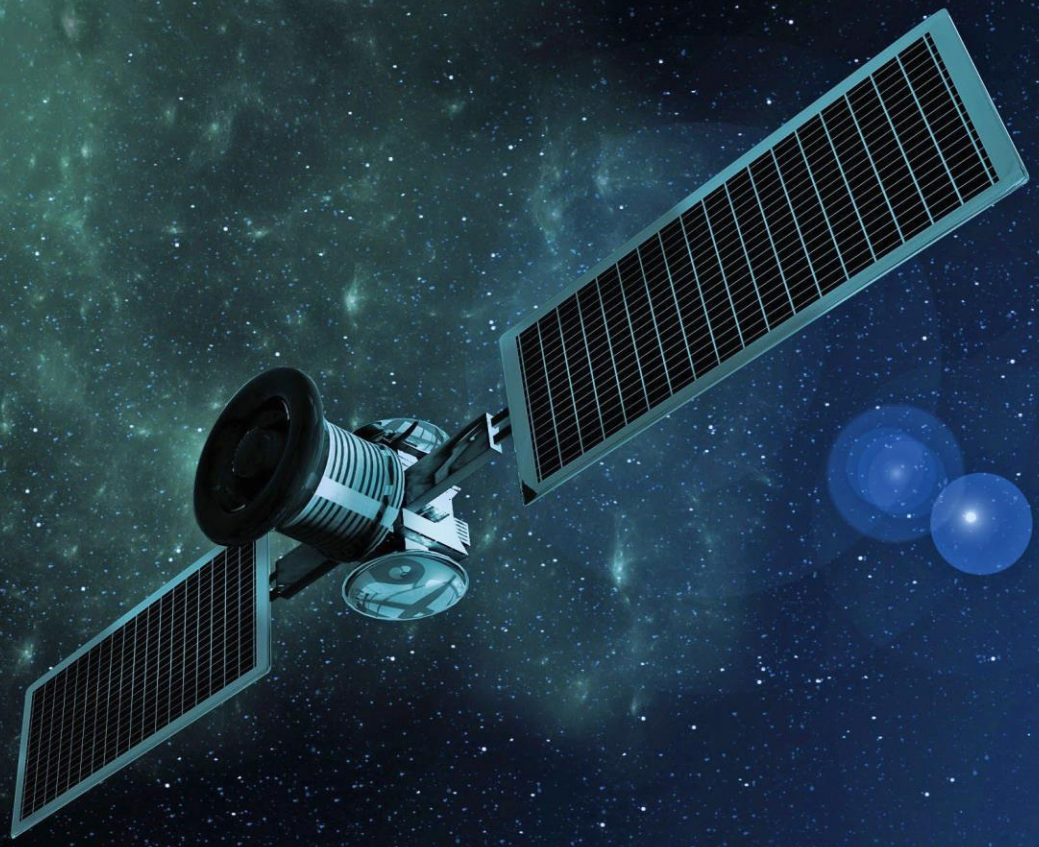
AEROSPACE

SPACE AND TECHNOLOGY GOVERNMENT CUSTOMER COURSE CATALOG



The Aerospace Corporation is committed to nurturing the next generation of scientists and engineers by sharing the knowledge of our experts. A major way we do this is through Aerospace University, which offers a wide range of courses taught by our experts to our employees. This knowledge sharing also extends to our customers.

We encourage you to browse this catalog to learn more about the courses and curriculum offered with a purpose.

Aerospace University (AU)

ELIGIBILITY

Aerospace government customers may attend select Aerospace University courses within our technical curriculum on a space-available basis. Customers should consult their Aerospace counterpart to determine eligibility and begin the enrollment process.

ACCESS

Approved customers may access The Aerospace Corporation's Talent & Learning Center (TLC) to register for live training events, view on demand training videos, and browse the catalog.

Contents

Aerospace University maintains a diverse curriculum in the Space and Technology category. Courses are aligned under one or more of the following subjects.

Aerospace Business courses are intended to elevate individual skills and organizational practice driving continuous improvement in the areas of business management, finance, project management, business software and tools. With a diverse range of courses and workshops, the portfolio covers essential aspects of the space industry.

Digital Applications and Practices covers topics that support the development of digital capabilities and other areas related to digital operation such as machine learning/artificial intelligence, agile development, and data visualization.

Operating in Space encompasses topics related to space itself. The space environment and astrodynamics may be obvious, but communicating with spacecraft is equally universal, as is the protection of space systems.

