EEE 419/591
Python for Rapid Engineering Solutions

Syllabus

[In the very rare situation, this syllabus might change slightly depending on the class progress. The professor will announce any changes]

Course and Faculty Information

Course Description: Engineers in industry frequently need to quickly solve problems that may be new to them. The goal of this course is for students to learn how to achieve rapid engineering solutions using Python libraries and functions readily available on the internet. The Python libraries include NumPy, SciPy, matplotlib, pandas, and scikit-learn. The focus is on rapid solutions on wall-clock time, not necessarily CPU time. At the end of this course, the student will have been exposed to a wide variety of computational problems from engineering and physics and have become acquainted with a typical approach to their solution using Python. When confronted with similar problems in the future, the student will know how to approach the problems and where to look for more detailed knowledge.

EEE591 students will be responsible for either an additional project or harder specifications for existing projects with the goal of demonstrating superior understanding of the material in the course. The projects will be defined in Canvas and might vary from semester to semester to keep the course challenging and interesting.

Credits: 3

Prerequisites: EEE203, PHY131, MAT342/343   **Co-requisite:** EEE350

Instructor: Ahmed Ewaisha

Contact Info: ewaisha@asu.edu

Class Meeting Time (Recitation Sessions):

- Time and location posted on Canvas
- All Zoom Recitation sessions will be recorded.
- Recordings accessed on Canvas > Zoom > Cloud Recordings
- No attendance is taken, but Recitation Sessions are very helpful

Office Hours

- Check Canvas for times.
- Other hours by appointment (arrange via email)
- Office Hours Zoom Link: https://asu.zoom.us/my/ewaisha

Ed Discussion Board

This course uses a tool called "Ed Discussion" for general questions and comments about the course. Prior to posting a question or comment, check the syllabus, announcements, and existing posts to ensure it's not redundant. You are encouraged to respond to the questions of your classmates. You can expect a response within 48 hours. Most of the time it is within 24 hours, though.

For questions of personal nature regarding this class, please send your instructor an email to the email address posted above.

Course Learning Outcomes

At the completion of this course, students will be able to use python to quickly solve a wide variety of engineering problems.

Course Topics

Each week of the semester, one topics is covered in the following order:
1. Python Grammar
2. Integrals
3. Linear Algebra
4. Digital Signal Processing and Graphical User Interfaces
5. Machine Learning: Classification (Perceptron, Logistic Regression, SVM, Kernel SVM, Decision Tree, Random Forest, and K Nearest Neighbors)
6. Machine Learning: Principal Component Analysis, Regular Expressions and Sentiment Analysis
- Midterm Exam
7. Machine Learning: Clustering, Deep Learning, Linear Regression
8. Nonlinear Equations
9. Scripting and CAD (Using Python to run other Software)
10. Ordinary Differential Equations
11. Random Processes
12. Fourier Transforms
- Final Exam / Final Project
13. Additional Offered Topics (Covered as time permits):
    i. Partial Differential Equations
    ii. Object Oriented Programming
    iii. Additional Topics

Recommended Textbooks

- "Computational Physics", Newman ~$48 at Amazon.com
- "Python for Machine Learning", Raschka ~$36 at Amazon.com (NOTE: 2nd and 3rd edition are ok)
- Online References: https://lectures.scientific-python.org/

The above books are only recommended. They are not mandatory. You can finish this class successfully without purchasing the books but you will need to search the internet.

Other Good References

- Hands on Machine Learning with Scikit-Learn & TensorFlow, Geron - more thorough presentation of deep learning
- Deep Learning, Goodfellow et al., - covers the mathematics of deep learning, available free online at https://www.deeplearningbook.org/
- https://stackoverflow.com/questions/ # a forum for questions and answers

Required Software

Python 3.7 or greater installed on your computer. I suggest having a Python development environment since it is helpful in writing and editing codes. There are many free environments available. These include:
- Anaconda
- IDLE
- PyCharm
- Visual Studio Code (not to be confused with Visual Studio)

Use whatever environment you wish. As long as your code runs, it shouldn't matter which environment you use. Whichever you choose, learn the debugger!

