

# SPST330

**STUDENT WARNING:** This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

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## Course Summary

### Description

**Course Description:** This is a survey course of launch systems and re-entry principles that reviews the basic principles of rocket propulsion, and covers launch windows, times and locations, launch vehicles and their subsystems, the concept of staging, current launch systems, re-entry design including trade-offs and options, and ICBM re-entry systems.

#### Course Scope:

This is a survey course of launch systems and re-entry principles that reviews the basic principles of rocket propulsion, and covers launch windows, times and locations, launch vehicles and their subsystems, the concept of staging, current launch systems, re-entry design including trade-offs and options, and ICBM re-entry systems.

As an introductory survey course, the objectives of this class are geared towards gaining a conceptual understanding of these topics, rather than memorizing a lot of facts.

We will be using some mathematics, although all of the math in the class will be at the level of college algebra or below.

As noted in the course outline, there will be eight graded forums, three essays, a midterm exam, a final exam, and a final research paper.

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## Objectives

Upon completion of this course, the student will be able to:

1. Apply basic principles of rocket science to launch operations
2. Differentiate concepts of launch windows, launch times, and launch locations
3. Analyze launch vehicle subsystems and their key design issues
4. Apply the principles of rocket staging to a specific example
5. Analyze current launch systems being used by the U.S. and other countries
6. Differentiate the competing design requirements for re-entry vehicles
7. Deconstruct the basic vehicle options and trade-offs in re-entry design and trajectory options
8. Analyze ICBM re-entry systems (unclassified discussion)

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# Outline

## Week 1: Review of Propulsion Principles

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### Course Objectives

CO-1: Apply basic principles of rocket science to launch operations

### Readings

eBook pages:

4 - 24

99 - 107

### Assignment

Forum Post #1: two parts:

(1) personal introduction, and

(2) briefly discuss how Newton's Third Law and The Ideal Rocket Equation apply to launch operations

## Week 2: Launch Windows, Times and Locations

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### Course Objectives

CO-2: Differentiate concepts of launch windows, launch times, and launch locations

### Readings

eBook pages:

64 - 80,

188 - 195

### Assignment

Forum Post #2: Choose one of these three topics:

- Discuss why U.S. launch vehicles launch primarily from the East and West Coast of the U.S.
- Discuss why the European Space Agency (and now in some cases, Russia) launches out of Kourou in French Guiana

Russia and China use launch sites in the interiors of their countries. Describe the advantages and disadvantages of these launch locations

## Week 3: Launch Vehicle Subsystems and Staging

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### Course Objectives

CO-3: Analyze launch vehicle subsystems and their key design issues

CO-4: Apply the principles of rocket staging to a specific example

## Readings

eBook pages:

153 - 158,

158 - 163

## Assignment

Forum Post #3: Discuss the concept of "single stage to orbit". What makes this idea difficult to implement, and what research has been conducted to make this a reality?

Assignment/Essay #1:

Describe early attempts at staged rockets. What difficulties had to be overcome and how were these problems solved?

## **Week 4: Current Launch Systems**

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### Course Objectives

CO-5: Analyze current launch systems being used by the U.S. and other countries

### Readings

Websites:

ULA

Space X, Orbital,

Bigelow,

Virgin Galactic, etc.

### Assignment

Forum Post #4: What do you think is the future of commercial launch systems?

### Midterm Exam

## **Week 5: Trade-offs for Re-entry Design**

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### Course Objectives

CO-6: Differentiate the competing design requirements for re-entry vehicles

### Readings

eBook pages:

198 - 209

### Assignment

Forum Post #5: Choose one of these two topics:

Briefly describe the concept of "ballistic coefficient" and how it applies to re-entry vehicles

or

Describe a personal idea, even a wild, science-fiction level idea, for safer return of humans and science packages from space to the Earth's surface; what are some of the challenges and issues related to your idea?

Assignment/Essay #2: Write a paper on how U.S. manned spacecraft engineers decided on the blunt shape for the Mercury, Gemini and Apollo capsules. What other alternatives exist for safe re-entry of humans? What are the primary issues?

## **Week 6: Options for Re-entry Vehicle Design**

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Course Objectives

CO-7: Deconstruct the basic vehicle options and trade-offs in re-entry design and trajectory options

Readings

eBook pages:

210 - 222,

225 - 227

Assignment

Forum Post #6: Discuss the effects of re-entry vehicle shape on deceleration, heating rate and accuracy

## **Week 7: ICBM Re-entry Systems**

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Course Objectives

CO-8: Analyze ICBM re-entry systems (unclassified discussion)

Readings

eBook pages:

177 - 185

Assignment

Forum Post #7: Discuss the concept of a "re-entry corridor" as it applies to ICBM (RV) re-entry

Assignment/Essay #3: Pick one of these topics:

1. Write a paper on sea-launched ballistic missiles and their re-entry vehicles. Include a short history of SLBMs and special considerations for sea launch. or
2. Discuss the technique of aerobraking as it applies to interplanetary space missions. How does it work, why is it used, and describe at least two examples where the concept has been applied.