Space Systems and Spacecraft tackles topics pertaining to space vehicles, spacecraft, as well as the systems required to get them into space. Content in this area is for those who are interested in learning about specific systems and technologies, including the functions that maintain them.

Systems Engineering is a broad subject area that encompasses space system design, engineering, architecture, and other disciplines related to the work of Aerospace. Content in this category is intended for those who need to look across several technologies, going into some depth without being technology specific.

AEROSPACE BUSINESS

Title	Description
Agile Program Management Series	With the increasing use of Agile methods across the Department of Defense (DoD) that go beyond individual software development, program and product managers and supporting staff need to increase their skill sets accordingly. To support DoD's vision, Aerospace University is offering a 4-part series on Agile Development Methodologies conducted by certified trainers with diverse experience in both DoD and commercial industries.
Agile Software Development Overview	This training introduces key concepts and terms related to agile development methodology and eases the transition to an agile way of thinking by comparing these new ideas to familiar development processes, artifacts, and milestones traditionally associated with government programs. This course also provides case studies, insights on considerations specific to Aerospace/defense and government programs, and opportunity for discussion and questions.
Space 101	This course equips you with foundational knowledge of space exploration, enabling you to engage in informed conversations and understand Aerospace's contributions to the space industry. Ultimately, the goal is to highlight how every role at Aerospace contributes to fulfilling the company's mission in space.
Space Policy Overview	This course explores the critical role of space policy in shaping national space efforts, covering its impact on capabilities, resource allocation, and program management. By understanding historical and current policy trends, participants will gain insights into anticipated changes and develop effective strategies for engaging with policymakers.
Space Policy: International Cooperation and Competition	This course examines the rapidly evolving global space landscape, highlighting key players, significant advancements, and the international agreements shaping the field. Understanding the actions and motivations of other nations is crucial for Aerospace to contribute to a successful U.S. space program in this increasingly competitive environment.

DIGITAL APPLICATIONS AND PRACTICES

Title	Description
Cloud Computing Overview	Cloud Computing Overview reviews the basic concepts and terminology for cloud computing to get everybody "on the same page". It is for anyone who is interested in discovering the basics of cloud computing and will benefit those looking for an introduction to the topic.
Digital Engineering Overview	This course provides an overview of Digital Engineering (DE), to include what it is, how it's used, and what benefits it is expected to provide to Aerospace and the broader space enterprise. In this course, we start by forging a clear understanding of what model-based systems engineering (MBSE) is and how it forms an important foundation of DE. However, we also explore the distinctness of DE and how it has the potential to fundamentally change the nature of almost every aspect of our jobs and the future of the industry.
Machine Learning Overview	The purpose of this course is to provide a basic understanding of machine learning and the machine learning process. This course is not intended to be a deep dive into the foundational mathematics upon which the algorithms are built, rather an overview of what different machine learning algorithms do and in what situations they should be applied. Learners will be able to better understand machine learning's capabilities, limitations, applications, as well as where it is currently employed within Aerospace.
Smarter Buyer	Aerospace's EMAC is offering a "Smarter Buyer" course to government and Aerospace employees, aiming to enhance government understanding of industry perspectives on financial expectations, risks, rewards, and investment decisions. By providing insight into contractor behavior and decision-making processes, the course seeks to improve acquisition outcomes through increased government awareness of industry metrics.

SOAP Series

This curriculum is for those who want to learn about the Satellite Orbit Analysis Program (SOAP). SOAP is an interactive 3D orbit visualization and analysis program developed by Aerospace personnel for internal and external use. Deeper levels of practitioner capabilities are offered as the course levels increase.
Courses include:
SOAP Introduction
SOAP Analysis Applications
SOAP Geospatial Applications
SOAP Launch and RF Modeling

Trusted AI

Trusted AI is intended for decision makers, program managers, chief engineers, systems architects, analysts, AI scientists and practitioners from defense-related businesses interested in the application and ramifications of trusted autonomous systems. This course aims to provide a foundation for building trust in autonomous systems. Elements of autonomous systems are defined, and in that context, the perception of trust is explored.

