AEROSPACE ENGINEERING

COURSE 16

CONTACT

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DESCRIPTION

Aerospace engineers design, develop, and test new technologies for use in aviation, defense systems, and space exploration. They often use computer-aided design (CAD) software, robotics hardware / software, and lasers and advanced electronic optics to develop or improve aerospace platforms such as planes, drones, rockets, satellites, and spacecraft. Aerospace engineers may be experts in aerodynamics, thermodynamics, celestial mechanics, propulsion, acoustics, structural mechanics, embedded software, or guidance and control systems.

INSIDE COURSE 16

16	Aeronautics and Astronautics	Undergraduates: 134
16-ENG	S.B. in Engineering as recommended by the Department of Aeronautics and Astronautics	Undergraduates: 37

INTRODUCTORY CLASSES

16.00 **Introduction to Aerospace and Design**

Highlights fundamental concepts and practices of aerospace engineering through lectures on aeronautics, astronautics, and the principles of project design and execution. Provides training in the use of Course 16 workshop tools and 3-D printers, and in computational tools, such as CAD. Students engage in teambuilding during an immersive, semester-long project in which teams design, build, and fly radio-controlled lighter-than-air (LTA) vehicles. Emphasizes connections between theory and practice and introduces students to fundamental systems engineering practices, such as oral and written design reviews, performance estimation, and post-flight performance analysis.

16.001 - 16.004 **Unified Engineering**

Topics include statics, analysis of trusses, analysis of statically determinate and indeterminate systems, stress-strain behavior of materials, linear and time invariant systems, convolution, transform analysis, aircraft and aerodynamic performance, conservation laws for fluid flows, quasi-one-dimensional compressible flows, shock and expansion waves, thermodynamic state of a system, forms of energy, work, heat, the first law of thermodynamics, heat engines, and reversible and irreversible processes.

16.83 - **Space Systems Engineering, Space Systems Development**
16.831 Students design a complete space system, including systems analysis, trajectory analysis, entry dynamics, propulsion and power systems, structural design, avionics, thermal and environmental control, and human factors. Students participate in teams responsible for an integrated vehicle design. In 16.831, students build a space system, focusing on refinement of sub-system designs and fabrication of full-scale prototypes, which are integrated into a vehicle. Sub-system performance is verified experimentally, and compared to physical models and design goals.

16.100 - **Aerodynamics**
Extends fluid mechanic concepts from Unified Engineering to aerodynamic performance of wings and bodies in sub/supersonic regimes. Addresses themes such as subsonic potential flows, including source/vortex panel methods; viscous flows and boundary layer theory; aerodynamics of airfoils and wings; and supersonic and hypersonic airfoil theory.

COURSE 16-FRIENDLY UROP AREAS

Comp Sci and AI Lab (CSAI)	Lab for Info & Decision Systems (LIDS)
Environmental Solutions Init. (ESI)	Kavli Institute (MKI)
Institute for Soldier Nanotech (ISN)	

STUDENT GROUPS

American Institute of Aeronautics and Astronautics (AIAA)
Design-Build-Fly
Rocket Team

SKILLS

Problem-solving and analytical abilities
Generating or adapting equipment and technology
Interpret and write technical documentation
Time and project management

POSSIBLE FUTURE POSITIONS

- **Payload specialist:** Accompany equipment onboard spacecrafts to ensure proper installation and functionality.
- **Systems engineer:** Analyze mission and design requirements and coordinate high level stages of a project. Systems engineers are responsible for integrating different subsystems into the overall system.
- **Design engineer:** Takes the concept or working model of a product to create a design that meets the customer's requirements, industry standards, and can be manufactured economically.

CAREER INDUSTRY EXAMPLES

Aerospace and defense	Computer hardware	Electrical engineering
Chemicals and materials	Consulting	Military

SAMPLE EMPLOYERS

Airbus
Aerospace Corporation
Aurora Flight Sciences
Blue Origin
Boeing
GE Aviation
GE Aviation
Lincoln Laboratory
Lockheed Martin
NASA Jet Propulsion Laboratory
Northrop Grumman
OneWeb
Raytheon
Sikorski Aircraft
SpaceX
Verus Research