

**San José State University  
Aerospace Engineering Department  
AE 166, Rocketry, Spring 2019**

**Course & Contact Information**

<b><i>Instructor:</i></b>	Joseph Rodriguez
<b><i>Office Location:</i></b>	401 Charcot ave. Office 012
<b><i>Email:</i></b>	<a href="mailto:Joseph.Rodriguez@sjsu.edu">Joseph.Rodriguez@sjsu.edu</a>
<b><i>Class Days / Time:</i></b>	F 1:30 – 4:15
<b><i>Classroom:</i></b>	Lecture: E401, Lab: 164
<b><i>Prerequisite:</i></b>	AE 165
<b><i>Credit:</i></b>	3 units
<b><i>Text:</i></b>	Introduction to Rocket Science and Engineering

**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 and document each process in an Engineering Report.
2. Explain the evolution and current purpose of launch vehicles in industry.
3. Derive the equations of motion for a launch vehicle
4. Estimate Aerodynamic forces at each phase of flight
5. Calculate the locations of Center of Pressure & Center of Gravity,
6. Given a specific launch vehicle, use a set of criteria to decide on the propellant to be used.
7. Select an appropriate altimeter and/or accelerometer for a high powered rocket
8. Present, launch, and recover a fully developed amateur level rocket.

**Course Requirements & Grading*****Assignments & Exams***

	<u>Points</u>
2 Quizzes x 50 points each	100
Tripoli Level 2 Practice Exam	50
5 Homework assignments	200
Engineering Rocket Report	250
Amateur Rocket Build	100
<u>Launch &amp; Recovery: Level 1</u>	<u>300</u>
<i>Total Points</i>	<i>1,000</i>

***Extra Credit***

Tripoli Level 2 Achieved (successful launch & recovery)	+100
Launch Date: April 21 <sup>st</sup> (optional May 19 <sup>th</sup> )	
<b>OR</b>	
Future Rocket Technology Assignment	+100

***Quizzes***

There will be 2 quizzes. Questions are derived from the textbook, lectures and TRA Certification Rules.

***Tripoli Level 2 Practice Exam***

50 multiple choice questions (25 Technical & 25 on Safety) worth 1 point 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
- Background of rocketry and statement 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
- Plots of the simulated flight showing all relevant information
- 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, March 16th

100 points for a successful launch

100 points for a successful “event”

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](#) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](#) 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)