OPERATING IN SPACE

Title	Description
Advanced Cyber Assessments	Participants in this course will leave with an understanding of key Risk Management Framework (RMF) implementation errors. They can use this understanding to explain to their customers how those errors undermine the ability to manage cyber risk, and how the Cyber-Security Total Assessment & Remediation Recommendations (C-STARR) methodology can mitigate these common shortcomings.
C2 in the Space Warfighting Domain	Command and control (C2) of forces and the systems that support them is the lifeblood of military operations. In this new era where space has become a recognized warfighting domain, there are many questions surrounding the requisite actions required to orchestrate such operations. This course will not only explore these questions but will also posit candidate answers covering such topics as C2 basics including the targeting cycle, Joint and Combined military operations, global versus theater needs, building C2 for space, levels of decision making, challenges of C2 in warfighting, and current and future trends.
Cyber Ranges for Enhanced Space Mission Systems Resilience	Through the Cyber Ranges training, participants will gain an understanding of how testing space missions systems against advanced cyber threats can be done in a realistic prototyping and modeling environment. Topics covered during this course also include the National Cyber Range, cyber vulnerabilities and potential mitigations, and how the cyber range helps create new Defensive Cyber Operations tools which enhances Space Mission Resiliency.
Digital Radio Communication Overview	Wireless communication is a central feature of modern life, and no space system operates without it. This class provides a simplified explanation of the operation of radio transmitters, receivers, and associated communication networks. Sound, light, and radio waves obey similar physical laws; therefore, we build on the students' intuitive understanding of sound waves to develop understanding of invisible radio waves.

Mitigating Cyber Threats for Space Systems using Defense in Depth

It is critical to define robust cybersecurity principles and cyber requirements for space systems. Designers must evolve from traditional ways of not engineering security into the space segment. Using threat informed risk-based system engineering and applying defense in depth throughout the space system, particularly on the spacecraft themselves is imperative.

This class will break down the threat landscape to both ground and space segments and discuss a menu of defense in depth measures to counteract the threats using risk management.

Reducing the Software Risk in Space System Software

An estimated 84% of all security breaches are application-related, not firewall violations. To what extent is your customers focused on addressing security issues in its software? Software plays a critical role in mission success, and software similarly plays a role in mission security. However, software can introduce vulnerabilities to the system, such as use of a COTS (Commercial Off The Shelf) product that has a backdoor, or a hole in the security of the system deliberately left in place by designers or maintainers.

Students will learn an approach to securing ground software within the context of federal information systems. Federal requirements, coding standards, tool usage will be discussed as part of the solution to securing software. This class will focus more on the technical aspects of software assurance and less on policy, but some policy level discussions will take place. It will cover various development methodologies.

Reverse Engineering for Hardware and Software Systems

In today's world of hacking and cyberattacks, we must always be concerned when a product ships. No matter how rigorous our software development process, there will be "chinks in the armor" that could be potentially exploited. But how did the hacker find these vulnerabilities? In many cases, these hacks are found through the process of reverse engineering (RE) the hardware or software to look for information that helps to develop the attack. In this class, we will discuss the tools and techniques used for both hardware and software reverse engineering and how this information helps to develop a plan of attack.

Risk Management Framework (RMF) Controls	This class focuses on the NIST SP 800-53 Revision 5 (National Institute of Standards and Technology Special Publication Titled: Security and Privacy Controls for Information Systems and Organizations) control catalog. It will start out by discussing what the catalog is, and the basic notion and structure of controls. It will discuss the differences between Revision 4 and Revision 5. It will then explore each of the 19 control families, the basic controls therein, and some of the more noticeable enhancements. The goal is to create a familiarity with the catalog where there is often fear due to its size. This should make it easier for subject matter experts to select controls from the catalog and mitigate the threats their systems will be facing.
Risk Management Framework (RMF) Controls and Overlays for Space Platforms and Zero Trust	This class focuses on the use of the NIST SP (National Institute of Standards and Technology Specialist Publication) 800-53 Revision 5 Security and Privacy Control Catalog for Space Systems, and specifically for the space platforms and applications incorporating Zero Trust. It will aim to create a familiarity with the catalog where there is often fear due to its size. In addition to discussing general usage, the class will review SPARTA (Space Attack Research and Tactic Analysis) and two specific use cases: the Space Platform and Zero Trust. With a strong knowledge of the catalog, Aerospace Program Offices and Engineers can select the right controls to mitigate the threats their programs face, as well as being able to justify excluding controls because the threat the control addresses is not present.
Space as a Warfighting Domain [classified]	Bringing together various parts of existing courseware from the Aerospace Space Security and Cyber curriculum, this TS/SCI classified course addresses a wide range of topics fundamental to combat operations in the space domain.

