

Space Systems Integration

SPSM-5910

S1 2022 Section 36 3 Credits 01/10/2022 to 03/11/2022 Modified 11/18/2021

Meeting Times

Thursday, 5:30 PM to 9:30 PM, Zoom access point

Times are MST

In case the syllabus gnomes change the times above, the real time for this class is 5:30 PM - 9:30 PM MST for all meetings.

First class 13 Jan 2022

Last class 10 Mar 2022

Richard Colarco is inviting you to a scheduled Zoom meeting.

Topic: SPSM 5910 2022

Time: Jan 13, 2022 05:30 PM Mountain Time (US and Canada)

Every week on Thu, 9 occurrence(s)

Please download and import the following iCalendar (.ics) files to your calendar system.

Weekly: https://webster-edu.zoom.us/meeting/tJMpduqqTgpH9OGFn0PSc_b7YHspNatO4X9/ics?icsToken=98tyKuCvqjopGNOWsxyARowEBoj4b-rwtnZegvpyuznrUxBgYTz0YdtqIaJREcz_

Join Zoom Meeting

<https://webster-edu.zoom.us/j/97413273357?pwd=VGFwbWM5MVZ0SEd1enh1VjY5bHBrQT09>

Meeting ID: 974 1327 3357

Passcode: 940563

Join by SIP

97413273357@zoomcrc.com

Join by H.323

162.255.37.11 (US West)

162.255.36.11 (US East)

Passcode: 940563

Contact Information

Instructor: Professor Richard F Colarco

Email: richardcolarco98@webster.edu

Office: 7192469115

Office Hours

Morning
Office

0800-1200 EST Monday-Friday

Description

Students examine those processes that facilitate the design, development, integration, manufacture, deployment, sustainment, and disposal of space systems. The course identifies those criteria needed to reduce risks and ensure that performance integrity, compatibility, testing, and validation of functional and physical requirements are met.

Requisites

None

Outcomes

The student will:

- Examine the systems engineering (*integration*) management process using the Defense Acquisition University, Introduction to Systems Engineering Fundamentals following a large-scale project integration activity and processes such as the International Space Station, Lunar Station or Mars Exploration Mission. New acquisition streamlining approaches should include examination of critical specification and statement of work tailoring efforts that may reduce the impact of contract modifications during the development phase. Students should be exposed to the concepts of: Tailoring for Minimum Documentation; Intellectual Property Rights; Ethics in Contracting for Engineering Services; Risk Identification and Mitigation; application of Knowledge and Research; Integrated Product Teams; and tools for visualizing complex programs.
- Discuss the commercial and/or government (*space*) systems engineering, development and integration process as well as how to develop a "Win-Win" relationship with all project participants and the stakeholders.
- Understand the unique problems and differences space systems present to the program manager and how to use automation tools to support risk identification-mitigation and decision making with regard to space systems development and deployment.
- Demonstrate at the graduate level, the ability to understand, synthesize and exercise the knowledge gained in this course. Students may: complete short essay exams; be engaged in a comprehensive, team-oriented, hands-on computer lab exercise; or, complete several in-class, team oriented, and writing exercises combining the concepts of Systems Integration.

Required Textbook

Systems Engineering Fundamentals

Author: DAU

Publisher: Create Space

Edition: 2013

ISBN: 978-1484120835

Deliverables

Abstract

Abstract (1-2 pages) due third class meeting. All submissions by electronic means. Describes the contents of the two required papers, identifies the chosen mission, and gives several references.

First Paper

Due on sixth class meeting. 7-10 pages. All submissions by electronic means. Discusses application of the Systems Integration process to a specific space mission. Any space mission is eligible. May be a historic mission, a current mission, or a future mission.

At a minimum, discuss development of mission statement, mission concept, and an initial mission architecture. Relate statement, concept, and architecture to mission requirements.

Paper Evaluation Criterion Points

Space system chosen - applicability 5

Organization 15

Follow the APA format 15

Ability to apply the process 55

Mechanics 10

TOTAL POINTS: 100

Second Paper

Due on last class meeting. 7-10 pages. All submissions by electronic means. Continues discussion of application of the Systems Integration process to a specific space mission. Any space mission is eligible. May be a historic mission, a current mission, or a future mission. Briefly summarize first paper and point out any changes. Discuss how mission needs flow down to requirements. Discuss selection of the mission concept from alternatives. Discuss constraints, functional requirements, operational requirements, critical requirements, thresholds, objectives, and tradeoffs.