## **Week 8: Final Exam and Research Paper**

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Course Objectives

(All Course Objectives)

Readings

None

Assignment

Forum Post #8: Course Wrap-up and Comments

Final Exam

Research Paper

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## Evaluation

Forums: For each forum assignment, you are required to post your own response to the given topic and to respond to at least two of your classmates. Your main post must be at least 200 words, and your responses must be substantive (not merely saying “Good post”).

Research paper subject approval: the student will select a topic related to the course to research and present in the Research Paper. The student will contact the instructor through the Sakai Message System not later than the end of Week 2 to submit his or her request, with rationale, for subject approval.

Assignments/Essays: Three homework assignments will be posted to the online classroom (they are also briefly described in the weekly schedule below). Assignment/essay requirements:

- Papers should be 12-point font, double spaced and be approximately 3-4 pages in length
- Papers must include references/citations; those that do not will receive no higher than a “C” for the assignment
- Put your name on at least the first page of the paper, include your last name in the filename of the paper, and please number each page of your paper

Exams: the midterm exam and final exam will both be open-book, open-resource. The short-answer questions will require well-researched, well thought-out and detailed answers.

Research paper: not later than the end of the course (Week 8), the student will submit the final paper, the subject of which must be related to the course topic. The final paper must not be less than 8 pages in length, not including title page and bibliography/references. There must be a minimum of two published (not web site) references, such as textbooks or papers published in professional journals, and at least four total sources, which may also include magazine or web articles.

Final paper grading: the research paper will be graded on the following criteria:

- Research: did the student conduct important and relevant research in the area?
- Analysis: did the student thoroughly analyze and evaluate the research and data?
- Conclusions: did the student make original, logical, rational and convincing arguments based on the analysis?
- Was the paper well-written in a clear, logical style using proper grammar, spelling, and punctuation?  
Was the paper properly formatted and referenced?

## Grading:

Name	Grade %
Introduction Forum	0.50 %
Introduction Forum	0.50 %
Forums	20.00 %

Week 1 Forum: Newton's Third Law & The Ideal Rocket Equation	2.50 %
Week 2 Forum: Launch locations	2.50 %
Week 3 Forum: Single stage to orbit	2.50 %
Week 4 Forum: Commercial Launch Systems	2.50 %
Week 5 Forum: Re-entry concepts	2.50 %
Week 6 Forum: Re-entry concepts continued	2.50 %
Week 7 Forum: ICBM Re-entry	2.50 %
Week 8 Forum: Course wrap-up and comments	2.50 %
<b>Assignments/Essays</b>	<b>30.00 %</b>
Assignment #1	10.00 %
Assignment #2	10.00 %
Assignment #3	10.00 %
<b>Research Paper</b>	<b>15.00 %</b>
Research Paper	15.00 %
<b>Midterm Exam</b>	<b>15.00 %</b>
Midterm	15.00 %
<b>Final Exam</b>	<b>19.50 %</b>
Final Exam	19.50 %

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## Materials

**Book Title:** Introduction to Launch Systems and Re-entry - the VitalSource e-book is provided via the APUS Bookstore

**Author:**

**Publication Info:** McGraw-Hill

**ISBN:** 9781308656953

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**Book Title:** You must validate your cart to get access to your VitalSource e-book(s). If needed, instructions are available here - <http://apus.libguides.com/bookstore/undergraduate>

**Author:** N/A

**Publication Info:** N/A

**ISBN:** N/A

See the Course Materials in the Sakai classroom Lessons area for specific instructions on accessing the eBook.

Websites: Must be government or industry sites; e.g. NASA, NOAA, Boeing, Space X, ULA, etc.

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## Course Guidelines

## Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

## Tutoring

- [Tutor.com](https://www.tutor.com) offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours\* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

## Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 20% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

## Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

## Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

## Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

## Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

## Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- "Substantive" means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says "I agree" is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or

illustration of a key point, points out an inconsistency in an argument, etc.

- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.
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## University Policies

### [Student Handbook](#)

- [Drop/Withdrawal policy](#)
- [Extension Requests](#)
- [Academic Probation](#)
- [Appeals](#)
- [Disability Accommodations](#)

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