging.

This course also provides opportunities to develop an understanding of how programming is situated in and reflects broader social structures, constructs and issues, e.g. race, class or gender. Programming is often viewed as a value-neutral technical skill. However, the social and cultural impacts of information and technology are central concepts in our field, and the growing awareness of issues like algorithmic bias, ethical/unethical uses of algorithms and disparities in opportunties in tech jobs require that any informed professional needs to understand the larger context of programming. This is important to be ethical professionals and to be successful in the workplace. Through readings, discussion and writing, we will critically examine issues of racism, sexism and other forms of power and oppression that are pervasive in programming and related technical activities, and discuss what companies and individuals are doing to improve programming practices and professional work environments.

Student Learning Outcomes

After finishing this course, students will be able to:

1. Explain OOP concepts, principles, design patterns and methods;
2. Design, program, and debug Python applications to solve non-trivial problems;
3. Test and assess the quality of object-oriented code;
4. Write clear and effective documentation;
5. Explain how programming is situated in and reflects social issues (e.g., racism, classism, or sexism) and describe actions that individuals or organizations are taking to counteract disparities or inequities.

Teaching Notes

This course builds on a basic understanding of procedural programming, so you have to understand data types, variables, loops, conditionals, etc. and how to use them to write and debug a program. If you are fluent in a language such as JavaScript, Java, C#, Visual Basic, etc. you can readily apply your knowledge to learn Python. If you know a bit of Python already, you might find the first part of the course a bit of review. If you are interested in being challenged, I invite you to talk to me about leading a session (it's really true that you learn more by teaching), identifying more challenging exercises, or developing a more ambitious project. I want you to learn as much as you can from this course.

Each week will typically follow this pattern, with some exceptions:

Before class (preparation):

- Do assigned readings; watch assigned videos; complete any exercises, homework assignments or quizzes which are due.

In class:

- We will use a mix of lecture, discussion, and lots of hands-on activities to help you apply the materials;
- We will make extensive use of paired and group work in class.

After class (homework):

- There will be weekly assignments to help you practice, reflect, and extend your understanding. All homework assignments are to be completed on your own unless otherwise stated on the assignment handout.

Over the course of the semester, we will also examine selected broader issues of programming and coding – the social and organizational context, issues related to gender, race, disability, etc. This will help you prepare for situations that you are likely to encounter in your professional work. These are noted in the schedule as "Critical perspectives."

Our time together in class is precious. To use it effectively, you must come to class on time and prepared. Being prepared for class means that you have:

1. Completed all the readings/videos;
2. Either successfully completed the exercises/worksheets or submitted your questions the night before class, so I have time to prepare and answer them in class.
3. Arrived 5 minutes before class starts and followed any instructions posted in the classroom. You are ready to take notes and/or participate in a class activity, as instructed.

Here is my suggested general strategy for working on assignments:

1. Start early–don't wait. That will give you time to work through the problems and get help as needed.
2. When you run into a problem, spend 5-10 minutes trying to solve it on your own. Sometimes it's helpful to ask yourself how you would solve the problem on paper or using real-world objects.
3. Then take a break. Sometimes this will allow you to come back and see something you missed. Letting your subconscious work on it for a while (unsupervised, so to speak) will often lead to useful ideas.
4. If you've spent 20-30 minutes and are still stuck, post your question on ELMS. We are here to help each other, so don't beat your head against a brick wall–ask for help! When you post, provide as much information as you can. When helping your fellow students, please do not do their work for them. Help them understand underlying principles and programming techniques and let them arrive at solutions to homework problems on their own.
5. I will be monitoring and will respond as soon as I am able, usually within a day (longer during weekends, travel, etc.).
6. If you see a question on the discussion board that you can answer, or if you have an idea, please respond. Don't wait for me. You will be helping your colleagues.

