# SPACE ENGINEERING, MASTER OF SCIENCE

## Admission Requirements

Applicants must meet the general requirements for admission to graduate study, as outlined in the Admission Requirements (https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/) section.

The applicant's prior education must include an undergraduate or graduate degree in a quantitative discipline (e.g., engineering, computer science, mathematics, physics, or equivalent) from a regionally accredited college or university. Applicants must show competency in (1) calculus, (2) physics, and (3) computer programming, which must be demonstrated through undergraduate or graduate coursework or equivalent work experience.

Applicants whose prior education does not include the coursework listed above may still enroll under provisional status, followed by full admission status once they have completed the missing courses. Admitted students typically have earned a grade point average of at least 3.0 on a 4.0 scale (B or above) in the latter half of their undergraduate studies. When reviewing an application, the candidate's academic and professional background will be considered. As part of the admission process, the chair or the program coordinator may interview candidates to better evaluate their application.

## Program Requirements

A total of ten courses (at least three at the 700-level) must be completed within five years. The curriculum consists of five core courses and five electives. A maximum of two courses from other programs may be used to satisfy the program elective requirement. Elective selections outside of those listed below are subject to advisor approval. The curriculum is designed to provide maximum flexibility to students, enabling them to customize their five electives based on their educational needs and career goals.

Focus areas are provided as a guide for students to select courses. Students are ***not required*** to take courses from a specific focus area. The focus areas offered represent related groups of courses that are relevant for students with interests in the selected areas. The focus areas are only applicable to students seeking a master's degree. They do not appear as official designations on a student's transcript or diploma.

Only one C-range grade (C+, C, or C–) can count toward the master's degree. All core courses in the Space Engineering program may be completed remotely, except for the program capstone EN.675.710 Small Satellite Development and Experimentation, which includes a requirement that students attend a specified residency weekend in the Baltimore area to complete the laboratory component. Electives are offered online in either asynchronous or synchronous (virtual live) format. Some electives offer an in-person option at the Johns Hopkins Applied Physics Laboratory (Laurel, MD) or Bloomberg Center (Washington, D.C.). Several electives may be offered as in-person only; consult the website each semester for specifics.

### Core Courses

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.675.600 | Systems Engineering for Space | 3 |
| EN.675.601 | Fundamentals of Engineering Space Systems I | 3 |
| EN.675.602 | Fundamentals of Engineering Space Systems II | 3 |
| EN.675.701 | Applications of Space Systems Engineering | 3 |
| EN.675.710 | Small Satellite Development and Experimentation | 3 |

### Focus Areas

The focus areas offered represent related groups of courses that are relevant for students with interests in the selected areas. Focus areas are presented as an aid to students in planning their course selections and are only applicable to students seeking a master's degree. They do not appear as official designations on a student's transcript or diploma.

### SYSTEMS

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.675.621 | Space Environment and Effects | 3 |
| EN.675.641 | Space Cybersecurity | 3 |
| EN.675.711 | Ground System Engineering and Mission Operations | 3 |
| EN.675.712 | Space Mission Formulation | 3 |
| EN.675.713 | Fault Management & Autonomy | 3 |
| EN.675.761 | Reliability Engineering and Analysis | 3 |
| EN.675.768 | Spacecraft Integration and Test | 3 |
| EN.675.772 | Requirements, Verification and Validation | 3 |

### SPACECRAFT/SUBSYSTEM

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.525.640 | Satellite Communications Systems | 3 |
| EN.675.622 | Spacecraft Hardware Design Considerations | 3 |
| EN.675.702 | Spacecraft Materials | 3 |
| EN.675.722 | Space Mechanical Design and Analysis | 3 |
| EN.675.731 | Spacecraft Propulsion | 3 |
| EN.675.732 | Advanced Topics in Aerospace Hardware | 3 |
| EN.675.752 | Attitude Determination and Control | 3 |
| EN.675.753 | Avionics | 3 |
| EN.675.754 | Flight Software | 3 |
| EN.675.756 | Spacecraft Antenna Design | 3 |

### SCIENCE/INSTRUMENTS

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.675.613 | Bold Science Enabled by Engineering | 3 |
| EN.675.691 | Electro-Optical Space Systems | 3 |
| EN.675.742 | Optical Communications and Laser Radar | 3 |
| EN.675.792 | Scientific Instruments for Space | 3 |
| EN.675.793 | Science and Payload Operations Centers | 3 |

## ASTRODYNAMICS

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.675.733 | Spacecraft Rendezvous and Proximity Operations | 3 |
| EN.675.734 | Fundamentals of Celestial and Orbital Mechanics | 3 |
| EN.675.750 | Numerical Methods for Space | 3 |
| EN.675.771 | Space Mission Design and Navigation | 3 |
| EN.675.781 | Physics of Space Security | 3 |

## OTHER ELECTIVES

| Code | Title | Credits |
|---|---|---|
| **Courses** | | **Credits** |
| EN.525.744 | Passive Emitter Geo-Location | 3 |
| EN.615.744 | Physics of Space Systems I | 3 |
| EN.675.617 | Space Policy and Engineering | 3 |
| EN.675.724 | Space Internetworking | 3 |
| EN.675.740 | Assuring Success of Aerospace Programs | 3 |
| EN.675.751 | Space Weather | 3 |
| EN.675.800 | Directed Studies in Space Engineering | 3 |

Please refer to the course schedule (https://ep.jhu.edu/courses/) published each term for exact dates, times, locations, fees, and instructors.