Each student will give a short, ungraded presentation of the final paper on the last night of class.

Identify and discuss, as required: Mission subject; Orbit and constellation; Payload; Launch element; Ground element; Operational element; Command, control, and communications; Operations and disposal.

The thrust of this paper is to describe how the various pieces of the mission are integrated to support the mission needs and requirements.

Paper Evaluation Criterion Points

Space system chosen - applicability 5

Organization 15

Follow the APA format 15

Ability to apply the process 55

Mechanics 10

TOTAL POINTS: 100

✓ Evaluation

Breakdown

First paper - 40% of final grade

Second paper - 40% of final grade

Class participation – 20% of final grade

In order to earn the class participation points:

- Your camera must be turned on
- Your microphone must be turned on when speaking
- You must take an active role in class by participating in the discussions

- You must make the required presentations

Criteria

All work must be turned in on time. Late submissions will not be accepted. Grading will follow the Points Earned to Letter Grade scale range and Graduate Catalog guidelines provided below.

Grades will be based on a straight grade percentage – no curve will be used.

The grade point structure for letter grades is as follows. Students earning the following points will be awarded the appropriate letter grade, or a letter grade with + or - emphasis:

Grade Points Earned Equivalent Letter Grade

- 94-100 A Superior Graduate Work
- 90-93 A- Superior Graduate Work
- 87-89 B+ Satisfactory Graduate Work
- 83-86 B Satisfactory Graduate Work
- 80-82 B- Satisfactory Graduate Work
- 70-79 C Work that is barely adequate as graduate-level performance
- Below 70 F Work that is unsatisfactory

I Incomplete work

ZF An "I" that is not completed within one year of the end of the course is automatically converted to a "ZF". A "ZF" is treated the same as an F or NC for all cases involving GPA, academic warning, probation and dismissal.

IP In progress

NR NR Not reported

W Withdrawn from the course

Schedule

When	Topic	Notes
Lecture/Discussion Week 1 01/13/2022 6:30 PM - 10:30 PM Zoom	Introduction - Systems Integration	<p>CLASS PREPARATION PRIOR TO THE FIRST SESSION</p> <p>Read chapters 1, 3, and 4 in the text</p> <p>Review slides for first class meeting (Connections)</p> <p>Systems Integration Process</p> <p>Assignment: Read chapters 1, 3, and 4 in the text before class</p> <p>Introduction</p> <p>Class Overview</p> <p>Grading Standards</p> <p>Student Expectations</p> <p>Lecture</p> <p>Discussions over text Chapters 1, 3, 4</p> <p>Discussion of papers</p>

When	Topic	Notes
Lecture/Discussion Week 2 01/20/2022 6:30 PM - 10:30 PM Zoom	Practical Examples of Systems Integration	Practical Examples of Systems Integration Assignment: Read paper "The Strategic Nature of the Tactical Satellite" before class for week 2 Discussion. Review slides. Discussion of paper "The Strategic Nature of the Tactical Satellite." Be prepared to participate in the discussion. Further discussion of chapters 1, 3, 4
Lecture, Movie, Discussion Week 3 01/27/2022 6:30 PM - 10:30 PM Zoom	The Apollo Program as an Example of Systems Integration	The Apollo Program as an Example of Systems Integration Assignment: Review Slides We will view the NOVA special "To The Moon" as an example of the Systems Integration process We will discuss the movie Abstracts due Students will informally discuss their abstracts and why they chose a particular system
Lecture/Discussion Week 4 02/03/2022 6:30 PM - 10:30 PM Zoom	NASA Mars Design Reference Architecture as an Example of the Systems Integration Process	Assignment: Review and be prepared to discuss NASA Mars Design Reference Architecture materials
Lecture/Discussion Week 5 02/10/2022 6:30 PM - 10:30 PM Zoom	NASA Mars Design Reference Architecture as an Example of the Systems Integration Process	Continuation of Week 4
Lecture/Discussion Week 6 02/17/2022 6:30 PM - 10:30 PM Zoom	NASA Artemis Return-to-Moon Mission as an Example of the Systems Integration Process	First paper due Read and be prepared to discuss the NASA Artemis Lunar Exploration Program Overview
Lecture/Discussion Week 7 02/24/2022 6:30 PM - 10:30 PM Zoom	Designs and Tradeoffs	Assignment: Read Chapters 6, 7, 12 and slides. Prepare for Discussion Each student will present an example of design tradeoffs from any mission studied so far. Short presentation. A few slides required.
Lecture/Discussion Week 8 03/03/2022 6:30 PM - 10:30 PM Zoom	Planning, Organizing, and Managing	Read Chapters 16, 18, 20, and slides
Lecture/Discussion Week 9 03/10/2022 6:30 PM - 10:30 PM Zoom	Final Topics, Student Presentations	Final paper due Final topics as required Student presentations - 15 minutes, slides required

