USC Viterbi School of Engineering

AME 341aL Mechoptronics Laboratory

Units: 3

Term: Summer 2022 W May 18th – T June 28th

Location: Lecture T/Th 9-11a GFS 201
Lab W 9a-1p BHE 301
*** first class (W May 18) 9a-1p in GFS 201***
See course Blackboard page
http://software.usc.edu/ (install Matlab)

Instructor: **Akshay Potnuru**
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Course Schedule

Wk.	Date	(Lecture #) Topics Covered	Assignments Due 1 Week After Lab (Contents) {Required elements}
1	W 5/18	(0) The Basic Ideas, Error Analysis I, Matlab **First class in GFS 201, 9a-1p**	A0: Hello (Graphical) World {Matlab}
	Th 5/19	(1) Error Analysis II	
2	T 5/24	(2) How to Communicate, MS-Word for Engineers	A1: Uncertainty analysis, Report (M&M, Results, Conclusion) {MS-Word equation editor}
	W 5/25	**LAB** - Blocks	
	Th 5/26	(3) Elements of Electronics, Linear Circuits I	
3	T 5/31	(4) Linear Circuits II	A2: Quantitative Reasoning A2.5: Linear Circuits
	W 6/1	**LAB** - Real and Virtual Instruments + Circuits	
	Th 6/2	(5) 1st Order Systems I	
4	T 6/7	(6) 1st Order Systems II, Matlab for Engineers	A3: Full Written Technical Report (Abstract, Intro, M&M, Results/Discussion, Conclusion) {Matlab}
	W 6/8	**LAB** - 1st Order Systems (RC Filters)	
	Th 6/9	(7) Digital Circuits, Digital Signal Processing I	
5	T 6/14	(8) Digital Signal Processing II	A4: Report (Results/Discussion) {Matlab}
	W 6/15	**LAB** - Signal Analysis (Time and Frequency Domain)	
	Th 6/16	(9) Op-Amps I	
6	T 6/21	(10) Op-Amps II, Excel for Engineers	A5: Spreadsheet Analysis (Results/Discussion, Conclusion) {MS-Excel}
	W 6/22	**LAB** - Operational Amplifiers	
	Th 6/23	(11) What have we done? Course Summary	
7	T 6/28	Lab Practical (held in lab)	

Course Description

A coordinated laboratory and lecture sequence on aeromechanical instrumentation and device control stressing the symbolic integration of mechanical, optical and electronic components. This course is intended for junior level aerospace and mechanical engineering students, and is designed to develop self-sufficient, capable, and critically thinking engineers.

Learning Objectives

AME 341aL teaches the basics of aerospace and mechanical experimentation; this includes how to make a measurement, perform analysis, and report on technical findings. Laboratory experiments introduce the students to a variety of digital and analog measurement devices and often require the construction of basic circuits; the physical nature of these devices are presented during the lecture section, and the capabilities and limitations are explored during the laboratory section. Assignments focus on clarity in technical communication. Diligent data collection followed by detailed data analysis is required, where Matlab and MS-Excel computational methods are employed. The results are then communicated in a written technical format of publishable quality.

Prerequisite(s):	MATH 126, PHYS 152
Co-Requisite (s):	n/a
Concurrent Enrollment:	n/a
Recommended Preparation:	n/a

Course Content and Discussion Forum

This course will use Piazza for all class discussions. Refrain from emailing questions related to assignments, midterms, etc., and instead **use Piazza**. The TA, myself and even you can answer questions as they arise, thus providing an efficient means for communication. If you have issues accessing the Piazza, contact team@piazza.com directly. Before the semester begins, verify that you have access to these websites; Piazza is accessed from within the Blackboard page. **Recommended download**: Piazza App for phones. It works!

Technological Proficiency and Hardware/Software Required

Matlab: student license available at http://software.usc.edu/; also available in the Mechoptronics Lab (BHE 301). **MS-Office**: student license available at https://itservices.usc.edu/officestudents/. Students need to stay connected to the course Blackboard and Piazza webpages.

