Space Systems Academics Overview
SSAG Background

- Interdisciplinary Academic Unit responsible for space-related curricula at NPS
  - Founded in 1983 as an Academic Committee
  - Designated in 1985 as an Academic Group
- Includes both SSAG-internal faculty and faculty from multiple NPS departments
  - Mechanical and Aerospace Engineering, Physics, Electrical Engineering, National Security Affairs, Computer Science, and Information Sciences.
SSAG Mission

- Provide relevant and unique space-related education and research programs to enhance the security of the United States.
- Educate our students to be innovative space professionals who will lead the design, development, acquisition, and operational application of space systems.
- Drive the personal and professional development of our students, faculty, and staff.
Space is Critical to the Naval Services' Global Presence

Our Advantage in Space Must be Protected and Extended
Naval Driven Curricula Focus

Two primary programs of study are offered:

**Space Systems Engineering**
- Systems design
- Technical requirements
- Acquisition in an operational context
- S&T/R&D
- Grants Subspecialty 5500P

**Space Systems Operations**
- Military systems and applications
- User requirements and operations
- Exploitation of space and information products
- Overview of S&T/R&D/Acquisition
- Grants Subspecialty 6206P

Offering Unique combination of classified course work
We are committed to personal and professional development of our students, faculty, and staff
Education, Not Training
example for Space Systems Operations

Thesis Research

SS4055
Space Operations for the Warfighter

SS3041
Space Systems and Operations

AE4860
Space Control

SS3011
National Systems

MN3331
Acquisitions Management

SS3600
Modeling and Simulation

SS3610
Space Systems Comms

SS3613
MILSATCOM Systems

SS3001
National Systems

SS3051
Mil Space Applications

AE4830/4831
Spacecraft Systems

PH3052
Physics of Remote Sensing

SS3011
Space Tech & Apps

Wisdom

Understanding

Knowledge

Information

Data

Unclassified
# Space Systems Operations

**Navy 21 month + refresher**

Red text indicate unique classified course work up to TS//SCI

<table>
<thead>
<tr>
<th></th>
<th>Preparatory</th>
<th>Required</th>
<th>Elective</th>
<th>JPME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0S</td>
<td>PH1121 Mechanics</td>
<td>MA1113 Single Var Calc</td>
<td>MA1114 Calc II + Matrix Algebra</td>
<td>NW3230 Strategy &amp; War</td>
</tr>
<tr>
<td>1F</td>
<td>SS1100 Programming for Space Applications</td>
<td>SS3011 Space Technologies &amp; Applications</td>
<td>MN3301 (4-0) Acquisition of Defense Systems</td>
<td>PH1322 Electromagnetism</td>
</tr>
<tr>
<td>2W</td>
<td>SS3610 Space Communications Systems</td>
<td>PH3052 Remote Sensing</td>
<td>SS3400 Orbital Mechanics, Launch and Space Operations</td>
<td>NS4677 Space &amp; International Security</td>
</tr>
<tr>
<td>3S</td>
<td>SS3600 Modeling &amp; Simulation</td>
<td>SS3041 Space Systems &amp; Ops 1</td>
<td>SS3051 Military Applications of DoD &amp; Commercial Space Systems</td>
<td>SS3613 MILSATCOM Systems</td>
</tr>
<tr>
<td>4S</td>
<td>AE4830 S/C Systems I</td>
<td>(AE4860) elective</td>
<td>PH2514 Space Environment</td>
<td>SS3001 Military Applications of Space</td>
</tr>
<tr>
<td>5F</td>
<td>AE4831 S/C Systems 2</td>
<td>SS4051 Military Space Systems/Arch</td>
<td>SS0810 Thesis Research</td>
<td>NW3285 NSDM</td>
</tr>
<tr>
<td>6W</td>
<td>SS0810 Thesis Research</td>
<td>SS0810 Thesis Research</td>
<td>Elective</td>
<td>NW3275 JMO Part 1</td>
</tr>
<tr>
<td>7S</td>
<td>SS4055 Space Operations for the Warfighter</td>
<td>SS0810 Thesis Research</td>
<td>IW3101 Military Ops in the Information Env.</td>
<td>NW3276 JMO Part 2</td>
</tr>
</tbody>
</table>
Space Systems Engineering
Navy 21 month + refresher