* Course Policies

Additional useful resources:

Webster University online library <http://library.webster.edu/netresearch/spacesys.html>

NASA <http://www2.jpl.nasa.gov/basics/>

Aviation Week and Space Technology http://www.aviationnow.com/avnow/news/channel_awst.jsp

Air and Space (<http://www.airspacemag.com>) Space News (<http://www.space.com/spacenews>)

Space Flight Now (<http://spaceflightnow.com>) Space (<http://www.space.com>)

APA format must be used for all papers. Prior APA Style Manuals are permitted. Students who do not own prior APA Style Manuals may order the current edition below:

American Psychological Association. (2009). Publication manual of the American Psychological Association (6th ed.). Washington, DC: Author. ISBN: 978-1-4338-0561-5. May be ordered from order@apa.org

See this link for information and help:

<http://owl.english.purdue.edu/owl/resource/560/01/>

The following link offers useful information on citations:

<http://citationmachine.net/>

Additional materials supplied by instructor:

NASA Systems Engineering Handbook

NASA Mars Reference Architecture

NASA information on MODIS sensor

Strategic Nature of the Tactical Satellite

Others as required

Institutional Policies

Academic Policies

Academic policies provide students with important rights and responsibilities. Students are expected to familiarize themselves with all academic policies that apply to them. Academic policies for undergraduate students can be found in the Undergraduate Studies Catalog; graduate students should review the Graduate Studies Catalog.

Undergraduate Studies Catalog

The Undergraduate Studies Catalog contains academic policies that apply to all undergraduate students. The *academic policies and information* section of the catalog contains important information related to **attendance, conduct, academic honesty, grades, and more**. If you are an undergraduate student, please review the catalog each academic year. The current Undergraduate Studies Catalog is at:

<http://www.webster.edu/catalog/current/undergraduate-catalog/> (<http://www.webster.edu/catalog/current/undergraduate-catalog/>)

Graduate Studies Catalog

The Graduate Studies Catalog contains academic policies that apply to all graduate students. The *academic policies* section of the catalog contains important information related to **conduct, academic honesty, grades, and more**. If you are a graduate student, please review the catalog each academic year. The current Graduate Studies Catalog is at:

<http://www.webster.edu/catalog/current/graduate-catalog/> (<http://www.webster.edu/catalog/current/graduate-catalog/>)

Grading

The Grades section of the academic catalog outlines the various grading systems courses may use, including the information about the final grade reported for this class.

Undergraduate

<http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html#grading>
(<http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html#grading>)

Graduate

<https://webster.edu/catalog/current/graduate-catalog/academic-policies.html#gradingsystem>
(<https://webster.edu/catalog/current/graduate-catalog/academic-policies.html#gradingsystem>)

Incomplete

There are important policies that govern grades of Incomplete (I), including the circumstances under which Incomplete grades are granted, deadlines for completion, and consequences should the remaining course work not be completed. It is the responsibility of a student who requests an Incomplete to ensure that they understand and follow the policies.

Grade Appeals

Instructors are responsible for assigning grades, and student should discuss grade issues with the instructor. Policies and procedures for appealing grades are available in the appropriate catalog.

Academic Honesty Policy

Webster University is committed to academic excellence. As part of our Statement of Ethics, we strive to preserve academic honor and integrity by repudiating all forms of academic and intellectual dishonesty, including cheating, plagiarism and all other forms of academic dishonesty. Academic dishonesty is unacceptable and is subject to a disciplinary response. Students are encouraged to talk to instructors about any questions they may have regarding how to properly credit others' work, including paraphrasing, quoting, and citation formatting. The university reserves the right to utilize electronic databases, such as Turnitin.com, to assist faculty and students with their academic work.