The use of generative Artificial Intelligence (AI)

In this course – EEE419/591 - you are allowed and even encouraged to use generative AI (like ChatGPT and similar) for all assignments except the quizzes, midterm and the final exam, unless otherwise explicitly stated. However, you should treat generative AI as just a helping tool in developing a python script. You must understand what it gives you and improve on it. Otherwise, companies will not bother hiring you. They too can use generative AI. You must learn to provide additional value to your employer. You will not get full credit on an assignment if it appears that you did not understand and/or improve on the code generated from AI.

Common mistake from previous students: some students don't understand how to approach the assignment. Instead, they put the question statement on an AI-platform and assume that the code that AI provides is a good start. A lot of times such a code has nothing to do with what the question is asking. No matter how much you try to modify it, you cannot succeed without both

understanding the problem statement AND thinking about what the correct solution approach should be BEFORE you attempt using an AI, should you decide to use one. AI in this class is like a calculator in a physics class. It will never solve your assignment. It can merely do some and only some complex parts of the problem much faster than you.

<u>MANDATORY – Citing AI chat in each assignment, if used:</u>

- Using AI: If you use AI in an assignment, you MUST cite the chat that you used to help you finish that assignment. Keep in mind the following:
    - Cite your chat by pasting its link in your code as a commented line. If you use multiple chats on the same or different AI platforms, cite them all.
    - Make sure you use an AI platform that allows sharing a link to the chat and that allows the chat to be viewed publicly by anyone who has the link.
    - Each assignment needs to have a separate dedicated chat. Parts of a single assignment can share the same AI chat or each can have its own chat.
    - Each chat needs to have the following identifying info: Your name, Assignment name, today's date. The following prompt to the chat is sufficient for the identifying info to be saved in the chat:
      Name: First Last Name
      Assignment: HW 1 – Prime Numbers
      Date: Sunday Jan 24, 20xx.
    - A chat without identifying information means it is not yours. The identifying information could go at the beginning or at the end of the chat.
- Not using AI: If you do not use AI at all in a particular assignment, you must write the following commented line in the code you submit "*I did not use AI at all to complete this (part of the) assignment*".

Collaboration Policies

- HWs and Projects
    - Encouraged to be posted in public on Ed Discussion, even if they contain your python code.
    - If you need to post your entire code from A to Z, post a screenshot of it. Do not copy and paste your entire code in a copyable format unless you want to post only a portion of your code.
    - All students are highly encouraged to help their peers through the online discussion board (Ed Discussion) or outside it, as long as the solution you submit is your own code, that is, in your own way of writing your code.
    - Helping in understanding the problem and how to approach the solution is encouraged. Sharing solution steps explicitly is acceptable as well and even encouraged.
    - Submitting identical and close-to-identical (change of variable names, for example) solutions will be considered as academic integrity violations and will not be tolerated.
- Quizzes and Exams:
    - No collaboration is allowed, unless otherwise explicitly mentioned.

o When posting on Ed Discussion, questions should be posted in private since other students might have not taken the exam yet.

Technology Requirements

We highly advice against the use of iPads or Chromebooks as these devices, unlike desktops and laptops, do not work well for class exams.

This course requires the following technologies:

- Web browsers ([Chrome](), [Mozilla Firefox](), or [Safari]())
- [Adobe Acrobat Reader]() (free)
- Webcam, microphone, headset/earbuds, and speaker
- Microsoft Office ([Microsoft 365 is free]() for all currently enrolled ASU students)
- Reliable broadband internet connection (DSL or cable) to stream videos.

Exam format

The midterm and final exams are held online on your personal computer using Honorlock software. Instructions on how to use Honorlock will be provided. You must take the exam on your personal computer. If you do not have a personal computer or if you cannot take the exam on your personal computer for some reason, you must communicate with the professor immediately.