Textbooks and Readings

Our readings will come from a variety of free online sources; the main ones are:

- **Python for Everybody: Exploring Data Using Python 3**
  Charles R. Severance
  https://www.py4e.com/book (https://www.py4e.com/book)
  Download: **http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf (http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf)**
- **Object-Oriented Programming in Python**
  University of Cape Town
  http://python-textbok.readthedocs.io/en/1.0/ (http://python-textbok.readthedocs.io/en/1.0/)
  Download: **https://media.readthedocs.org/pdf/python-textbok/1.0/python-textbok.pdf (https://media.readthedocs.org/pdf/python-textbok/1.0/python-textbok.pdf)**
- **(http://python-textbok.readthedocs.io/en/1.0/) The Python Tutorial**
  Guido van Rossum and the Python Software Foundation
  https://docs.python.org/3/tutorial/ (https://docs.python.org/3/tutorial/)
  Download: **https://docs.python.org/3/download.html (https://docs.python.org/3/download.html)** (as part of the official Python documentation)

(https://docs.python.org/3/tutorial/) (https://docs.python.org/3/tutorial/) Note that all of these sources can be downloaded for offline access. Please take a moment and download copies now, so that you're prepared in the event of internet issues during the semester.

Required Technology

- Laptop - we will do live programming exercises during most classes, so bring your laptop and be prepared to write code. Any reasonably current operating system can be used. If you don't have access to a laptop, contact me before the first class.
- Python - Python programming language (3.4 or newer). Python is freely available from
  https://www.python.org/downloads/ (https://www.python.org/downloads/) .

- Editor - I assume most students will use PyCharm (**https://www.jetbrains.com/pycharm/ (https://www.jetbrains.com/pycharm/)**), but you may use any programmer's text editor or integrated development environment you choose.

Topics

Topics to be covered include:

- Computational thinking
- Programming patterns
- Variables, expressions, statements
- Conditionals
- Functions
- Iteration
- Strings
- Lists
- Dictionaries
- Tuples
- Classes, objects, methods
- Critical perspectives on programming, which may include:
  - Sociotechnical systems
  - Limitations of computational thinking
  - Coding and gender
  - Search engine bias, algorithmic bias

Grading

Every graded element of the course (e.g., assignments, tests, quizzes, etc.) is assigned to one of the following weighted categories:

Category	Weight
Homework (7)	20%
Midterms (2)	20%
Quizzes (5; one gets dropped)	16%
Final project	15%
Exercises	15%
Reflections (3)	9%
Participation	5%
Final exam (optional)	3% (extra credit)

Your grade will be calculated as follows:

- for each category, the sum of your scores is divided by the sum of possible points within the category; this is the proportion of points you have earned for that category
- the proportion of points in each category is multiplied by the category's weight; this is the weighted score for the category

- the sum of the weighted scores is your total score
- your total score is converted into a letter grade according to the table below:

A+: >= 97.00	A: 93.00-96.99	A-: 90.00-92.99
B+: 87.00-89.99	B: 83.00-86.99	B-: 80.00-82.99
C+: 77.00-79.99	C: 73.00-76.99	C-: 70.00-72.99
D+: 67.00-69.99	D: 63.00-66.99	D-: 60.00-62.99
F: 0.00-59.99		

Course Schedule (subject to change)

This course consists of three interconnected parts:

- Fundamentals of programming using Python (~Weeks 1-7)
- Data analysis using Python (~Weeks 8-10)
- Object-oriented programming using Python (~Weeks 10-15)

The table below shows the most current version of the planned course schedule. While this is our planned timeline, please note that this schedule is subject to change at any time. Any revisions to this timeline will be published to ELMS; appropriate announcements will be made in class and posted online accordingly.

The following abbreviations are used in the table:

- P4E: Python For Everybody
- Tut: Python Tutorial
- OOP: Object-Oriented Programming in Python

Note that all work (homework, reading, exercises, reflections, etc.) is due at 11:59 PM the day before the class period in which it appears below. (The final project is an exception; it is due at 11:59 PM on Monday, December 17.) See "Late Work and Resubmissions" below for more information.

Wk	Tuesday	Thursday
1	8/28 Introductions; course overview; best practices	8/30 Best practices; types, variables, operators, expressions **Reading: P4E 2; Style guide; Docstrings page**
2	9/4 Conditional execution; functions; modules **Practice quiz** (in class) **Reading: P4E 3, 4; Tut 4.7.1-4.7.2, 6-6.1.2** Due: **Homework 1**	9/6 Iteration Quiz 1 (in class) **Reading: P4E 5**