The university's Academic Honesty Policy is published in academic catalogs:

Undergraduate

<http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html>
(<http://www.webster.edu/catalog/current/undergraduate-catalog/academic-policies.html>)

Graduate

<http://www.webster.edu/catalog/current/graduate-catalog/academic-policies.html>
(<http://www.webster.edu/catalog/current/graduate-catalog/academic-policies.html>)

As a part of the university commitment to academic excellence, the Reeg Academic Resource Center provides student resources to become better acquainted with academic honesty and the tools to prevent plagiarism in its many forms:

<https://websteru.sharepoint.com/sites/AcademicIntegrityAtWebster>
(<https://websteru.sharepoint.com/sites/AcademicIntegrityAtWebster>)

Statement of Ethics

Webster University strives to be a center of academic excellence. The university makes every effort to ensure the following:

- The opportunity for students to learn and inquire freely
- The protection of intellectual freedom and the rights of professors to teach
- The advancement of knowledge through scholarly pursuits and relevant dialogue

To review Webster University's statement of ethics, see the Undergraduate Studies Catalog and the Graduate and Studies Catalog:

Undergraduate

<http://www.webster.edu/catalog/current/undergraduate-catalog/overview.html#ethics>
(<http://www.webster.edu/catalog/current/undergraduate-catalog/overview.html#ethics>)

Graduate

<http://www.webster.edu/catalog/current/graduate-catalog/ethics.html> (<http://www.webster.edu/catalog/current/graduate-catalog/ethics.html>)

Contact Hours for this Course

It is essential that all classes meet for the full instructional time as scheduled. A class cannot be shortened in length. If a class session is cancelled for any reason, the content must be covered at another time.

Important Academic Resources

Academic Accommodations and Support

At Webster University, we understand that all students learn differently and may have specific, often differing, learning needs. Some examples are doing rather than watching, being active instead of sitting still, and taking frequent breaks. For others, the professor needs to speak louder, give more clear instructions, and be understanding with health issues. Regardless of what makes learning easier for you, our goal is to provide the most accessible learning environment possible for each student. If there are any specific needs you'd like to make your instructors personally aware of, including any academic accommodations, please reach out to them directly.

Webster University supports students in several ways. Students with academic/learning, health, physical, and psychological disabilities and students who have accessibility concerns can reach out to Webster's Academic ADA Coordinator at disability@webster.edu. You can also reach out if you have any questions relating to accessibility.

Online resources through WorldClassRoom (Canvas) have a variety of accessibility tools, provided through a program called Ally, for both students and faculty. Ally is free and already incorporated into WorldClassRoom. It helps students who have visibility and attention challenges; who need easier access to course materials from mobile phones, tablets, electronic readers, etc.; or who need or prefer file types different from the format uploaded by the instructor. You can find more information about Ally at <https://webster.edu/online/ally.php> (<https://webster.edu/online/ally.php>).

Life circumstances can make focusing on education, or anything else, difficult. For this reason, several additional resources and services are available to students at no cost:

1. Reeg Academic Resource Center (<https://websteru.sharepoint.com/sites/ReegARC>)
(<https://websteru.sharepoint.com/sites/ReegARC>)
 - Academic Counseling: academiccounseling@webster.edu
 - Assistive Technology: atacr@webster.edu
 - Disability Accommodations: disability@webster.edu
 - Testing Center: arc@webster.edu
 - Tutoring: tutoring@webster.edu
 - Writing services: writing@webster.edu
2. Counseling and Life Development (<https://www.webster.edu/student-counseling.php> (<https://www.webster.edu/student-counseling.php>)): 314-968-7030 or counselingld@webster.edu (these contact methods are non-confidential, but appointments are confidential)

Lastly, circumstances change. If, at any point throughout your education, you find that something is making learning difficult for you, please reach out to your instructor directly and/or to Webster's ADA team. It is never too late to ask for accommodations. We entirely support you and want you to have the best and most accessible education possible.

Student Success Portal

Webster University's Student Success Portal, powered by Starfish, is a communications tool to connect students with faculty members and campus support services. It allows faculty and staff members to communicate with you regarding academic achievements as well as areas where support may be helpful. You may use the portal to contact faculty and staff members for

assistance and to arrange meetings. Activity in the portal will be communicated to your Webster University email account. The Student Success Portal is available via your course home page in WorldClassRoom or via Connections. Learn more about the Student Success Portal at <https://www.legacy.webster.edu/success/students.html>.
(<https://www.legacy.webster.edu/success/students.html>)

University Library

Webster University Library is dedicated to supporting the research needs and intellectual pursuits of students throughout the university's worldwide network. Resources include print and electronic books, journal articles, online databases, DVDs and streaming video, CDs and streaming music, datasets, and other specialized information. Services include providing materials at no cost and research help for basic questions to in-depth exploration of resources. The gateway to all of these resources and services is <http://library.webster.edu> (<http://library.webster.edu/>). For support navigating the library's resources, see <http://libanswers.webster.edu/> (<http://libanswers.webster.edu/>) for the many ways to contact library staff.