Red boxes indicate unique classified course work up to TS//SCI

<table>
<thead>
<tr>
<th>Qtr</th>
<th>Course</th>
<th>Course</th>
<th>Course</th>
<th>Course</th>
<th>Seminar</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Su</td>
<td>MA1995 (5-1) Engineering Math I</td>
<td>MA1996 (5-1) Engineering Math II</td>
<td>PH1211 (4-2) Mechanics</td>
<td>PH1322 (4-2) Electromagnetism</td>
<td>SS4000 (0-1) Seminar</td>
<td></td>
</tr>
<tr>
<td>1 F</td>
<td>MA2097 (4-0) Engineering Math III</td>
<td>SS1100 (2-2) Introduction to Programming for Space Apps</td>
<td>AE3840 (3-2) Introduction to Spacecraft Structures</td>
<td>ME2801 (3-2) Control Systems</td>
<td>SS4000 (0-1) Seminar</td>
<td></td>
</tr>
<tr>
<td>2 W</td>
<td>SS3500 (4-0) Orbital Mechanics &amp; Launch Systems</td>
<td>PH3052 (4-0) Remote Sensing</td>
<td>EO3510 (4-1) S/C Communications Engineering</td>
<td>AE3804 (3-0) Thermal Control of Spacecraft</td>
<td>SS4000 (0-1) Seminar</td>
<td>JPME - NW3230 (4-0) Strategy &amp; War</td>
</tr>
<tr>
<td>3 Sp</td>
<td>PH2514 (4-0) Space Environment</td>
<td>MN3331 (3-1) Principles of Acquisition &amp; Pgm Management</td>
<td>AE3818 (3-2) Spacecraft Attitude Determination &amp; Control</td>
<td>Degree/Track Elective</td>
<td>SS4000 (0-1) Seminar</td>
<td>JPME - NW3285 (4-0) Theater Security Decision Making</td>
</tr>
<tr>
<td>4 Su</td>
<td>SS3861 (2-4) Spacecraft Payload Design</td>
<td>EC3230 (3-1) Space Power</td>
<td>AE3851 (3-2) Spacecraft Propulsion</td>
<td>Degree/Track Elective</td>
<td>SS4000 (0-1) Seminar</td>
<td></td>
</tr>
<tr>
<td>5 F</td>
<td>AE4870 (2-4) Spacecraft Design &amp; Integration I</td>
<td>AE0810 (0-8) Thesis Research</td>
<td>Degree/Track Elective</td>
<td>Degree/Track Elective</td>
<td>SS4000 (0-1) Seminar</td>
<td>JPME - NW3275 (2-4) Joint Maritime Operations - Part 1</td>
</tr>
<tr>
<td>6 W</td>
<td>AE4872 (2-4) Spacecraft Design &amp; Integration II</td>
<td>SS3001 (4-1) Military Applications of Nat. Space TS/SCI</td>
<td>AE0810 (0-8) Thesis Research</td>
<td>Degree/Track Elective</td>
<td>SS4000 (0-1) Seminar</td>
<td>JPME - NW3276 (2-2) Joint Maritime Operations - Part 2</td>
</tr>
<tr>
<td>7 Sp</td>
<td>SS3051 (4-0) Mil. DoD &amp; Comm Space (S)</td>
<td>AE0810 (0-8) Thesis Research</td>
<td>AE0810 (0-8) Thesis Research</td>
<td>Degree/Track Elective</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend
Preparatory Courses
591 Core
Track/Electives
JPME
# Unique Classified Course Offerings

<table>
<thead>
<tr>
<th>SECRET-level Courses:</th>
<th>Parts Up to TS//SCI-level:</th>
<th>TS//SCI-level Full Courses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS3051: Military, DoD, and Commercial Space</td>
<td>SS3861 Spacecraft Payload Design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE4870 Spacecraft Design and Integration I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE4872 Spacecraft Design and Integration II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS3041: Capabilities-based Space Systems and Operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE4860: Space Control / Space Maneuvers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS4055: Space Operations for the Warfighter</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS4856: Rendezvous and Proximity Operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS3001: Military Applications of National Space Systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SS4051: Competitor Space Systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AE4860: Space Control</td>
<td></td>
</tr>
</tbody>
</table>
Capstone Courses and Projects

**Space Systems Engineering**
- Satellite Design/Acquisition
- Design & Build Payloads
- High Altitude Balloons & CubeSats
- Functional Analysis & Requirement Allocation
- Classified Collection and Exploitation Systems

**Space Systems Operations**
- Mission/Architecture Design
- SATCOM EMI Resolution
- Imagery Architecture Analysis
- Protected SATCOM Architecture
- SATCOM Vulnerability and Mitigation Assessments
- Space Situational Awareness Architecture Design
## Certificate Programs

<table>
<thead>
<tr>
<th>Resident Programs</th>
<th>Distance Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augment other NPS degree programs with a space graduate certificate</td>
<td>Reach audiences outside of the traditional resident education setting</td>
</tr>
<tr>
<td>- Space Control Tactics and Operations</td>
<td>- Space Systems Fundamentals</td>
</tr>
<tr>
<td></td>
<td>- Space NC³ (Nuclear Command, Control, and Communications)</td>
</tr>
</tbody>
</table>