

**San José State University
Aerospace Engineering**

AE 200, Engineering Analysis and Control of Aerospace Systems, Spring 2019

Course and Contact Information

Instructor:	Dr. Lucía Capdevila
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Office Hours:	Mondays: 11:00 – 12:00, 13:30 – 15:30, Wednesdays 11:00 – 12:00 and 14:00-15:00
Class Days/Time:	Mondays and Wednesdays 16:30 – 17:45
Classroom:	Engineering Building 329
Prerequisites:	BSc degree in Aerospace Engineering

Faculty Web Page and Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>. You are responsible for regularly checking the email address listed in your [MySJSU](http://my.sjsu.edu) at <http://my.sjsu.edu> profile and the [Canvas Inbox](#) to learn of any updates.

Course Description

Engineering analysis and control; Linear algebra; Ordinary differential equations; Laplace Transformation; Complex analysis; Singular values; Matrix perturbations; and observability; Feedback stabilization; H₂ and H_∞ optimization.

Course Goals

1. Outline engineering analysis problems with emphasis on advanced level mathematics and control theory and aerospace systems.
2. Investigate of aerospace systems that evolve with time. Typically, these systems have inputs and outputs; it is of interest to understand how the input affects the desired output).
3. In particular, concentrate on systems that can be modeled by Ordinary Differential Equations (ODEs), and that satisfy certain linearity and time-invariance conditions.

Course Learning Outcomes (CLO)

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

1. Outline analysis skills in real and functional analysis, complex analysis methods.
2. Investigate the response of these systems to inputs and initial conditions from the control theory perspective.

3. Analyze systems obtained as interconnections (e.g., feedback) of two or more other systems.
4. Derive (control) systems (and properties) that ensure desirable properties (e.g., controllability, observability, stability, performance) of the interconnection.
5. Analyze least squares solutions to linear problems.
6. Explain singular values and matrix perturbations.
7. Derive solutions to state space models
8. Derive input output relationships and transfer functions between systems.
9. Analyze input output stability of control systems.
10. Use Bode's sensitivity integral to outline robust stability.
11. Formulate reachability and observability.
12. Use minimal and balanced realizations.
13. Outline H2 and Hinf. optimization in control systems.

Required Texts/Readings

Textbook

Kreyszig, E., Norminton, H., Kreyszig, Herbert, & Norminton, E. J. (2011). *Advanced engineering mathematics* (10th ed.). Hoboken, NJ: John Wiley.

Availability: The textbook is available as a Course Reserve at the [SJSU Dr. Martin Luther King Jr. Library](#) and the 10e edition is available for purchase at the [SJSU Spartan Bookstore](#).

Other Readings

Notes and handouts.

Course Requirements and Assignments

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Final Examination or Evaluation

A comprehensive written final examination will be administered during the university's final exam week. See Schedule for details.

Grading Information

Determination of Grades

- Grade Scale:
100 to 97% A+; 96.9 to 93% A; 92.9 to 90% A-; 89.9 to 87% B+; 86.9 to 83% B; 82.9 to 80% B-; 79.9 to 77% C+; 76.9 to 73% C; 72.9 to 70% C-; 69.9 to 67% D+; 66.9 to 63% D; 62.9 to 60% D-; less than 59.9% F
- Grade Components and Distribution:
 - Homework assignments: 30 %

- Exams: 70 %
- All exams must be taken to receive a passing grade.
- All assignments will be submitted via [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com> by the due date posted on Canvas.
- Late work is not accepted for credit without a valid justification and proper documentation.
- Extra credit opportunities will be announced in class.

Classroom Protocol

It is expected that everyone will treat each other and themselves with the highest respect at all times. We all benefit from each other's contributions to the class, so everyone's timely attendance and participation are also expected.

University Policies

Each student is responsible for reviewing the information listed at the

- [Office of Graduate and Undergraduate Program's Syllabus Information Page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>
 - [AE Program Policies Page](http://www.sjsu.edu/ae/programs/policies/) at <http://www.sjsu.edu/ae/programs/policies/>
- and let the instructor know if you have any questions

AE 200 / Engineering Analysis and Control of Aerospace Systems, Spring 2019, Course Schedule

The following is an approximate course schedule that is subject to change with fair notice given during class and/or via email and/or Canvas messaging.

Course Schedule

Date	Topics
01/28/19	ODEs
01/30/19	ODEs
02/04/19	ODEs
02/06/19	ODEs
02/11/19	ODEs
02/13/19	ODEs
02/18/19	ODEs
02/20/19	ODEs
02/25/19	Laplace Transforms
02/27/19	Exam 1
03/04/19	Laplace Transforms
03/06/19	Linear Algebra
03/11/19	Linear Algebra
03/13/19	Linear Algebra
03/18/19	Linear Algebra
03/20/19	Fourier Analysis
03/25/19	Fourier Analysis
03/27/19	Exam 2
04/01/19	No instruction (SJSU Spring Break)
04/03/19	No instruction (SJSU Spring Break)
04/08/19	PDEs
04/10/19	PDEs
04/15/19	Complex Analysis
04/17/19	Complex Analysis

Date	Topics
04/22/19	Complex Analysis
04/24/19	Complex Analysis
04/29/19	Numerical Analysis: Linear Algebra
05/01/19	Numerical Analysis: Linear Algebra
05/06/19	Numerical Analysis: ODEs
05/08/19	Numerical Analysis: ODEs
05/13/19	Control topics
05/17/19	Final Exam 14:45 - 17:00 in classroom (as listed on the Final Exam Schedule - Spring 2019)