

Astronautical Engineering

BUILD FOR BEYOND



Astronautical engineers design, build, and operate space vehicles for exploration and applications beyond the earth's atmosphere. This program prepares students for engineering careers in the space and defense industries, space research, development, and operations in industry and government centers and laboratories, as well as for graduate study.

MAJOR

- ➔ Astronautical Engineering

BUILD FOR BEYOND

The Astronautical Engineering (ASTE) program provides the fundamentals of science and engineering, specialized courses in astronautics, and technical electives to broaden as well as deepen the coursework. ASTE students learn spacecraft and launch vehicle design and operations, propulsion, orbital mechanics, spacecraft dynamics and control, navigation, instrumentation and sensors, and much more.

RESEARCH

The Department of Astronautical Engineering (ASTE) is at the center of exciting and innovative research in spacecraft and space exploration, from basic science to new ways of designing and integrating spacecraft. Astronautical engineering students can engage in research under faculty guidance as early as their first year. In addition, ASTE has several ongoing hands-on student projects. The Microsatellite Project designs and builds CubeSats, small spacecraft approximately the size of a loaf of bread. The Liquid Propulsion Laboratory is focused on designing liquid-propelled rocket engines. The Rocket Propulsion Laboratory designs and builds solid-fueled rockets. In April, 2019, it became the first student group ever to send a rocket into space.

COMPANIES HIRING YOU

Aerospace Corporation, The Boeing Company, Defense Advanced Research Projects Agency (DARPA), Lockheed Martin, Northrop Grumman, various government agencies, Jet Propulsion Laboratory (JPL), NASA Research Centers (Glenn, Marshall, Johnson), SpaceX, Blue Origin, Virgin Galactic... and many more!

CAREER OPTIONS

- ✔ Design rocket vehicles
- ✔ Design, build, and test satellites
- ✔ Operate unmanned spacecraft and probes
- ✔ Build space instrumentation and sensors
- ✔ Conduct government research
- ✔ Become a researcher at a university or government research center

FACULTY HIGHLIGHTS

Prof. Dan Erwin is Chair of the Department of Astronautical Engineering. He also directs the Bachelor of Science program of the Department of Astronautical Engineering. His research interests focus on autonomous vehicles and distributed intelligent systems. Dr. Erwin teaches two lower-division astronautics courses and a graduate course in flow simulation. He mentors the Rocket Propulsion Laboratory. Dr. Erwin has industrial experience at Lockheed Martin, The Aerospace Corporation, and Sierra Online.



Prof. David Barnhart is the Director of the Space Engineering Research Center (SERC). His research interests include rendezvous and proximity operations, cellular spacecraft design, and on-orbit assembly and integration. He teaches courses for hands-on experiences in tracking satellites and capstone design and oversees student programs focused on cubesats and space technology.



Prof. Mike Gruntman is the founder of the USC Astronautics Program and directs the Master of Science program of the Department of Astronautical Engineering. He teaches its flagship graduate course in spacecraft design, which helped to propel the program to its current leadership position in the nation. His research focuses on space science and technology, including studies of the heliosphere, magnetosphere, and satellite systems. Dr. Gruntman has authored four books; he is a member (academician) of the International Academy of Astronautics.



Prof. Azad Madni is the director of the Systems Architecture and Engineering program at USC. He is an internationally recognized expert in intelligent model-based systems engineering, complex engineered systems, adaptive architectures, and human-centered design. He is a Fellow of the AIAA, IEEE, and several other professional societies.



Prof. Garrett Reisman is a former NASA astronaut who spent more than one hundred days in space. Prof. Reisman recently joined the department after working at SpaceX for seven years, most recently as the Director of Space Operations. He teaches courses on human spaceflight and science and engineering of human-operated space vehicles. In particular, his courses cover human factors engineering, spaceflight biospherics and life support systems, and human spaceflight operations.



