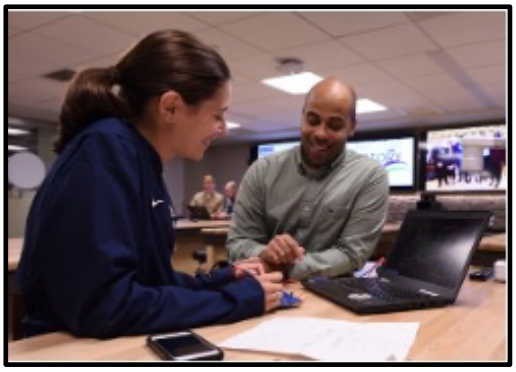
PITT SPACE

Workforce Development in Space Engineering

Launched in September 2024, Pitt Space is a campus-wide initiative dedicated to producing world-class research and graduates in space engineering, biomedicine, and science to meet the growing needs of the U.S. space community. With a focus on workforce development, the Department of Electrical and Computer Engineering is developing two academic programs. One is a 10-credit *Graduate Certificate*, and the other is a 15-credit *Undergraduate Minor,* both in *Space Engineering*. Each new program will build upon existing strengths of the various engineering degrees at Pitt to prepare graduates for the space workforce.



In support of both academic programs, five cross-listed (graduate and senior) courses in *Space Engineering* are being offered annually as of the 2024-25 academic year. Each course provides students with critical background, knowledge, and skills needed in the space workforce and is open to a broad range of engineering and science disciplines at Pitt.

- **Introduction to Space Engineering** (4 cr., every Fall semester). This course is a comprehensive overview of space engineering. Topics covered include the importance and applications of space, space environment, basics of orbital mechanics, spacecraft dynamics, systems engineering, control systems, and spacecraft subsystems (such as communication and data-handling subsystem, electrical power subsystem, environmental control and life-support subsystem, and structures), rocket propulsion, space operations, and space politics and economics. This course will include a lab session in and after Fall 2025, which focuses on simulations of spacecraft orbit control and attitude control.
- **Dependable Computer Architecture** (3 cr., every Fall semester). The focus of this course is the analysis, design, evaluation, and optimization of dependable computers and other complex systems for resilient operation in space and other harsh environments while supporting critical applications. Featuring a mix of theory and practice, novel methods in hardware, information, network, software, and time redundancy are studied and employed to mitigate threats and maximize reliability, availability, performability, and safety.
- **Extreme Environment Electronics** (3 cr., every Spring semester). This course covers the fundamentals of widely used circuits tailored for standard settings and advanced versions specifically engineered for challenging environments, such as those characterized by extreme radiation, temperature, vibration, and vacuum. Topics covered include: the impact of extreme environment on electronics; semiconductor device technologies, digital electronics, and analog electronics for wide temperature range and radiation; electronics for vibration and vacuum; packaging for extreme environments; and real-world applications.
- **Space Orbital Mechanics** (3 cr., every Spring semester). This course presents rigorous treatment of classical mechanical systems pertaining to spaceflight and orbital dynamics. Students will be able to apply mathematical treatments to Newtonian systems and in the process appreciate both physical nature and engineering feats achieved in successful completion of space missions.
- **Space Systems Project** (3 cr., every semester). This course provides students in solo and small teams the opportunity to develop requirements for a notional space mission and then design, construct, test, and optimize a space system and application for that mission.

In addition to these core space courses, another dozen space-related graduate and undergraduate courses are available or in development to expand the options for students in space engineering.