AE 030 - Computer Programming for Aerospace Engineers, Fall 2019

Instructor Information: Professor Long Lu
Long.Lu@sjsu.edu

ISA (Grader): Derek Chen

Credit: 2 units

Class Times & Locations: Section 01 (Lecture): M 13:30-14:20 in ENG 331
Section 03 (Lab): M 9:00-11:50 in ENG 407
Section 04 (Lab): W 9:00-11:50 in ENG 407
Section 05 (Lab): W 13:30-16:20 in ENG 407

Office Hours & Locations: M & W 8:00-9:00 in ENG 407

Prerequisites: None

Textbooks: [1] Attaway, Stormy, *MATLAB: A Practical Introduction to Programming and Problem Solving*, Elsevier.

[2] Kernighan, Brian W., and Ritchie, Dennis M., *The C Programming Language,* Prentice Hall.

Course Description:

Introduction to the fundamentals of programming in MATLAB-Simulink and C. Topics in MATLAB programming include variables, characters and encoding, vectors and matrices, inputs and outputs, user-defined functions, selection and loop statements, modular programming, debugging, and plotting techniques. Topics in Simulink include block diagrams, libraries, wiring techniques, modeling, and simulations. Topics in C programming include variables, data types, operators, expressions, statements, inputs and outputs, arrays, functions, arguments, control flow, and program structure.

Course Goals:

Introduce students to:

1. Developing algorithms, pseudocode, and flowcharts
2. Writing, compiling, analyzing, and debugging computer programs in MATLAB-Simulink and C
3. Applying computer programming in solving aerospace engineering problems

Course Learning Objectives:

Upon successful completion of this course, students should be able to:

1. Develop algorithms, pseudocode, and flowcharts
2. Define and manipulate variables in MATLAB
3. Define, index, and manipulate vectors and matrices in MATLAB
4. Write, compile, analyze, and debug user-defined functions in MATLAB
5. Incorporate selection and loop statements in MATLAB
6. Utilize modular programming to write a program in MATLAB
7. Plot and interpret data in MATLAB
8. Draw and interpret block diagrams
9. Derive transfer functions from block diagrams
10. Construct block diagrams in Simulink
11. Model and simulate dynamical systems in MATLAB and Simulink
12. Define variables, data types, operators, and expressions in C
13. Define and utilize control flow in C
14. Write, compile, analyze, and debug programs in C
15. Work effectively in teams to define, propose, and solve an aerospace engineering problem utilizing MATLAB-Simulink and/or C programming

Grading:

Laboratory reports (12 x 40 points):		480 points
Examinations (2 x 100 points):		200 points
Course project:		320 points
• Project proposal presentation:	40 points	
• Project progress presentation:	40 points	
• Final project presentation:	40 points	
• Final project report:	200 points	
Total:		1000 points

Grading Scale:

- Total ≥ 950 points: A+
- Total ≥ 900 points: A
- Total ≥ 850 points: A-
- Total ≥ 800 points: B+
- Total ≥ 750 points: B
- Total ≥ 700 points: B-
- Total ≥ 670 points: C+
- Total ≥ 650 points: C
- Total ≥ 630 points: C-
- Total ≥ 600 points: D
- Total < 600 points: F

Course Project:

- Students will be working in groups to provide computer-programming support, utilizing MATLAB-Simulink and/or C, to one of our senior design teams (aircraft or spacecraft teams depending on their interest and the availability of senior projects). Details will be announced in class.
- Students must follow the AIAA technical conference paper format for their final project reports.
- Each group must submit a final project report to Canvas for originality check.
- Each group must also submit a zipped code folder which contains all MATLAB/Simulink and/or C files to Canvas for verification.
- The deadline to submit your final project reports and code folders to Canvas is **Monday 12/09/2019 by 11:59 PM**.

