Syllabus
ECE 105: Programming for Engineers 2 -- Spring 2020
Department of Electrical and Computer Engineering
Drexel University

Instructor
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Educational delivery mode: this course will be conducted entirely **online** using **Zoom** for videoconference and **BB/Learn** for all course communications, course materials, and grades:

- Lectures will be streamed live via Zoom at the time listed in the term master schedule (Tuesdays 10am); they will also be recorded and available via BB/Learn.
- Laboratory sections will be streamed live via Zoom at the time listed in the term master schedule (Thursdays and Fridays).

Contact and office hour guidelines:

- **You are strongly encouraged to reach out to us for help with your questions.** Here are the four ways to do this, ranked by preference:
  - **First best:** during **lab** sessions. Your TAs are there to help you one on one, as needed.
  - **Second best:** during **lectures**. Please do ask questions using the Zoom chat feature, and either one of the TAs or I will attempt to answer it.
  - **Third best: email your TA**. Your TAs will seek to reply promptly. Try to make your question succinct and clear. Do **not** send code with the question "why won't this work?"
  - **Fourth best: email me**. I am more than happy to answer questions, but my preference is you reach out to me when your question is not best addressed using one of the above four methods. Also, please understand that an immediate reply may not be possible, although I will do my best to provide a timely response.
- **Your TAs and I are here to help you; we will do what we can to assist you with any problems**
- **Your TAs will treat each of you with respect; it is expected you will treat them with that same respect**

Credits: 3

Course format: There are two hours of lecture and two hours of laboratory each week.

- Lectures: Tuesdays 10:00AM – 11:50AM
- Laboratories: please attend the laboratory section in which you are enrolled whenever possible.

Section	Day	Start Time	End Time	Teaching Assistants
060	Thursdays	10:00AM	11:50AM	Aho, Dutta
061	Thursdays	12:00PM	1:50PM	Aho, Dutta
062	Thursdays	2:00PM	3:50PM	Aho, Dutta
063	Fridays	10:00AM	11:50AM	Ghen, Phatharodom
064	Fridays	12:00PM	1:50PM	Ghen, Phatharodom
065	Fridays	2:00PM	3:50PM	Ghen, Phatharodom

Course prerequisites
- ENGR 131 Introductory Programming for Engineers, OR
- ENGR 132: Programming for Engineers

Catalog course description
This course will cover advanced usage and understanding of programming concepts using Python within the Linux environment. By the end of the course, students will not only possess strong programming capabilities but will also have a firm grasp on scientific computing fundamentals. Students should already have a working knowledge of bash, python, pylint, tmux/GNU screen, X11 tunneling, and at least one terminal based editor (vim, nano, joe, etc) from ENGR 131 or ENGR 132.

Overview: The goal of this course is to expose students to scientific computing concepts in Python, with the concepts illustrated and motivated by examples drawn from mathematics, computing, and engineering.

Required textbook
Learning Scientific Programming with Python
by Christian Hill
Cambridge University Press 2016, 1st Edition
ISBN-13: 978-1107428225

Recommended but optional textbook
Learning Python, 5th Edition
by Mark Lutz
O'Reilly Media 2013
ISBN-13: 978-1449355739

Required software: Python3.x, with NumPy, and other standard packages for scientific computing. Any Python development environment is fine (e.g., Atom, Anaconda, etc.).

Course learning outcomes
At the completion of this course, students will be able to:
- Design code, including modular design, data structures, polymorphism, and object-oriented programming.
- Implement computer programs to solve scientific computing problems pertinent to the field of electrical and computer engineering.
- Design code to perform probabilistic and Monte Carlo simulations.
- Analyze the performance of computer-based simulations.

Based on the above objectives, the curriculum will be enriched by laboratory exercises that tie the skills of programming and algorithmic design directly into relevant scientific computing applications.

Mapping of student learning outcomes

The ABET Student Outcomes are listed below. Outcomes 1, 2, and 3, are intended learning outcomes of this course.

1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

Grading basis

The total score has a maximum of 100 points, and is the sum of the homework score (55 points max) and the quiz score (45 points max).

Assignment	Max Points
Homework	55
Quizzes	45
Total	100

Final grades for the course will be assigned by the instructor on the basis of a curve of the total scores. While the curve will be computed on the basis of the collection of total scores, the assigned grades are guaranteed to be no lower than the Min Grade column below.

