

# CDS 230: MODELING AND SIMULATION I

Fall 2019

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<b>Instructor:</b>	Carlos Cruz	<b>Class time:</b>	T-R 15:00 – 16:15
<b>Email:</b>	<a href="mailto:ccruz1@gmu.edu">ccruz1@gmu.edu</a>	<b>Place:</b>	Exploratory Hall 1004.

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**TA:** Dwayne Smith

**Office hours:** T 10:00 – 11:30

**Place:** Research Hall 249.

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**TA:** Shatha Alahmadi

**Office hours:** R 13:00 – 15:00

**Place:** Research Hall 249.

**Email:** [salahmad@gmu.edu](mailto:salahmad@gmu.edu)

**Objectives:** This course aims to provide students with an **introduction** to modeling and simulation concepts using the **Python** programming language and to gain confidence in writing computer programs that solve scientific problems. The class will combine lectures with hands-on programming emphasizing the art of converting problem descriptions into functional programs. Student participation will be highly encouraged.

**Prerequisites:** CDS 130 or permission of instructor. Also, basic computer skills, including familiarity with text editors and the command line interface.

## Participation

A large portion of the material for this course will be presented during the lectures, so regular attendance will be essential. Furthermore, quizzes will be administered during lectures. There will be a **CDS230 Discussion Board** available through Blackboard where students will be able to interact and engage in discussions regarding lecture material and class assignments. **You may not post homework solutions in the forum!**

## Course Pages:

1. Course page available through **Blackboard**
2. <https://github.com/cds-230/fall-2019>

**Main References:** There is no required text for this class. The following are references that you may find helpful. Additional references are provided in the Appendix of the class notes.

- Allen B. Downey, *Modeling and Simulation in Python*. This is an Open Access book available here: <http://greenteapress.com/modsimpy/ModSimPy3.pdf>. It has the same objectives as this class but with a different approach.
- Brad Miller and David Ranum, *How to think like a Computer Scientist*, available here: <https://runestone.academy/runestone/books/published/thinkcspy/index.html>. This online book includes an interactive workspace that you may find helpful.
- Class notes and other readings will be provided throughout the semester.

**Grading Policy:**

Quizzes	10%
Homework	40%
Midterm	20%
Final	30%
Total	100%

The letter grade is based on:

A+	> 96.7
A	93.3-96.6
A-	90.0-93.2
B+	86.7-89.9
B	83.3-86.6
B-	80.0-83.2
C+	76.7-79.9
C	73.3-76.6
C-	70.0-73.2
D	60.0-69.9
F	< 60.0

**There is no curve in this class.** All the points earned will be counted and converted to a grade according to the grading scale above. If you do all the assignments and ask for help when the going gets rough then you will get a good grade. "F"s and "D"s are generally awarded to students that fail to do their work and give up on the course material. It is important that you **do not fall behind** in this class.

**Exercises:** Exercises will be assigned on Tuesday and will consist of simple questions and/or exercises that should be solvable by inspection or with little effort. Exercises will be graded as either correct or incorrect. Exercises will be due before the start of the next class (Thursday).

**Homework:** There will be approximately 12 homework sets in this course, roughly one per week. Each homework will consist of 5-10 short programming tasks. The top 10 homework scores will be used to compute your grade and the bottom two will be discarded.

- **Homework assignments will be submitted as a Python file or a Jupyter notebook.** I will explain during class how to submit your homework.
- The files you will submit **must** run and produce some output. If a particular homework problem fails to execute, i.e produces a **syntax** error, then that problem will not get any credit.
- Partial credit may be given only if the answers are **reasonable** or close to the correct answer.

- All homework is due before class one week after they are assigned (Thursday at 3PM) unless otherwise noted. **Late homework will be not be accepted.**
- All assignments will be turned in through Blackboard. Do not email them or they will not get graded!
- **Ask questions!** Do not hesitate to contact me to discuss a homework problem or any aspect of the course. If requested, I will be available until 5 PM after class in Planetary Hall 117. You may also post your questions in the forum provided for this purpose. **I will not be able to respond to questions on Saturday and Sunday.**

#### Academic Honesty:

- You may work together with other classmates to discuss the homework assignment, but in the end **you must write your own codes and documents.**
- It is fine (and encouraged) to use other books, internet resources, your friends, etc. to get solution ideas, but **you may not copy-paste or transcribe code and submit as your own.** Get an idea, sleep on it and then generate the answer yourself based on your own understanding.
- **If you use outside resources then you are required to cite these sources.**
- **If there appears to be evidence of cheating or plagiarism, then honor code actions may be initiated.**

#### Disability Statement:

If you have a documented learning disability or other condition that may affect academic performance you should make sure this documentation is on file with Office of Disability Services (<http://ods.gmu.edu>) to determine the accommodations you need.

#### Tentative Course Outline:

Week 1 (8/27-8/29)	..... Introduction
	..... <b>Readings:</b> CN, Ch 1, App. A.; M & R Ch 1
Week 2 (9/3-9/5)	..... Variables, Data Types
	..... <b>Readings:</b> CN, Ch 2, App. B; M & R Ch 2,5
Week 3 (9/10-9/12))	..... Control Flow, Collections I
	..... <b>Readings:</b> CN, Ch 3; M & R Ch 8
Week 4 (9/17-9/20))	..... Collections II, Functions
	..... <b>Readings:</b> CN, Ch 4; M & R Ch 9-12
Week 5 (9/24-9/26))	..... Python Arrays
Week 6 (10/1-10/3)	..... Numpy
Week 7 (10/8-10/10)	..... File IO, Matplotlib
Week 8 (10/17)	..... Midterm
Week 9 (10/22-10/24)	..... Population growth
Week 10 (10/30-10/31)	..... Spreading of diseases
Week 11 (11/5-11/7)	..... Discrete time models
Week 12 (11/12-11/14)	..... Continuous time models
Week 15 (11/19-11/22)	..... Random numbers
Week 14 (11/26)	..... Monte Carlo simulation
Week 14 (11/28)	..... Thanksgiving recess
Week 13 (12/3-12/5)	..... Continuous field models
Week 16 (12/12)	..... Final

## References:

CN = Course Notes

M & R = <https://runestone.academy/runestone/books/published/thinkcspy/index.html> (only some sections are relevant)**Important Dates:**

First day of classes .....	Aug 26
Drop Deadline .....	Sep 17
Student self-withdrawal (100% tuition liability) .....	Sep 18 - Sep 30
Selective withdrawal (100% tuition liability) .....	Oct 1 - Oct 29
Fall break .....	Oct 14: Tuesday classes do not meet.
Midterm exam .....	Oct 17
Thanksgiving recess .....	Nov 27 - Dec 1: No classes.
Last day of classes .....	Dec 7
Final exam .....	Dec 12