Submitting Assignments

All assignments MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

Assignment due dates follow Arizona Standard time. Click the following link to access the [Time Converter]() to ensure that you account for the difference in Time Zones. Note: Arizona does not observe daylight savings time.

Late or Missed Assignments

All examinations and quizzes must be taken at the scheduled time and cannot be made up. It is up to the instructor to excuse missing a quiz and, if so, the score for that quiz will be the average of the others BEFORE corrections. Homework assignments and lab reports must be submitted by the due date indicated in the course calendar. Accommodation will be made for religious observances provided that students notify the instructor at the beginning of the semester concerning those dates. Students who expect to miss class due to officially university-sanctioned activities should inform the instructor early in the semester. Alternative arrangements will generally be made for any examinations and other graded in-class work affected by such absences. The preceding policies are based on [ACD 304–04](), "Accommodation for Religious Practices" and [ACD 304–02](), "Missed Classes Due to University-Sanctioned Activities."

If you are granted an extension, include a copy of your instructor's correspondence in your template or "comments" box while you submit your assignment. Graders are asked to apply late penalties if they do not see a written instructor note while they grade. Make sure to check your grade after the assignment was graded and notify the professor if you see a grading mistake.

Late Homework and Project assignments without a documented explanation (such as physician's note) will be penalized 20% per day. A zero is given for a missed midterm or final exam unless there is a documented explanation. With a documented explanation such as a physician's note, the other exam will count twice. Note that arrangements for a missed assignment or exam must be made ahead of time (i.e. let the professor know in writing BEFORE the due date that you need an extension). Extensions requested after the due date are almost never granted.

Late Quizzes, Midterm or Final exams (including the Final Project) will not be accepted without a prior written extension from the professor. Extensions will be decided on a case by case basis and are usually granted for extreme reasons (such as family emergencies).

Grading

Your grade will be determined based on the following grading schema:

Grade	Percentage
A+	100% - 97%
A	<97-93%
A-	<93-90%
B+	<90-87%
B	<87-83%
B-	<83-80%
C+	<80-77%
C	<77-70%
D	<70-60%
E	<60%

Note that rounding is done based on thousandths. So, 96.995% rounds up to A+, but 96.994% does not.

I usually do not curve grades unless you are very close to the boundary. When I curve, I curve up and never curve down. The midterm and final exams will focus on the principles of Python and the libraries we use. Homework problems will be challenging but exercise basic capabilities. Projects will be similar but more challenging.

20%   Homework (homeworks equally weighted)
35%   Projects (projects NOT equally weighted)
5%   Quizzes
20%   Midterm Exam
20%   Final Exam and Final Project
~1.5% Extra Credit (as time permits)
1-2%   Ed Discussion Participation Extra Credit

If you have a question about a graded assignment, contact the professor and copy the grader to your email.

Rubric

Homework and Projects are graded using the following rubric:
50% Does it run? Was a good effort made to create the required code?
20% Do you get the correct answers?
20% AI Citation / Declaring no AI used
10% Good comments

Honors Project

If you are a Barrett student interested in an honors project, you'll need to do the extra EEE591 project to get honors credit. If you are taking this as EEE591, then the course already counts as honors. Please see your advisor if you'd like to change your enrollment from EEE498 to EEE591 to cut down on the paperwork required to get honors.

Academic Integrity

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. All engineering students are expected to adhere to the ASU Academic Integrity Honor Code.