Prof. Joseph Wang's research interests include computational and experimental investigations applied to spacecraft environmental interactions, space propulsion, spacecraft reliability, and space plasma physics. Some ongoing research in his group include spacecraft charging and dust particle interactions on the lunar surface, radiation belt remediation, and plasma instabilities in the solar wind. Dr. Wang's awards and honors include two National Academy of Engineering "Frontiers of Engineering" invitations, a National Academies "Keck Futures Initiative Conference" invitation, JPL's Lew Allen Award, and four NASA group achievement awards.



Allie Anderson | B.S. Astronautical Engr. '07

Following graduation, Allie took a position at the Information Sciences Institute, where she was a subsystem configuration engineer for microsatellite development. She left ISI in 2008 to earn her Ph.D. at the Massachusetts Institute of Technology. She is currently Assistant Professor at the University of Colorado, Boulder, specializing in bioastronautics.



ALUMNI HIGHLIGHTS

Lucy Hoag | Ph.D., M.S., B.S. Astronautical Engineering '13, '09, '07

Lucy continued her education in astronautics immediately following graduation, ultimately receiving her PhD in Astronautical Engineering. After years as a researcher at the USC Information Sciences Institute she took a position as Space Systems Design Expert for Defense Advanced Research Projects Agency (DARPA). She is currently a Technical Program Manager, Autonomous Vehicle Division, at Lyft.



Martin Hilario | B.S. Astronautical Engineering '13

During his undergraduate years, Martin performed research in advanced propulsion for the Air Force Research Laboratory. He is now a Ph.D. student at USC, working on high-power electromagnetic interactions for beamed-energy thermal propulsion.

