

**San José State University  
Aerospace Engineering Department  
AE 166, Rocketry, Spring 2018**

**Course & Contact Information**

<i>Instructor:</i>	Joseph Rodriguez
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<i>Class Days / Time:</i>	F 13:30 – 16:15
<i>Classroom:</i>	Lecture: E164, Lab: TBD
<i>Prerequisite:</i>	AE 165
<i>Credit:</i>	3 units
<i>Text:</i>	Instructor Notes

**Course Description**

Introduction to rocketry through theory, computer simulations, and development / launch of an amateur level rocket. Topics include basic principles of aerodynamics, vehicle structures, rocket propulsion, flight mechanics, avionics, as well as past and current launch vehicle technologies.

**Course Learning Objectives**

1. Explain the history and current purpose of launch vehicles in industry.
2. Explain Newton's Laws and how they apply to launch vehicles.
3. Define and estimate the aerodynamic forces of a launch vehicle.
4. Define and calculate the center of gravity and the center of pressure of a launch vehicle.
5. Explain the in-flight dynamics and safety hazards of launch vehicles.
6. Determine the flight stability of a launch vehicle.
7. Define the chemical components of a solid and liquid rocket motor.
8. Describe average thrust vs. impulse and thrust plots.
9. Explain the solid rocket motor naming convention.
10. Explain how rocket altimeters and accelerometers work.
11. Define the components of a launch vehicle and explain their purpose.
12. Use a simulation tool to approximate the flight trajectory of a rocket.
13. Present, launch, and recover a fully developed amateur level rocket.

## Course Requirements & Grading

### *Assignments & Exams*

	<u>Points</u>
2 Quizzes x 100 points each	200
Tripoli Level 2 Practice Exam	150
College Tutorial & Pass Quiz for Hazardous Materials	50
Engineering Rocket Report	200
Amateur Rocket	200
<u>Launch &amp; Recovery: Level 1</u>	<u>200</u>
<i>Total Points</i>	<i>1,000</i>

### *Extra Credit*

Tripoli Level 2 Achieved (successful launch & recovery)	+150
Launch Date: April 21 <sup>st</sup> (optional May 19 <sup>th</sup> )	
<b>OR</b>	
Future Rocket Technology Assignment	+150

### *Quizzes*

There will be 2 quizzes, each with 50 multiple-choice questions. Questions are derived from the lectures and TRA Certification Rules.

### *Tripoli Level 2 Practice Exam*

50 multiple choice questions (25 Technical & 25 on Safety) worth 3 points each and derived from the Tripoli Level 2 Certification Study Guide.

### *Engineering Rocket Report*

A complete engineering report consisting of:

- Title Page
- Table of Contents
- Preflight Data Capture
- Introduction of engineering intent
- Construction techniques employed
- Dimensionally accurate plot of your launch vehicle showing the CG and CP
- Engineering explanation of the stability status
- Full avionics bay wiring diagram
- A plot of the simulated flight showing the approximate apogee
- Explanation of what iterations can improve launch vehicle performance
- One paragraph expressing project conclusions and lessons learned

***Amateur Rocket***

Develop and present a complete amateur rocket, ready for launch:

- Motor mount assembly
- Avionics demonstration
- Flight plan
- Recovery assembly
- Trajectory and tracking plan

***Launch & Recovery – Level 1***

Launch Date: Sat, April 15

100 points for a successful launch

100 points for successful recovery.

***Grading Scale***

90% +	A
80 to 89%	B
70 to 79%	C
60 to 69%	D
59% and below	F

**Approximate Weekly Schedule**

<u>Week</u>	<u>Topics</u>
1	Syllabus, Project Costs & Resources, & Engineering
2	A Brief History of Rocketry
3	Definitions, Components, Certification Rules, and Safety
4	Newton's laws, calculation of aerodynamic forces on rockets
5	<b>Quiz 1</b>
6	Center of gravity and center of pressure, in-flight dynamics of rockets; equation of motion
7	Avionics and recovery
8	Rocket propulsion; rocket thrust equation
9	<b>Quiz 2</b>
10	Open Rocket and RAS Aero Simulators
11	Open Forum: Tripoli Level 2 Practice Exam & Simulators <b>Open Rocket Report Due</b>
12	Review exam and amateur rocket due
13	<b>Launch Day</b> & launch day review (April 21)
14	Tripoli Level 2 Practice Exam
15	Current & future rocket technologies (E.C. assignment)
16	<b>Future technology assignment due</b>

**University 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](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

**AE Department Policies** may be found at: <http://www.sjsu.edu/ae/programs/policies/>

**Faculty Web Page and MySJSU Messaging**

*Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my faculty web page at <http://www.sjsu.edu/people/firstname.lastname> and/or on [Canvas Learning Management System course login website](http://www.sjsu.edu/canvas) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](http://my.sjsu.edu) at <http://my.sjsu.edu> (or other communication system as indicated by the instructor) to learn of any updates.*

**Associations & Clubs****Tripoli Rocketry Association (TRA)**

Membership, certification, motor classifications, and records  
[www.tripoli.org](http://www.tripoli.org)

**Tripoli Central California (TCC)**

Launch schedule, launch site location, and technical info  
[www.tccrockets.com](http://www.tccrockets.com)

**SJSU Rocket Club**

Membership, projects, events, vids, pics, etc  
[Studentorgs.sjsu.edu/rocketclub](http://Studentorgs.sjsu.edu/rocketclub)