AE 030 - Computer Programming for Aerospace Engineers

Instructor Information:	Professor Long Lu Long.Lu@sjsu.edu
Credit:	2 units
Class Times & Locations:	Section 01 (Lecture): M 16:30-17:20 in CL 226 Section 02 (Lab): M 17:30-20:20 in ENG 407 Section 03 (Lab): W 17:30-20:20 in ENG 407
Office Hours & Locations:	M and W 20:20-21:20 in ENG 407
Prerequisites:	None
Textbooks:	[1] Attaway, Stormy, *MATLAB: A Practical Introduction to Programming and Problem Solving,* 3rd ed., Elsevier Inc., 2013. [2] Kernighan, Brian W., and Ritchie, Dennis M., *The C Programming Language,* 2nd ed., Prentice Hall, NJ, 1988.

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 and 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 (CLOs):

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 dynamic systems in 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 programming

Course Relationship to BSAE Program Outcomes[1]:

CLOs	A	B	C	D	E	F	G	H	I
1, 4, 6, 8, 10-11, 14	✱✱		✱✱✱	✈	✈				✱✱
2-3, 5, 7,9,12-13	✱✱								✱✱
15	✱✱		✱✱✱	✈	✈	✈	✈	✱✱	✱✱✱

- ✱✱: skill level 3 or 4 in Bloom's taxonomy[2]
- ✱✱✱: skill level 5 or 6 in Bloom's taxonomy
- ✈ : skill addressed but not assessed

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[1] BSAE Program Outcomes: available at < http://www.sjsu.edu/ae/programs/bsae/bsae_program_outcomes/>

[2] Bloom's Taxonomy: available at < https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/>

Grading:

Laboratory reports (12x40 points):		480 points
Examinations (2x100 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:

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

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 during class throughout the semester.

- 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 **Tuesday 12/12/2017 by 11:59 PM**.

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. Laboratory assignments will be posted on Canvas after Monday lectures and typically due the following Friday by 11:59 PM to Canvas. Please check our class schedule for more details.

4. No late submissions will be accepted.

Approximate Schedule

	Lecture	Laboratory	Note
Week 1 W 08/23	Welcome to AE 030		
Week 2 M 08/28 W 08/30	Lecture 1: Algorithms, Pseudocode, and Flowcharts	Lab 1: Algorithms, Pseudocode, and Flowcharts	
Week 3 M 09/04 W 09/06	**M 09/04: Labor Day-Campus Closed**	Lab 1: Algorithms, Pseudocode, and Flowcharts *(cont.)*	
Week 4 M 09/11 W 09/13	Lecture 2: Introduction to MATLAB	Lab 2: Introduction to MATLAB	Lab 1 report due **F 09/15 by 11:59 PM** to Canvas
Week 5 M 09/18 W 09/20	Lecture 3: Vectors and Matrices	Lab 3: Vectors and Matrices	Lab 2 report due **F 09/22 by 11:59 PM** to Canvas
Week 6 M 09/25 W 09/27	Lecture 4: Introduction to MATLAB Programming	Lab 4: Introduction to MATLAB Programming	Lab 3 report due **F 09/29 by 11:59 PM** to Canvas
Week 7 M 10/02 W 10/04	Lecture 5: Selection Statements in MATLAB	Lab 5: Selection Statements in MATLAB	Lab 4 report due **F 10/06 by 11:59 PM** to Canvas
Week 8 M 10/09 W 10/11	Lecture 6: Loop Statements and Vectorizing Code in MATLAB	**Project Proposal Presentations** Lab 6: Loop Statements and Vectorizing Code in MATLAB	Lab 5 report due **F 10/13 by 11:59 PM** to Canvas
Week 9 M 10/16 W 10/18	Lecture 7: MATLAB Programs and Plotting Techniques	Lab 7: MATLAB Programs and Plotting Techniques	Lab 6 report due **F 10/20 by 11:59 PM** to Canvas
Week 10 M 10/23 W 10/25	Lecture 8: Introduction to Dynamical Systems and Simulink	Lab 8: Introduction to Dynamical Systems and Simulink	Lab 7 report due **F 10/27 by 11:59 PM** to Canvas
Week 11 M 10/30 W 11/01	Lecture 9: Introduction to C Programming	**Exam 1 (MATLAB & Simulink)** Lab 9: Introduction to C Programming	Lab 8 report due **F 11/03 by 11:59 PM** to Canvas
Week 12 M 11/06 W 11/08	Lecture 10: Conditional Statements in C	**Project Progress Presentations** Lab 10: Conditional Statements in C	Lab 9 report due **Sat 11/11 by 11:59 PM** to Canvas
Week 13 M 11/13 W 11/15	Lecture 11: Loop Statements in C	Lab 11: Loop Statements in C	Lab 10 report due **F 11/17 by 11:59 PM** to Canvas

Week 14 M 11/20 W 11/22	Lecture 12: Functions and Modular Programming in C	Lab 12: Functions and Modular Programming in C **(No lab on W 11/22: non-instructional day)**	
Week 15 M 11/27 W 11/29	In-class activities	**Exam 2 (C Programming)** Lab 12: Functions and Modular Programming in C *(cont.)*	Lab 11 report due **F 12/01 by 11:59 PM** to Canvas
Week 16 M 12/04 W 12/06	Project Q&A	**Final Project Presentations**	Lab 12 report due **F 12/08 by 11:59 PM** to Canvas
Week 17 M 12/11 **T 12/12**	**No class on Monday 12/11/2017. Please work on your project.** **Final project reports and code folders are due Tuesday 12/12/2017 by 11:59 PM to Canvas.**		

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>.