Required and Supplementary Materials

There are no "Required" text textbooks for AME 341aL. A course reader will be provided which includes background information related to the topics discussed during lecture and lab. The course reader supplements the topics covered in class; thus, by definition, it is not as detailed as the material presented during lecture and lab. There are several *optional* textbooks outlined below, but note there are several copies available for reading in BHE 301 (these copies are to remain in the lab):

(optional) Introduction to Mechatronics and Measurement Systems, Alciatore & Histand (2011) McGraw-Hill.
(optional) Theory and Design for Mechanical Measurements, Figliola & Beasley (2010) Wiley.
(optional) The Art of Electronics, Horowitz & Hill (1989) Cambridge University Press.

Description and Assessment of Assignments

There will be one Lab Practical examination given on the last day of classes, **Tuesday, June 28th**. The remainder of the course assignments will be based on experiments conducted in lab (every Wednesday). All assignments are typically due within one week, unless otherwise noted. All assignments will be produced using a technical report writing style, which will be detailed during lecture. Data analysis will be performed using Matlab and MS-Excel, as required.

Grading Breakdown

Assignment	% of Grade
A0	5
A1	11
A2	9
A3	19
A4	13
A5	13
Lab Practical Exam	25
Lab Performance	5
Total	**100**

Assignment Submission Policy

Each assignment is due within one week of the lab, **before** class begins, as specified at lab time or in class announcements. All submissions are Electronic documents, which must be submitted through Blackboard via **TurnItIn**. They must be submitted on time. A late assignment will be docked 50% and no assignment will be accepted after 9am on the day following the due date. One microsecond ($1\ \mu s$) late is considered late and there are no exceptions. For similar reasons, there are no make-up labs. All labs will count towards the total grade (*i.e.*, none are dropped). Absences for medical reasons must be justified with some reasonable evidence. It is not possible to pass the course if you are missing two or more assignments or any labs.

Additional Policies

See the Mechoptronics course reader for all policies, codes of conduct, and expectations. Read that in full.

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* https://scampus.usc.edu/b/11-00-behavior-violating-university-standards-and-appropriate-sanctions/, and **view the guidelines presented in Appendix A at the end of this document**. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety of the whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage http://sarc.usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://dsp.usc.edu/ provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* http://emergency.usc.edu will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Appendix A: Academic Dishonesty Sanction Guidelines

Violation	USC - Recommended Sanction for Undergraduates*	AME - Recommended Sanction for Undergraduates and Graduates
Copying answers from other students on any course work.**	F for course.	First offense: F on assignment. Second offense: F for course.
One person allowing another to cheat from his/her exam or assignment.	F for course for both persons.	If assignment: First offense: F on assignment. Second offense: F for course. If exam: F for course.
Possessing or using material during exam (crib sheets, notes, books, etc.) which is not expressly permitted by the instructor.	F for course.	First offense: F on exam. Second offense: F for course.
Continuing to write after exam has ended.	F for course.	F on exam
Taking exam from room and later claiming that the instructor lost it.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Changing answers after exam has been returned.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Fraudulent possession of exam prior to administration.	F for course and recommendation for suspension.	F for course
Obtaining a copy of an exam or answer key prior to administration.	Suspension or expulsion from the university; F for course.	F for course
Having someone else complete course work for oneself.	Suspension or expulsion from the university for both students; F for course.	F for course
Plagiarism — Submitting other's work as one's own or giving an improper citation.	F for course.	First offense: F on assignment. Second offense: F for course.
Submission of purchased term papers or papers done by others.	F for course and recommendation for further disciplinary action (possible suspension).	F for course
Submission of the same assignment to more than one instructor, where no previous approval has been given.	F for both courses.	F for both courses
Unauthorized collaboration on an assignment.	F for the course for both students.	First offense: F on assignment. Second offense: F for course.
Falsification of information in admission applications (including supporting documentation).	Revocation of university admission without opportunity to reapply.	Revocation of university admission without opportunity to reapply.
Documentary falsification (e.g., petitions and supporting materials; medical documentation.)	Suspension or expulsion from the university; F for course when related to a specific course.	Suspension or expulsion from the university; F for course when related to a specific course.
Plagiarism in a graduate thesis or dissertation.	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***	Expulsion from the university when discovered prior to graduation; revocation of degree when discovered subsequent to graduation.***

*Assuming first offense
**Exam, quiz, tests, assignments or other course work.
***Applies to graduate students