In today’s space community, change is the only constant. From market and technological changes to policy and budgetary uncertainty, the space industry has been faced with increasing challenges that transcend technical boundaries. To fully utilize emerging opportunities and explore new ones within a modern space-centric enterprise, it is crucial to have both the technical knowledge necessary to design cutting edge space missions, systems and associated products, as well as the systems knowledge that is required to operate in an increasingly complex business and policy environment.

Partnering with TSTI, the leading educational institute for technical mission analysis and design, and the International Space University (ISU), Stevens created a unique program geared towards professionals currently working in the space industry or those interested in careers in space systems. This unique, flexible program, delivered by the primary authors in the field of space systems today, provides experienced professionals with the edge needed to excel in this increasingly complex and competitive industry.

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Space Systems Engineering Partners
The Master’s Degree in Space Systems Engineering can be applied toward a Master’s Degree in Space Systems Engineering or a Master’s in Systems Engineering with a Graduate Certificate in Space Systems Engineering.

**GRADUATE CERTIFICATE IN SPACE SYSTEMS ENGINEERING**

This Graduate Certificate integrates crucial activities spanning the entire life cycle. Information and capabilities are learned by participants in hands-on space system and mission design assignments focusing on: operations concept development, space system architecture, verification and validation, as well as key system engineering processes and tools. These four courses provide the backbone for the development of solid space system engineers.

**SYS/SDOE 625: FUNDAMENTALS OF SYSTEMS ENGINEERING**

This module presents the fundamental principles and processes for designing effective systems, including how to determine customer needs, how to distinguish between needs and solutions, and how to translate customer requirements into design specifications. The focus is on designing systems that not only provide the required capabilities, but that are reliable, supportable and maintainable throughout their life-cycle. The course concludes with a Systems Requirements Review (SRR) in which students present their class projects.

**SYS/SDOE 650: SYSTEM ARCHITECTURE AND DESIGN**

This module presents the fundamentals of system architecting, including practical heuristics for developing good architectures. It extends the systems engineering process introduced in SYS/SDOE 625 through functional analysis, decomposition and requirements flow-down. The implications of open systems architectures and the use of commercial technologies and standards (COTS) are explicitly addressed, as are the linkages between the early architectural decisions, driven by customer requirements and the concept of operations, and system operational and support costs. Prerequisite: SYS/SDOE 625.

**SYS/SDOE 632: DESIGNING SPACE MISSIONS AND SYSTEMS**

This course examines real-world space missions and systems design. Taking a process-oriented approach, the course starts with basic mission objectives and examines the principles and practical methods for mission design and operations in depth. Interactive discussions focus on key system engineering issues like initial requirements definition, operations concept development, architecture tradeoffs, payload design, bus sizing, subsystem definition, system manufacturing, verification and operations. (When enrolling in an on-site program for an organization specializing in human spaceflight, SYS/SDOE 635, Human Spaceflight, may be substituted for SYS/SDOE 632. This requires approval of the School of Systems and Enterprises.)

**SYS/SDOE 633: MISSION AND SYSTEM DESIGN VERIFICATION AND VALIDATION (V&V)**

This course provides hands-on opportunities to apply key principles of space systems engineering. In this course, participants are given a set of customer expectations in the form of broad mission objectives. Using state-of-the-industry mission design and analysis tools, participants apply systems engineering processes to define top-level system requirements, design key elements and conclude with a system design review. (Please note that SYS/SDOE 633 is not available on-line due to the “hands-on” nature of the course. Thus, for students enrolled in the program through Stevens WebCampus, SYS/SDOE 665, Systems Integration may be substituted for SYS/SDOE 633. This requires approval of the School of Systems and Enterprises.)

**INTENDED AUDIENCE**

The Graduate Certificate in Space Systems is relevant for professionals with Bachelor’s or advanced degrees in other disciplines who wish to complement their existing knowledge and skills base to include state of the art spacecraft systems and mission analysis design combined with a holistic systems engineering and architecture perspective. This flexible Graduate Certificate can be taken in intensive one-week modules, that minimize interference with work-related responsibilities.

**ONLINE FORMAT**

Online courses are run in an asynchronous format. Candidates are often required to collaborate with each other and complete weekly assignments. Online courses run on a traditional semester schedule spread over 15 weeks.

**PROJECT OR THESIS COURSES**

Students have an option of working on a project (3 credit hours) or a thesis (6 credit hours) to complete the requirements for a Master’s Degree. Project or Thesis work must be coordinated with a faculty advisor.

- **SYS 800: Special Topics in Systems Engineering (3 credit hours), or SYS 900: Thesis in Systems Engineering (6 credit hours for a Thesis)**

Student pursuing a 3 credit hour project must take one additional advisor-approved elective to meet the 30 credit hours required for the degree. All courses in this Program are taught in a modular format and many are also taught in an online format.

**MODULAR FORMAT**

- **Pre-Module Readings:** Students will receive course pre-readings in preparation for the live session(s).
- **Module Days (live):** Intensive live sessions with lectures and group exercises
- **Independent Work:** Students have time during the intersession, or following the second session, to complete either homework, project work, or exam, where applicable.

**MASTER’S PROGRAM**

The Master’s Degree program in Space Systems Engineering allows professionals working in government and industry to combine a robust technical education in space systems design and development as well as key space system engineering processes and tools with a holistic understanding of systems engineering principles. This combination provides them with a unique advantage that is hard to come by anywhere else.

**REQUIRED COURSES**

The Master’s degree in Space Systems Engineering or Systems Engineering with a graduate certificate in Space Systems Engineering requires the following core courses:

- SYS/SDOE 625: Fundamentals of Systems Engineering
- SYS/SDOE 650: System Architecture and Design
- SYS/SDOE 632: Designing Space Missions and Systems
- SYS/SDOE 633: Mission and Systems Design Verification and Validation (V&V)
- EM/SDOE 612: Project Management of Complex Systems

In addition, candidates must take one or two courses from the Space Concentration Electives, and one or two courses from the Systems Concentration Electives listed below. Students must also take either SYS 800 – Special Topics in Systems Engineering and one faculty advisor approved elective, or SYS 900 – Thesis in Systems Engineering.

**ELECTIVE COURSES**

Students must take one course from each of the Concentrations listed below.

**Space Concentration**

- SYS/SDOE 635: Human Spaceflight
- SYS/SDOE 636: Space Launch and Transportation Systems
- SYS/SDOE 637: Cost-Effective Space Mission Operations
- SYS/SDOE 638: Crew Exploration and Vehicle Design Exercise

**Systems Concentration**

- SYS/SDOE 611: Modeling and Simulation
- SYS/SDOE 645: Design for System Reliability, Maintainability, & Supportability
- SYS/SDOE 660: Decision and Risk Analysis
- SYS/SDOE 655: Human Spaceflight