Performant Programming

CEN 4XXX

Academic Term: Summer 2023

Instructor:
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Office Hours: TBD

Course Description

Focuses on utilizing flexibility of interpreted / scripting language (e.g., Python) paired with features made available through low-level bindings in a systems language (e.g., C/C++ or Rust) (such as threading, process manipulation, and computational libraries in machine code) to build software that is extensible, robust, and performant. (3)

Course Pre-Requisites / Co-Requisites

COP3530 - Data Structures & Algorithms

Course Objectives

By the end of the semester, successful students should be able to…

- Identify potential performance bottlenecks within a software system
- Build high-performance modules in low-level languages and bind them to scripting engines
- Design an application using modern optimization-focus conceptual programming models
- Develop and deploy performant software using a mix of flexible and performant sources

Professional Component (ABET):

This course serves criteria (b) of ABET Professional Component, namely: "one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study". This course constitutes one-semester of engineering-specific coursework.

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. Ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	High
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	Medium
3. Ability to develop & conduct appropriate experimentation, analyze & interpret data, & use engineering judgment to draw conclusions.	
4. 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.	Low
6. Ability to recognize ongoing need for additional knowledge & locate, evaluate, integrate, & apply this knowledge appropriately.	
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

There are no require materials for this course. All materials will be provided by the instructor. The College of Engineering requires students to have a mobile computing device (laptop).

Course Schedule

Week 1: Python Fundamentals
Week 2: Functional Programming. OOP, and Data Storage
Week 3: System Language Bindings
Week 4: Development, Distribution, and Concurrency
Week 5: Numerical Data Handling
Week 6: Prototype Presentations
Week 7: Release Candidate Development
Week 8: GUI and Audio Interaction
Week 9: Data Science Techniques
Week 10: Post-Mortem Presentations

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is mandatory. Make-up assignments in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Evaluation of Grades

Assignment	Points	Percent
Project Milestones		
Pitch	50	5%
Progress Presentation	80	8%
Post-Mortem Presentation	120	12%
Design Prototype	100	10%
Production Release	200	20%
Other Activities		
Professional Interaction	10	1%
Syllabus Quiz	10	1%
Presentation Reviews (4)	8 x 4	3.2%
Peer Evaluations (6)	8 x 6	4.8%
Stakeholder Meetings (6-drop-1)	10 x 5	5%
Exercises (4-drop-1)	100 x 3	30%
TOTAL	**1000**	**100%**

Grading Policy

Percent	Grade	Grade Points
93.0 - 100.0	A	4.00
90.0 – 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 - 86.9	B	3.00
80.0 - 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 - 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0.0 - 59.9	E	0.00

Percentages will be rounded to the nearest whole percentage for the purposes of assigning letter grades. For more information on UF grading policy, see https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Student Teams

Most software requires many disparate skillsets. Few students will have all these skills; instead, student should form groups with the goal of create well-rounded teams.

All students will be responsible for completing peer reviews that, on their honor, are correct and accurate. Students will also be required to utilize GitHub or another source control system that may be used to task review and consideration. Students are also required to track features and issues using a professional tool (e.g., Trello and/or GitHub issues).

Based on peer reviews, instructors will intervene to correct behavior as necessary to maintain well-functioning teams. All team members are expected to contribute to the project on equal terms; as such, grade adjustments may be made if it is determined by faculty that student(s) are not acting productively as part of the team.

Finally, students are expected to be available during regular business hours (JST) to contribute to the team's efforts, meetings, and necessary communications. Teams are expected to meet **synchronously**, at a minimum, on a biweekly basis, but more frequent meetings are recommended for the health of the projects. Meetings are not required to be formal, but to build community, communication channels, and rapport; for example, some students may choose to engage in a short formal meeting each week but meet informally for co-working on other days.

Code & Schematic Submissions
Functionality is key to success in computing, so it is **extremely important** that the guidelines are followed. Failure to follow these instructions will result in penalties.

1) Code must compile / run in debug and release mode, and schematics must be error-free. Debug information should never be released in the final version of a software project. **Projects that do not compile AND run will be marked zero**.

2) Include only those files specified by the documents in your archives. Projects should have only directory structure explicitly mentioned in the documentation (i.e., relevant files and folders should be submitted in the root of the zip file.) It should be possible to open the archive, copy your files directly into the project, compile, and then run the project without further steps. Packaging errors will result in a grade of **zero**.

Course Expectations
Academic Dishonesty will be dealt with strictly. Sharing / copying, "borrowing" of code structure, discussing code structure, looking at code from another student or providing such code, and plagiarism, in addition to other dishonest behaviors, are all considered academic dishonesty. Absolutely no information regarding assignment solutions may be shared by students except at a conceptual level. If students implement algorithms from other sources, they must cite those sources. Students may not copy code from the Internet or other sources under any circumstances. Any student found to have violated these rules, whether a provider or receiver or unauthorized help, will be assigned a **grade of E (failing) in the course** and referred to the Honor Court. **When in doubt, ask.**

Grade reviews must be requested within one week of a grade being posted. After two weeks, no grade will be revisited. In the event of a grade review, the entire assignment will be reviewed.

All assignments are due by the time listed on Canvas. Projects and homework with a cascading deduction: one (1) weekday late for 10% penalty; two (2) for 25% penalty; or three (3) for 50% penalty.

Students should visit office hours for project help and grade questions. Online students should make plans to be chat with a TA during scheduled office hours or try to arrange an appointment with the TA or instructor. Do not send email to, send private messages to, or "@" instructors or TAs about project help or grades. The TAs and instructor will often try to answer questions when possible in chat, but the way to get personalized help is to visit or make arrangements!

Students should not distract others in class. Students are not compelled to attend against their will. Students should refrain from watching videos; playing games; talking; sleeping; howling; biting toe nails; screeching like a banshee; and other distracting behaviors in lecture or lab.

Important correspondence (other than project help) should be engaged via email. In particular, the chat system is helpful for simple questions and allows students to help one another, but students should not expect a response to important questions via chat. Please allow 48 business hours for a response; the instructor and TAs have many responsibilities and respond to messages as efficiently as is practical.

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
• Your academic advisor or Graduate Program Coordinator
• Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources

Health and Wellness

U Matter, We Care:
Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

E-learning technical suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall*,* 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus*:* https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints*:* http://www.distance.ufl.edu/student-complaint-process.