Space Domain Awareness Overview

This course provides an overview of situational awareness of space, officially known as Space Domain Awareness (SDA), with a focus on space protection and warfighting. The material is presented using the doctrinal categories of Detect/Track/Identification (DTI), Characterization (CH), Threat Warning and Assessment (TWA), and Data Integration and Exploitation (DIE) to explain SDA as a mission area and covers each topic in relation to the others. This material is relevant to anyone working in the space industry today as space is being tightly woven into the larger multi-domain fight. Space protection, which is enabled by SDA, is a foundational element of the space community's ability to provide critical space services to the warfighter and ensure their resiliency.

Space Protection Awareness Fundamentals Series [classified]

This classified course addresses a wide range of threats to space systems, from radio-frequency jamming to co-orbital antisatellite (ASAT) attacks. Each type of threat is examined in detail to present the fundamental physics and technology, a brief history, considerations regarding use and deployment, and potential countermeasures. This seminar is not a survey of current intelligence regarding threats to space systems; rather, it is a foundational presentation of the technology and underlying physics of these potential threats.

SPACE SYSTEMS AND SPACECRAFT

Title	Description
Applied MBSE for Spacecraft Exercise	So you know what MBSE is, and you know enough about SysML to recognize the different types of diagrams and how they are used. This class takes the next step by applying this knowledge to support spacecraft programs throughout the lifecycle. This class is for: Modelers who want practical methods for structuring and using descriptive models to conceive, design, build, integrate, test, and operate spacecraft Reviewers who need to navigate contractor-provided models to assess compliance and provide mission assurance Concept developers establishing mission requirements, performing trade studies, creating ConOps, and producing point designs Spacecraft builders and integrators wanting to understand what it means for requirements and behaviors to be model-based, and how an “authoritative source of truth” can provide them the information they need Managers and systems engineers who want to understand the anatomy of a spacecraft SysML model, how it can be used to support various lifecycle activities, and what’s “under the hood”
Global Positioning System (GPS) Introduction	This course will introduce participants to the technical and programmatic fundamentals of the Global Positioning System - its origins, architecture, acquisition, deployment, operations, applications, and management. It will also provide an overview of the organizational aspects and mission of the GPS program. The course provides an opportunity for quickly coming up to speed on GPS for people who are in the early phases of supporting one of the GPS acquisitions or GPS-related activities.
Global Positioning System (GPS) Intermediate	GPS Intermediate is designed for those who want detailed insight into GPS at the program, system, and subsystem levels. Note certain portions of this course may require that participants have a secret clearance.

Ground Systems Overview	Ground Systems Overview is intended for those who seek to understand satellite ground system design, development, acquisition, and operations—and the vital roles played by Aerospace. This course provides an overview of satellite ground systems with the intention of introducing the key vocabulary and concepts necessary to discuss ground systems and understand their relationship to other elements of space systems and mission operations.
Launch Systems Introduction	Launch Systems Introduction is geared toward technical staff needing a broad overview of space launch and launch systems. This course introduces launch vehicles and how they work from both technical and operational perspectives.
Space Communications	This self-paced training provides an overview of space communications focusing on fundamental concepts such as what constitutes a link, signal power and noise, communication system components, and key metrics related to performance. Aerospace subject matter expert Dean Sklar introduces these concepts as he steps through a communication link from transmission to propagation to reception.
Space Systems Overview	Space Systems Overview offers a basic introduction to the primary elements of space systems. This course is designed for those new to Aerospace, new to space, or unfamiliar with space systems.
Spacecraft Propulsion Overview	Spacecraft Propulsion Overview provides an introduction to spacecraft propulsion. The course covers various propulsion system types, along with thruster details, relevant testing, mission assurance documents, and examples of notable anomalies.