Wk	Tuesday	Thursday
3	9/11 Strings **Reading: P4E 6; string documentation**	9/13 Catch-up **Exercise: Run a script from the command line**
4	9/18 File I/O; command-line arguments Reading: P4E 7; Tut 7.2, 7.2.1 Due: **Homework 2: Tuition calculator**	9/20 Reflection 1 discussion; Quiz 2 Reading: (reflection 1 reading TBD)
5	9/25 Lists; tuples Reading: P4E 8, 10.1-10.3; Tut 5.3 Due: **Homework 3**	9/27 Lists; tuples Reading: Tut 4.7.5 Due: **Reflection 1** *No class today; do online assignment*
6	10/2 Dictionaries; Quiz 3 Reading: P4E 9, 10.4-10.9	10/4 Sets Reading: (reading on sets TBD)
7	10/9 Putting it together	10/11 Reflection 2 discussion; Midterm 1 Reading: (reflection 2 reading TBD) Due: **Homework 4**
8	10/16 Data analysis Reading: (data analysis reading TBD) Due: **Midterm 1 (take-home portion)**	10/18 Data visualization Reading: (data visualization reading TBD) Due: **Reflection 2**
9	10/23 XML **Reading: XML**	10/25 Putting it together
10	10/30 Reflection 3 discussion; Quiz 4 Reading: (reflection 3 reading TBD) Due: **Homework 5**	11/1 Final projects discussion; Intro to OOP (classes, attributes, methods) **Reading: OOP: Classes**

Wk	Tuesday	Thursday
11	11/6 Encapsulation, abstraction, inheritance **Reading: OOP: Object-oriented programming** Due: **Reflection 3**	11/8 Project proposal check-in; Quiz 5 (online) *Scheduled group+instructor meetings instead of class; take quiz 5*
12	11/13 Team programming Reading: TBD Due: **Homework 6**	11/15 Midterm 2
13	11/20 Project work and check-in Due: **Midterm 2 (take-home portion)**	11/22 *Thanksgiving holiday*
14	11/27 Object-oriented programming exercise	11/29 Object-oriented programming exercise
15	12/4 Project presentations	12/6 Project presentations
Finals week	Monday 12/17 Final exam (optional); final projects due	

University Course Policies

The essential purpose of the university's undergraduate course policies is to enable all of us to fully participate in an equitable, accessible and safe academic environment so that we each can be challenged to learn and contribute most effectively. They address issues such as academic integrity, codes of conduct, discrimination, accessibility, learning accommodations, etc. We are all responsible for following the policies at **http://www.ugst.umd.edu/courserelatedpolicies.html (http://www.ugst.umd.edu/courserelatedpolicies.html)** . You must read them and send me any questions by the first week of classes.

Academic Integrity and Ethical Use of Other People's Work

In academia and in computer programming, building on the work of other people is often accepted and encouraged. In this class, there will be some situations in which it is appropriate (sometimes even necessary) to build on other people's work. For example:

- you may get help from fellow students to understand a particular concept or technique
- you may collaborate with another student on a project that has been designated as a group assignment
- you may want to use a function or an algorithm published on a website
- you may find it useful to share ideas from a journal article in a reflection you are writing

For the purposes of this class, the following principles govern the ethical use of other people's work:

- You have an obligation to produce original work to satisfy the learning objectives of each assignment. Other people's work should complement, not replace, your own work.
- You should always give credit to individuals whose work you use. In a written document such as a reflection, this means providing a full entry in your bibliography as well as an in-text citation. In code, you should provide a comment indicating the following details:
  - the source of the code
    - URL (if online) or bibliographic citation (if not)
    - whatever authorship information is available
  - the date you accessed it
  - if applicable, the version number and title of the code

UMD students are required to abide by the student honor pledge: *I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.* You will be asked to complete the honor pledge as part of each assignment, quiz, and test in this class.

Suspected cases of cheating, plagiarism, or other academic integrity violations will be referred to the Honor Council.

Late Work and Resubmissions

I do not accept late work unless I have approved it by prior arrangement. If you have to miss a deadline, you should inform me as soon as possible, indicating the reason and when you propose to submit your work. If you have a legitimate reason, such as a major medical or family emergency, I may agree to an extension or makeup work, which I will grade by the end of the semester. Documentation of the emergency (e.g., a doctor's letter) may be required.

Homework resubmission

For Homework 2, 3, 4, 5, and 6, after the assignment is graded, you will be given an opportunity to resubmit for up to 50% of the points you missed on the first submission. For example, if you received 2 out of 3 points on your first submission, you would be eligible to resubmit for up to 0.5 additional points. In order to receive points for your resubmission, you must fix the issues for which you lost points on the first submission.

