ENAE 380 Fall 2024

Flight Software Systems

M/W, 12:00 pm - 12:50 pm

Associate Professor Mumu Xu (She/Her/Hers)

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Office Hours: By appointment. Just send an email with request to meet.
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Course Description: Avionics using advanced sensor and computing technologies are at the heart of every modern aerospace vehicle. Advanced software systems improve cockpit safety and enable unmanned and deep-space missions. Object-oriented programming and software engineering concepts required to design and build complex flight software systems will be discussed. Other discussions include software validation, verification, real-time performance analysis to assess flight software system reliability and robustness; human-machine interfaces designed for piloted systems; automatic onboard data acquisition and decision-making for unmanned air and space vehicles.

Credit Hours: 3

Text(s): No textbook. All course content will be in the class lectures (slides will be posted online following lecture). Google is your friend.

Grade Distribution (approximately):

Homework/Labs	30%
Midterm	25%
Project Proposal	5%
Final Project (Code, report, and presentation)	40%

Homework/Lab Policy:

Every student will have 7 late days to use on their homework assignments. They can be used all at once or throughout the semester. You do not need to ask permission to take them. However, any homework turned in late after your 7 excused days are used will NOT be accepted unless (1) there is a medical reason as justified by a doctor's note; or (2) personal/family circumstances as documented from a dean or another faculty/staff member. To be clear, conflicts in other classes, including assignments/exams in other classes, are not considered to be excuses for additional late days beyond your 7 excused days. You must use your 7 late days first before you can request further extensions. Late days cannot be used for anything related to the final project, including the project proposal.
We will be using Piazza for class discussion, questions, and answers. Posting of materials and course-related announcements will still be made through Elms. The system is highly catered to getting you help fast and efficiently from classmates, the TFs, and myself. Rather than emailing questions to the teaching staff, post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. Sign up for our class page at: piazza.com/umd/fall2024/enae380

We will NOT allow for re-submissions if you submit the wrong version of your homework assignment, or submit a blank assignment. Please check to make sure that you submitted the correct version of your assignment.

Absences:

"For medically necessitated absences: Students may, one time per course per semester, provide a self-signed excuse as documentation of an absence from a single class (e.g., lecture, recitation, or laboratory session) that does not coincide with a major assessment or assignment due date. For all other medically necessitated absences, a course instructor may request that students provide documentation from a physician or the University Health Center to verify an absence. In cases where students are asked to provide verification, the course instructor may request the dates of treatment or the time frame that the student was unable to meet academic responsibilities, but may not request diagnostic information."

Academic Honesty:

For UMD course policies, please refer to the following: http://www.ugst.umd.edu/courserelatedpolicies.html

Academic integrity is an important value for our community. Because of this, we have high standards for behavior. Academic dishonesty is prohibited. All students are subject to the requirements of the Code of Academic Integrity and are responsible for upholding these standards for this course. It is very important for all students to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. If you have any questions about whether something is unauthorized, please contact the instructor.

Be reasonable. We encourage you to interact with classmates to better understand the course material. For homework, unless explicitly stated as a group project, you must submit your own work. You may ask for help and give help to others so long as that help does not reduce to doing the work for the other person. If you are asking for help from someone, you may show your code to others, but you may not view theirs. Incorporating parts of code that you find online or elsewhere is permissible as long as you cite the origins, and those snippets are not the entirety (or majority) of the solution to the assigned problem.

Collaboration on exams is not permitted.

Diversity and Inclusion Statement: This classroom is a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, national origins, religious affiliations, sexual orientations, ability – and other visible and non-visible differences. All members of this class are expected to contribute to a welcoming and inclusive environment for every other member of the class (including instructors and teaching fellows), an environment in which diversity, opinions, unique perspectives, and others' worldviews are respected.

Week	Tentative Course Outline
Week 1	• 8/26: Lecture 1 – Introduction to Python I • 8/28: Lecture 2 – Introduction to Python II
Week 2	• *9/2: Labor Day (No Class)* • 9/4: Lecture 3 – Introduction to Python III • **Lab 1: Python Basics**
Week 3	• 9/9: Lecture 4 – Sorting and Complexity • 9/11: Lecture 5 – Object Oriented Programming • **Lab 2: Sorting and OOP**
Week 4	• 9/16: Lecture 6 – Logic Gates and Hexadecimal • 9/18: Lecture 7 – Data Types • **Lab 3: Logic and Data Types**
Week 5	• 9/23: Lecture 8 – Search Algorithms • 9/25: Lecture 9 – GPS • **Lab: Jeopardy**
Week 6	• 9/30: Midterm Review • 10/2: Midterm • **No Lab**
Week 7	• 10/7: Lecture 10 – Digital Signal Processing • 10/9: Lecture 11 – Fast Fourier Transform • **Lab 4: DSP and FFT**
Week 8	• 10/14: Project Review • 10/16: Project Review • **No Lab**
Week 9	• 10/21: Lecture 12 – Image Processing I • 10/23: Lecture 13 – Image Processing II • **Lab 5: Image Processing**
Week 10	• 10/28 Lecture 14 – Path Planning I • 10/30: Lecture 15 – Path Planning II • **Lab 6: Path Planning**
Week 11	• 11/4: Lecture 16 – Filtering • 11/6: Lecture 17 – Verification and Validation • **No Lab**
Week 12	• 11/11: Lecture 18 – Introduction to Machine Learning • 11/13: Lecture 19 – ML and Python • **Lab 7: ML and Python**
Week 13	• 11/18: Lecture 20 – ML Applications to Air • 11/20: Lecture 21 – ML Applications to Space • **Lab 7: ML and Python continued**
Week 14	• *11/25: No Class* • *11/27: No Class*
Week 15	• 12/2: Special Topics – Guest Lecture (remote) • 12/4: Special Topics – Guest Lecture (remote)
Week 16	• 12/9: Final Presentations • **12/17(ish): Final Reports Due**