Drops and Withdrawals

Drop and withdrawal policies dictate processes for students who wish to unenroll from a course. Students must take proactive steps to unenroll; informing the instructor is not sufficient, nor is failing to attend. In the early days of the term or semester, students may DROP a course with no notation on their student record. After the DROP deadline, students may WITHDRAW from a course; in the case of a WITHDRAW, a grade of W appears on the student record. After the WITHDRAW deadline, students may not unenroll from a course. Policies and a calendar of deadlines for DROP and WITHDRAW are at:

Undergraduate

<http://www.webster.edu/catalog/current/undergraduate-catalog/enrollment.html>
(<http://www.webster.edu/catalog/current/undergraduate-catalog/enrollment.html>)

Graduate

<http://www.webster.edu/catalog/current/graduate-catalog/enrollment.html>
(<http://www.webster.edu/catalog/current/graduate-catalog/enrollment.html>)

Academic Calendar - <http://www.webster.edu/academics/academic-calendar/>
(<http://www.webster.edu/academics/academic-calendar/>)

Current tuition rates, policies, and procedures, including details of pro-rated tuition refunds, are available in the "Tuition, Fees, and Refunds" section of Webster's Academic Catalogs:

Undergraduate

<http://www.webster.edu/catalog/current/undergraduate-catalog/tuition.html>
(<http://www.webster.edu/catalog/current/undergraduate-catalog/tuition.html>)

Graduate

<http://www.webster.edu/catalog/current/graduate-catalog/tuition.html> (<http://www.webster.edu/catalog/current/graduate-catalog/tuition.html>)

Student Handbook and Other Important Policies

Student handbook and other non-academic policies may apply to you and may impact your experience in this class. Such policies include the student code of conduct, privacy, technology and communications, and more. Please review the handbook each year and be aware of policies that apply to you. The handbook is available at:

<http://www.webster.edu/student-handbook/> (<http://www.webster.edu/student-handbook/>)

Sexual Assault, Harassment, and Other Sexual Offenses

Webster University makes every effort to educate the community to prevent sexual assault, harassment, and other sexual offenses from occurring, and is committed to providing support to those affected when this behavior does occur. To access information and resources or to review the Policy on Sexual Assault, Harassment, and Other Sexual Offenses, visit:

<https://webster.edu/titleix/policy.php> (<https://webster.edu/titleix/policy.php>)

Research on Human Subjects

The Webster University Institutional Review Committee (IRB) is responsible for the review of all research on human subjects. The IRB process applies to all Webster University faculty, staff, and students and must be completed prior to any contact with human subjects. For more information on the IRB, visit:

<https://www.legacy.webster.edu/irb/> (<https://www.legacy.webster.edu/irb/>)

Course Evaluations

At the end of this course, you will have the opportunity to provide feedback about your experience. Your input is extremely valuable to the university, your instructor, and the department that offers this course. Please provide your honest and thoughtful evaluation, as it helps the university to provide the best experience possible for all of its students.

Important Technology Information

Connections Accounts

Webster University provides all students, faculty, and staff with a University email account through Connections. Students are expected to activate their Connections account and regularly check incoming university email. Students may choose to have their University email forwarded to an alternate email address. Connections account holders can call the Help Desk (314-246-5995 or toll free at 1-866-435-7270) for assistance with this setup. Instructions are also provided on the Information Technology website at:

<https://www.webster.edu/technology/service-desk/> (<http://www.webster.edu/technology/service-desk/>)

WorldClassRoom

WorldClassRoom is Webster's Learning Content Management System (LMS). Your instructor may use WorldClassRoom to deliver important information, to hold class activities, to communicate grades and feedback, and more. WorldClassRoom is available using your Connections ID at:

<https://worldclassroom.webster.edu/> (<https://worldclassroom.webster.edu/>)

Webster Alerts

Webster Alerts is the university's preferred emergency mass notification service, available free to current students, faculty and staff at all US campuses. By registering a valid cell phone number and email address, you will receive urgent campus text, voice mail and email communications. Valuable information concerning a range of incidents affecting you - from weather-related campus closures, class delays and cancellations, to more serious or life-threatening events - are immediately and simultaneously delivered through multiple communication channels. To register for Webster Alerts, visit (sign with your university-provided email and password:

<https://www.getrave.com/login/webster> (<https://www.getrave.com/login/webster>)

Campus Information

Webster University Colorado Springs (COLO)

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Colorado Springs, CO 80919

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