Min	Max	Min Grade
98	100	A+
93	97	A
90	92	A-
87	89	B+
83	86	B
80	82	B-
77	79	C+
73	76	C
70	72	C-
65	69	D+
60	64	D
0	59	F

Students are advised of their eligibility, specific to the Spring 2020 quarter, to take this course on a Pass/Fail basis. Guidance on this policy is available here:

https://drexel.edu/now/archive/2020/April/Pass-fail-policy-update/

Course policies

- *Homework:* **Six homework assignments will be assigned throughout the term**. Collaboration on homework is permitted and encouraged, but **each student must turn in her/his own work**. Homework is to be submitted online (instructions on submission will be forthcoming separately). **Submission of copied / nearly identical homework will incur severe penalties**. **Late homework will be accepted but with penalty**, unless negotiated otherwise directly with instructor. **Lowest homework score will be automatically dropped**. Each homework will be worth 11 points (55 points total).
- *Quizzes:* **Three quizzes will be held throughout the term**, each covering the material from lecture in the previous several weeks. More detail on quiz mechanics will be forthcoming. **Quizzes must be completed by each student individually, without outside help. Failure to adhere to this rule will incur severe penalties**. Each quiz will be worth 15 points (45 points total).

- *Laboratories:* **Attendance is strongly encouraged, but not required**. Use this time to learn together!
- *Lectures:* **Attendance is strongly encouraged, but not required**. Use this time to learn together!
- *Final exam:* **There will not be a final exam for this course**.

Students needing accommodations: Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website, or contact DR for more information by phone at 215.895.1401, or by email at disability@drexel.edu.

Academic policies

- Drexel University Office of the Provost Academic Integrity Policy:
http://drexel.edu/provost/policies/academic-integrity/
- Drexel University Office of the Provost Course Add Drop Policy:
http://drexel.edu/provost/policies/course-add-drop/
- Drexel University Office of the Provost Course Withdrawal Policy:
http://drexel.edu/provost/policies/course-withdrawal/
- Drexel University Office of Equality and Diversity Disability Resources Accommodations Policy:
http://drexel.edu/oed/disabilityResources/students/Accommodations/

Course topics

Topics will be likely cover the following list, although exact topic selection may vary at instructor's discretion.

- Arrays: indexing, partitioning, joining, converting, etc.
- Scientific computing: defining and plotting functions, vectorization
- Use of randomness for averaging and integrating (i.e., Monte Carlo)
- Performance analysis: measuring running time as function of input, identifying bottlenecks
- Simulations: cellular automata (e.g., Conway's Game of Life)
- Discrete event simulation (e.g., queues and queueing networks)

Course calendar

Wk	Lectures	Homeworks	Laboratories	Quizzes
1	Tue April 7 10:00-11:50am: LECTURE 1		Thu, Fri April 9-10: LABORATORY 1	
2	Tue April 14 10:00-11:50am: LECTURE 2		Thu, Fri April 16-17: LABORATORY 2	
3	Tue April 21 10:00-11:50am: LECTURE 3	Wed April 22 11:59pm Wk 1 HW1 DUE	Thu, Fri April 23-24: LABORATORY 3	QUIZ 1 due on Fri April 24 11:59pm
4	Tue April 28 10:00-11:50am: LECTURE 4	Wed April 29 11:59pm Wk 3 HW2 DUE	Apr 30, May1: LABORATORY 4	
5	Tue May 5 10:00-11:50am: LECTURE 5	Wed May 6 11:59pm Wk 4 HW3 DUE	Thu, Fri May 7-8: LABORATORY 5	
6	Tue May 12 10:00-11:50am: LECTURE 6		Thu, Fri May 14-15: LABORATORY 6	QUIZ 2 due on Fri May 15 11:59pm
7	Tue May 19 10:00-11:50am: LECTURE 7	Wed May 20 11:59pm Wk 6 HW4 DUE	Thu, Fri May 21-22: LABORATORY 7	
8	Tue May 26 10:00-11:50am: LECTURE 8	Wed May 27 11:59pm Wk 7 HW5 DUE	Thu, Fri May 28-29: LABORATORY 8	
9	Tue June 2 10:00-11:50am: LECTURE 9	Wed June 3 11:59pm Wk 8 HW6 DUE	Thu, Fri June 4-5: LABORATORY 9	QUIZ 3 due on Fri June 5 11:59pm

Final note: the difficulties and complications imposed upon our world by the coronavirus affect us all, and create a variety of obstacles for learning. My goal for this course is for us to form a community of learners; as a community, we must above all seek to be understanding and respectful of each other. To that end, if you are facing difficulties that affect your ability to succeed in this class, I urge you to reach out to me to discuss the matter.