Exercise revision

Exercises cover material that you are assigned to read but that we have not covered in class. You are expected to submit your best work on each exercise by the deadline; at a bare minimum this should include the code you wrote (even if it doesn't work) and your questions or an explanation of what you didn't understand. You will be given 48 hours past the deadline to resubmit the exercise before it is graded; this gives you a chance to revisit the exercise after we discuss the material in class. Students who fail to make a "bare minimum" submission by the assignment deadline can still submit within the 48-hour revision window, but they forfeit half the possible points for that exercise.

Syllabus Revision Policy

This syllabus is a guide for the course and is subject to change with advance notice. Changes will be posted in ELMS. The ELMS course site is the definitive location for all course work, and communications, including class schedules, assignments, and deadlines.

Last updated September 11, 2018. Version 2018f1.2.

Course Summary:

Date		Details	
Wed Aug 29, 2018	📝	**Exercise: P4E 2; Style guide; Docstrings** (https://umd.instructure.com/courses/1249149/assignments/4688219)	due by 11:59pm
Thu Aug 30, 2018	📝	**20180830 participation** (https://umd.instructure.com/courses/1249149/assignments/4724251)	due by 2pm
Mon Sep 3, 2018	📝	**Exercise: P4E 3,4; Tut 4.7.1-4.7.2, 6-6.1.2** (https://umd.instructure.com/courses/1249149/assignments/4691512)	due by 11:59pm
	📝	**Homework 1: Software, selfie, survey** (https://umd.instructure.com/courses/1249149/assignments/4691993)	due by 11:59pm
Wed Sep 5, 2018	📝	**Exercise: P4E 5** (https://umd.instructure.com/courses/1249149/assignments/4691649)	due by 11:59pm
Thu Sep 6, 2018	📝	**Quiz 1** (https://umd.instructure.com/courses/1249149/assignments/4681593)	due by 2pm
Mon Sep 10, 2018	📝	**Exercise: P4E 6; string documentation** (https://umd.instructure.com/courses/1249149/assignments/4705638)	due by 11:59pm
Wed Sep 12, 2018	📝	**Exercise: Run a script from the command line** (https://umd.instructure.com/courses/1249149/assignments/4731887)	due by 11:59pm
Mon Sep 17, 2018	📝	**Exercise: P4E 7; Tut 7.2, 7.2.1** (https://umd.instructure.com/courses/1249149/assignments/4719525)	due by 11:59pm
	📝	**Homework 2: Tuition calculator** (https://umd.instructure.com/courses/1249149/assignments/4681584)	due by 11:59pm
Thu Sep 20, 2018	📝	**Reflection 1 reading** (https://umd.instructure.com/courses/1249149/assignments/4682053)	due by 12pm
	📝	**Quiz 2** (https://umd.instructure.com/courses/1249149/assignments/4681594)	due by 11:59pm
Mon Sep 24, 2018	📝	**Exercise: P4E 8, 10.1-10.3; Tut 5.3** (https://umd.instructure.com/courses/1249149/assignments/4719526)	due by 11:59pm
	📝	**Homework 3** (https://umd.instructure.com/courses/1249149/assignments/4719613)	due by 11:59pm

