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

Course & Contact Information

Instructor: Joseph Rodriguez
Office Location: 401 Charcot ave. Office 012
Email: Joseph.Rodriguez@sjsu.edu
Class Days / Time: F 1:30 – 4:15
Classroom: Lecture: E401, Lab: 164
Prerequisite: AE 165
Credit: 3 units
Text: 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

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
<table>
<thead>
<tr>
<th>Points</th>
<th>NASA</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Quizzes x 50 points each</td>
<td>100</td>
<td>councils</td>
</tr>
<tr>
<td>Tripoli Level 2 Practice Exam</td>
<td>50</td>
<td>councils</td>
</tr>
<tr>
<td>5 Homework assignments</td>
<td>200</td>
<td>councils</td>
</tr>
<tr>
<td>Engineering Rocket Report</td>
<td>250</td>
<td>councils</td>
</tr>
<tr>
<td>Amateur Rocket Build</td>
<td>100</td>
<td>councils</td>
</tr>
<tr>
<td>Launch &amp; Recovery: Level 1</td>
<td>300</td>
<td>councils</td>
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<tr>
<td><strong>Total Points</strong></td>
<td><strong>1,000</strong></td>
<td>councils</td>
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**Extra Credit**
- Tripoli Level 2 Achieved (successful launch & recovery) +100
- Launch Date: April 21st (optional May 19th)
- **OR**
  - 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
- Prelight 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**

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

Tripoli Central California (TCC)
Launch schedule, launch site location, and technical info www.tccrockets.com

SJSU Rocket Club
Membership, projects, events, vids, pics, etc Studentorgs.sjsu.edu/rocketclub