SYSTEMS ENGINEERING

Title	Description
Architecture Design & Evaluation	This course provides instruction on the Architecture Design and Evaluation process. It teaches students how to apply a structured process to define and perform architecture-level trade studies. This includes defining the problem space, understanding the acquisition and programmatic context, mapping out the trade space, designing architectures, assessing the various options and finally, integrating, synthesizing and communicating the final product.
Architecture Frameworks and Modeling: Overview	This two-hour overview of architecture frameworks for nonpractitioners also serves as the introduction (and prerequisite) to the balance of the architecture frameworks program for practitioners. It addresses what is meant by an architecture, and answer the question, “What are architecture frameworks?” Examples of architecture frameworks will be provided that are relevant to the Aerospace mission.
Architecture Modeling Fundamentals Curriculum	The live virtual session of this course focuses on instructor-facilitated hands-on student review of architecture model views. Having completed the pre-recorded training sessions, students will be armed with foundational knowledge of architecture frameworks and modeling concepts, the structure of the Unified Architecture Framework, and the SysML notation that underpins the UAF Modeling Language—and will apply this knowledge to interpret views of an example architecture model, answer questions about the content, and provide feedback on discrepancies or other issues with the model. Government students will not have Aerospace VPN access so will not be able to use Cameo Collaborator but will be given static captures of the relevant architecture views in lieu of using Collaborator to access the views.

Architecture Processes: Overview

This two-hour introduction to architecture processes provides a top-level overview of systems architecture processes as defined in ISO/IEC/IEEE Standard 42020. It is a prerequisite for all follow-on programs in Aerospace University's architecture curriculum. It will address the nature and purpose of architecture and describe how it contributes to the systems engineering life cycle processes identified in ISO/IEC/IEEE Standard 15288. The class will discuss architecture conceptualization, architecture evaluation, architecture elaboration, and architecture management, government, and enablement.

Digital Engineering Overview

This course provides an overview of Digital Engineering (DE), to include what it is, how it's used, and what benefits it is expected to provide to Aerospace and the broader space enterprise. In this course, we start by forging a clear understanding of what model-based systems engineering (MBSE) is and how it forms an important foundation of DE. However, we also explore the distinctness of DE and how it has the potential to fundamentally change the nature of almost every aspect of our jobs and the future of the industry.

Enterprise Planning and Portfolio Analysis Overview

This class includes a brief recap of enterprise systems engineering (ESE) concepts and will introduce and discuss facets of the portfolio planning decision space. It describes a framework and several of the tools Aerospace utilizes to support our customers across the space enterprise when doing Enterprise Planning and Portfolio Analysis activities, including the interaction between enterprise architectures, program budgets and schedules, and programmatic risks and opportunities. This class is for people who would like an understanding of how Aerospace supports our customers utilizing Enterprise Systems Engineering frameworks to include support to agency budget build processes, capability road-mapping, and other acquisition strategy activities.

Enterprise Systems Engineering Overview

Enterprise Systems Engineering (ESE) Overview provides a top-level overview of ESE approach including the ESE processes that go beyond traditional program-level SE. The course will discuss strategic technical planning, capability-based planning analysis, enterprise architecture and conceptual design, enterprise evaluation and assessment, technology and standards planning, enterprise requirements definition and management, and opportunity and risk management at enterprise level.

MBSE: Learning SysML	This course provides a theoretical introduction to Model Based Systems Engineering (MBSE) and the Systems Modelling Language (SysML). During the course, participants will get practical experience using a SysML tool to complete hands-on exercises. Aerospace personnel will be provided a trial license for the software used in this class.
Model Based Systems Engineering (MBSE) Overview	This course explores the world of reverse engineering, examining the tools and techniques hackers use to uncover vulnerabilities in hardware and software. Whether you're interested in safeguarding your own systems or delving into forgotten technologies, this class provides a foundational understanding of how reverse engineering works.
Model Basics	This lesson covers key concepts of model-based systems engineering, beginning with an introduction to models and modeling in systems engineering, followed by a discussion of modeling languages, using SysML to illustrate examples. The instruction also includes an introduction to views and viewpoints and examples of leveraging the use of models and various views in reviews. This module is part of the Model Based Reviews curriculum.
Systems Analysis Overview	This two-hour introduction to systems analysis explores performance, cost, and risk analysis, explaining their purpose, output, and application in Aerospace decision-making. Attendees will gain a foundational understanding of system analysis types and relevant tools used at Aerospace.
Systems Engineering Overview	Systems Engineering Overview introduces the standard systems lifecycle processes, and a variety of methods and approaches used to implement those processes. It provides prerequisite knowledge for more advanced and specific topics related to Systems Engineering such as Enterprise Systems Engineering, Model Based Systems Engineering, and Systems Architecture.
Transforming Systems Engineering Reviews	This course compares traditional and Digital Engineering-enabled reviews and identifies opportunities to leverage digital engineering tools and practices to transform SE reviews for near-term pursuit.