All work submitted for the course cannot have been submitted for any other course or any previous section of this same course. Student academic integrity violations are reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). Withdrawing from this course will not absolve you of responsibility for an academic integrity violation and any sanctions that

are applied. The AIO maintains a record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Each of the following is considered an academic integrity violation in this class (this is not an exhaustive list):

- Submitting a solution to an assignment that has significant similarity to that of another student in this class either enrolled in this semester or was enrolled in a previous semester
- Submitting a solution to an assignment that has been posted as a HW/project...etc. in a previous semester and has not been posted in this semester
- Submitting a solution that has someone else's name on it or mentioned in the cited AI chat
- Retaining on your computer some or all of the assignments' solutions from someone who was enrolled in this class in a previous semester. If such solutions is into your hands now or fall into your hands sometime during this class, delete it from your computer immediately
- Submitting an assignment that includes a link to an AI chat that is exactly the same link as another student in this class either enrolled in this semester or in a previous semester

Communicating With the Instructor

Ed Discussion

This course uses Ed Discussion for general questions about the course. Click on "Ed Discussion" on the left menu bar, then click on the link to self-enroll in the discussion forum. Prior to posting a question, please check the syllabus, announcements, FAQs and existing posts. If you do not find an answer, post your question. You are encouraged to respond to the questions of your classmates. For questions of a personal nature, use email. You can expect a response within 48 hours not including weekends. (It's usually much faster!)

If you have a question related to grading or of a personal nature, make sure to send an email directly to the professor of the class and copy the grader rather than the entire Ed Discussion community, especially when it is revealing the questions of the exam or a potential answer of the exam or project. Remember that this applies even if the deadline of the exam or project has passed since some students submit late.

Posting entire answers explicitly publicly in any forum is considered an academic integrity violation. Posting hints, methods of solutions, steps…etc., on the contrary, is encouraged.

Email

ASU email is an [official means of communication](#) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly.

Announcements

I send announcements periodically via Canvas. You can find a copy of all the announcements sent during the semester in the Announcements tab on Canvas. Students bear the responsibility

of missed announcements and should check the Announcements tab regularly. If you do not receive emails notifying you of recently posted announcements, try changing your Canvas settings.

All correspondence from instructors will be sent to either your ASU email account or to the Announcements on Canvas.

Chat

I only chat with AI.

Course Access

Your ASU courses can be accessed by both [my.asu.edu](my.asu.edu) and myasucourses.asu.edu; bookmark both in the event that one site is down.

Student Success

To be successful:

- check the course daily
- read announcements
- check and participate on Ed Discussion board frequently
- read and respond to course email messages as needed
- complete assignments by the due dates specified
- communicate regularly with your instructor and peers
- create a study and/or assignment schedule to stay on track
- access ASU Online Student Resources

Syllabus Disclaimer

The syllabus is a statement of intent and serves as an implicit agreement between the instructor and the student. Every effort will be made to avoid changing the course schedule, but the possibility exists that unforeseen events will make syllabus changes necessary. If a change needs to be made to the syllabus, an announcement will be posted on Canvas

Policy regarding expected student behavior

Students in this class are expected to acknowledge and embrace the FSE student professionalism expectation located at: https://engineering.asu.edu/professionalism

Student Copyright Responsibilities

You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the student first complies with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

The contents of this course, including lectures and other instructional materials, are copyrighted materials. Students may not share outside the class, including uploading, selling or distributing course content or notes taken during the conduct of the course. Any recording of class sessions is authorized only for the use of students enrolled in this course during their enrollment in this course. Recordings and excerpts of recordings may not be distributed to others. (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy5-308 F.14 for more information).

Policy against threatening behavior, per the Student Services Manual, SSM 104–02
Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services (see SSM 104-02). Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on-or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

Disability Accommodations
Suitable accommodations are made for students having disabilities. Students needing accommodations must register with the ASU Student Accessibility and Inclusive Learning Services office and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in enough time for it to be properly arranged. See ACD 304-08 Classroom and Testing Accommodations for Students with Disabilities.

Students who feel they will need disability accommodations in this class but have not registered with the Disability Resource Center (DRC) should contact DRC immediately. The DRC Tempe office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: (480) 965-1234 (V) or (480) 965-9000 (TTY). For additional information, visit: www.asu.edu/studentaffairs/ed/drc.

Harassment and Sexual Discrimination
Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs .

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, https://goto.asuonline.asu.edu/success/online-resources.html.