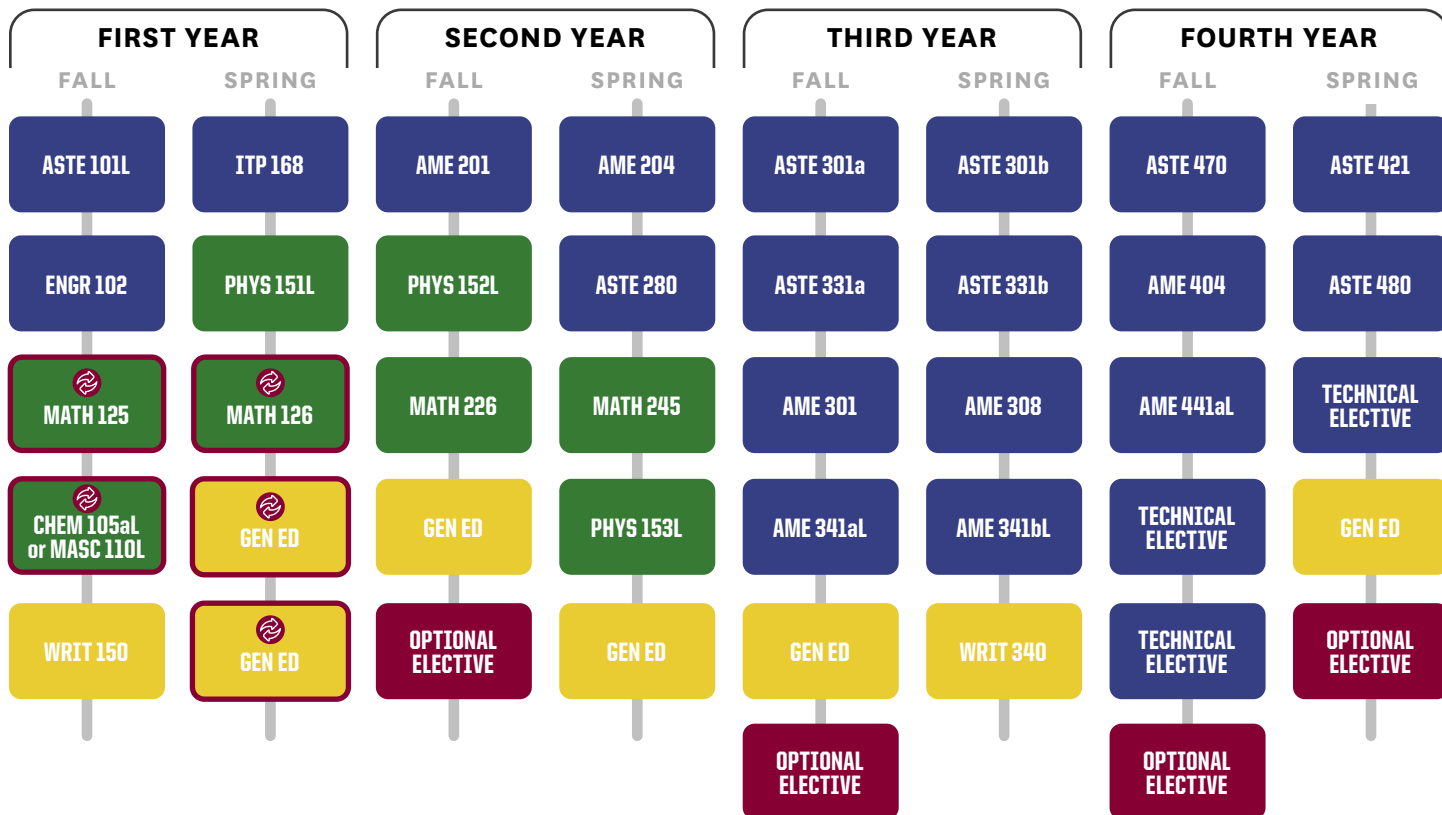


Desiree Webster-Zuber | B.S., M.S.

Upon completion of her Masters degree in the Viterbi Progressive Degree Program (PDP), Desiree took a full-time position as a Boost Propulsion Development Engineer at SpaceX.



Astronautical Engineering



ENGINEERING

- AME 201:** Statics
- AME 204:** Strength of Materials
- AME 301:** Dynamics
- AME 308:** Comp. Aided Analyses for Aero-Mechanical Design
- AME 341aL:** Mechoptronics Laboratory I
- AME 341bL:** Mechoptronics Laboratory II
- AME 404:** Comp. Solutions to Engr. Problems
- AME 441aL:** Senior Projects Laboratory
- ASTE 101L:** Introduction to Astronautics
- ASTE 280:** Foundations of Astronautical Engineering
- ASTE 301a:** Thermal & Statistical Systems
- ASTE 301b:** Thermal & Statistical Systems
- ASTE 331a:** Spacecraft Systems Engineering
- ASTE 331b:** Spacecraft Systems Engineering
- ASTE 421:** Space Mission Design
- ASTE 470:** Spacecraft Propulsion
- ASTE 480:** Spacecraft Dynamics
- ENGR 102:** Engineering Freshman Academy
- ITP 168:** Introduction to MATLAB
- TECHNICAL ELECTIVES:** Specialized upper division courses you choose for your major/specialization.

MATHEMATICS

- MATH 125:** Calculus I
- MATH 126:** Calculus II
- MATH 226:** Calculus III
- MATH 245:** Mathematics of Phys. & Engr.

SCIENCE

- CHEM 105aL:** General Chemistry or **MASC 110L:** Materials Science
- PHYS 151L:** Mechanics & Thermodynamics
- PHYS 152L:** Electricity & Magnetism
- PHYS 153L:** Optics & Modern Physics

GENERAL EDUCATION

As a USC Viterbi student your General Education (Gen Ed) curriculum will include courses in the Arts, Humanistic Inquiry and Social Analysis.

WRITING

- WRIT 150:** Writing & Critical Reasoning
- WRIT 340:** Advanced Writing

ELECTIVES

Your optional electives are one way to build engineering+ into your curriculum by choosing classes of interest to you.



Courses with this symbol may be satisfied with certain AP, IB or A-Level exams.

With each requirement you replace with prior credit, you increase your optional electives, creating more flexibility for you to pursue additional electives and increase your engineering+ education.

This is a simplified version of a complex curriculum with options and choices made between advisor and student. Course choices can vary by semester and adjust to include relevant topics and materials. Although every attempt has been made to ensure accuracy, the program requirements listed in the USC Catalogue supersede any information which may be contained in this or any other publication of any school or department. The information found in this document is not intended for advising purposes. The University reserves the right to change its policies, rules, regulations, requirements and course offerings at any time.