Important Notes:

1. All examinations must be taken in order to receive a passing grade.
2. No make-up examinations will be granted without a valid reason and proof.
3. All assignments are individual-effort assignments unless otherwise noted. Students are encouraged to have intellectual discussions about the assignment problems. However, all students must prepare and submit their own solutions to the assignment problems which reflect their understanding and problem-solving methodologies. Any form of cheating or plagiarism such as copied/shared answers or code will not be tolerated.
4. Laboratory assignments will typically be posted on Canvas after Monday lectures and due on the following Friday by 11:59 PM to Canvas. Please check our class schedule for more details.
5. All submissions are final after the deadlines. Please check to make sure that you have submitted the correct files before the Canvas assignment submission portals are closed.
6. No late submissions will be accepted.

SJSU & AE Department Policies:

- Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at <http://www.sjsu.edu/gup/syllabusinfo/>.

- AE Department and SJSU policies are also posted at <http://www.sjsu.edu/ae/programs/policies>.

Approximate Schedule

	Mon Lab	Lecture	Wed Labs	Lab Assignment Due
Week 1	Welcome to AE 030!			
Week 2 **M 08/26** **W 08/28**	**No lab on M 08/26**	Lecture 1: Algorithms, Pseudocode, and Flowcharts	Lab 1	
Week 3 **M 09/02** **W 09/04**	**No lab on M 09/02 Labor Day**	**No lecture on M 09/02 Labor Day**	Lab 1 (cont.)	
Week 4 **M 09/09** **W 09/11**	Lab 1	Lecture 2: Introduction to MATLAB	Lab 2	Lab 1 due on **F 09/13 by 11:59 PM** to Canvas
Week 5 **M 09/16** **W 09/18**	Lab 2	Lecture 3: Vectors and Matrices	Lab 3	Lab 2 due on **F 09/20 by 11:59 PM** to Canvas
Week 6 **M 09/23** **W 09/25**	Lab 3	Lecture 4: Introduction to MATLAB Programming	Lab 4	Lab 3 due on **F 09/27 by 11:59 PM** to Canvas
Week 7 **M 09/30** **W 10/02**	Lab 4	Lecture 5: Selection Statements in MATLAB	Lab 5	Lab 4 due on **F 10/04 by 11:59 PM** to Canvas
Week 8 **M 10/07** **W 10/09**	Lab 5	Lecture 6: Loop Statements and Vectorizing Code in MATLAB	Lab 6	Lab 5 due on **F 10/11 by 11:59 PM** to Canvas

Week 9 **M 10/14** **W 10/16**	Project Proposal Presentations Lab 6	Lecture 7: MATLAB Programs and Plotting Techniques	Project Proposal Presentations Lab 7	Lab 6 due on **F 10/18 by 11:59 PM** to Canvas
Week 10 **M 10/21** **W 10/23**	**Lab 7**	**Lecture 8: Fundamentals of System Modeling and Simulation with Simulink**	**Lab 8**	Lab **7** due on F 10/25 by 11:59 PM to Canvas
Week 11 **M 10/28** **W 10/30**	**Exam 1** Lab 8	Lecture 9: Introduction to C Programming	**Exam 1** Lab 9	Lab 8 due on **F 11/01 by 11:59 PM** to Canvas
Week 12 **M 11/04** **W 11/06**	Project Progress Presentations Lab 9	Lecture 10: Conditional Statements in C	Project Progress Presentations Lab 10	Lab 9 due on **F 11/08 by 11:59 PM** to Canvas
Week 13 **M 11/11** **W 11/13**	**No lab on M 11/11 Veteran's Day (Observed)**	**No lecture on M 11/11 Veteran's Day (Observed)**	Lab 10 (cont.)	
Week 14 **M 11/18** **W 11/20**	Lab 10	Lecture 11: Loop Statements in C	Lab 11	Lab 10 due on **F 11/22 by 11:59 PM** to Canvas
Week 15 **M 11/25** **W 11/27**	Lab 11	Lecture 12: Functions & Modular Programming in C	**No lab on W 11/27 Non-Instructional Day**	Lab 11 due on **F 11/29 by 11:59 PM** to Canvas
Week 16 **M 12/02** **W 12/04**	Exam 2 Final Project Presentations Lab 12	In-class activities	Exam 2 Final Project Presentations Lab 12	Lab 12 due on **F 12/06 by 11:59 PM** to Canvas
Week 17 **M 12/09**	Final project reports and code folders are due on **Monday 12/09/2019 by 11:59 PM** to Canvas.			