Date	Details	
Wed Sep 26, 2018	▧ **Exercise: Tut 4.7.5** (https://umd.instructure.com/courses/1249149/assignments/4719528)	due by 11:59pm
	▧ **Reflection 1** (https://umd.instructure.com/courses/1249149/assignments/4682054)	due by 11:59pm
Thu Sep 27, 2018	▧ **Sept. 27 participation assignment** (https://umd.instructure.com/courses/1249149/assignments/4719630)	due by 2pm
Mon Oct 1, 2018	▧ **Exercise: P4E 9, 10.4-10.9** (https://umd.instructure.com/courses/1249149/assignments/4719527)	due by 11:59pm
Tue Oct 2, 2018	▧ **Quiz 3** (https://umd.instructure.com/courses/1249149/assignments/4681595)	due by 11:59pm
Wed Oct 3, 2018	▧ **Exercise: Sets** (https://umd.instructure.com/courses/1249149/assignments/4719596)	due by 11:59pm
Wed Oct 10, 2018	▧ **Homework 4** (https://umd.instructure.com/courses/1249149/assignments/4719614)	due by 11:59pm
Thu Oct 11, 2018	▧ **Reflection 2 reading** (https://umd.instructure.com/courses/1249149/assignments/4682055)	due by 12pm
	▧ **Midterm 1 (in-class portion)** (https://umd.instructure.com/courses/1249149/assignments/4682000)	due by 11:59pm
Mon Oct 15, 2018	▧ **Exercise: Data analysis** (https://umd.instructure.com/courses/1249149/assignments/4719604)	due by 11:59pm
	▧ **Midterm 1 (take-home portion)** (https://umd.instructure.com/courses/1249149/assignments/4681998)	due by 11:59pm
Wed Oct 17, 2018	▧ **Exercise: Data visualization** (https://umd.instructure.com/courses/1249149/assignments/4719605)	due by 11:59pm
Thu Oct 18, 2018	▧ **Reflection 2** (https://umd.instructure.com/courses/1249149/assignments/4682056)	due by 11:59pm
Mon Oct 22, 2018	▧ **Exercise: XML** (https://umd.instructure.com/courses/1249149/assignments/4719606)	due by 11:59pm
Mon Oct 29, 2018	▧ **Homework 5** (https://umd.instructure.com/courses/1249149/assignments/4719615)	due by 11:59pm
Tue Oct 30, 2018	▧ **Reflection 3 reading** (https://umd.instructure.com/courses/1249149/assignments/4682057)	due by 12pm
	▧ **Quiz 4** (https://umd.instructure.com/courses/1249149/assignments/4681847)	due by 11:59pm

Date	Details	
Wed Oct 31, 2018	**Exercise: Classes** [(https://umd.instructure.com/courses/1249149/assignments/4719610)](https://umd.instructure.com/courses/1249149/assignments/4719610)	due by 11:59pm
Mon Nov 5, 2018	**Exercise: OOP** [(https://umd.instructure.com/courses/1249149/assignments/4719608)](https://umd.instructure.com/courses/1249149/assignments/4719608)	due by 11:59pm
	Reflection 3 [(https://umd.instructure.com/courses/1249149/assignments/4682058)](https://umd.instructure.com/courses/1249149/assignments/4682058)	due by 11:59pm
Wed Nov 7, 2018	**Project proposal** [(https://umd.instructure.com/courses/1249149/assignments/4682050)](https://umd.instructure.com/courses/1249149/assignments/4682050)	due by 11:59pm
Thu Nov 8, 2018	**Quiz 5** [(https://umd.instructure.com/courses/1249149/assignments/4681848)](https://umd.instructure.com/courses/1249149/assignments/4681848)	due by 11:59pm
Mon Nov 12, 2018	**Exercise: Team programming** [(https://umd.instructure.com/courses/1249149/assignments/4719611)](https://umd.instructure.com/courses/1249149/assignments/4719611)	due by 11:59pm
	Homework 6 [(https://umd.instructure.com/courses/1249149/assignments/4719617)](https://umd.instructure.com/courses/1249149/assignments/4719617)	due by 11:59pm
Thu Nov 15, 2018	**Midterm 2 (in-class portion)** [(https://umd.instructure.com/courses/1249149/assignments/4681999)](https://umd.instructure.com/courses/1249149/assignments/4681999)	due by 11:59pm
Mon Nov 19, 2018	**Midterm 2 (take-home portion)** [(https://umd.instructure.com/courses/1249149/assignments/4682001)](https://umd.instructure.com/courses/1249149/assignments/4682001)	due by 11:59pm
Mon Nov 26, 2018	**Homework 7** [(https://umd.instructure.com/courses/1249149/assignments/4719618)](https://umd.instructure.com/courses/1249149/assignments/4719618)	due by 11:59pm
Thu Dec 6, 2018	**Participation** [(https://umd.instructure.com/courses/1249149/assignments/4719619)](https://umd.instructure.com/courses/1249149/assignments/4719619)	due by 11:59pm
	Project presentation [(https://umd.instructure.com/courses/1249149/assignments/4682051)](https://umd.instructure.com/courses/1249149/assignments/4682051)	due by 11:59pm
Mon Dec 17, 2018	**Final project (code and writeup)** [(https://umd.instructure.com/courses/1249149/assignments/4682052)](https://umd.instructure.com/courses/1249149/assignments/4682052)	due by 11:59pm
	Reading comprehension: P4E 2 [(https://umd.instructure.com/courses/1249149/assignments/4682527)](https://umd.instructure.com/courses/1249149/assignments/4682527)	