Aerospace Engineering

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The mission of the Aerospace Engineering Department is to collaborate with the Aerospace Industry to build partnerships which promote excellence and innovation to serve diverse communities. We work as a team to provide an excellent Learn-by-Doing, systems and design focused engineering education; graduating Day One-ready professionals.

We accomplish our mission using a laboratory-based, hands-on approach to education students. This approach, coupled with a systems view of engineering, is encouraged through coursework and a group-based capstone design experience. This educational philosophy yields engineers capable of working in positions of technical responsibility and leadership in a modern multidisciplinary, systems-based industry.

The Bachelor of Science degree in Aerospace Engineering prepares students for engineering work in the exciting aerospace industry. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of technology and performance. Nevertheless, complex aerospace systems must be designed and manufactured; thus, an exceptionally wide range of engineering and problem solving abilities is required. Aerospace Engineering graduates obtain employment in all areas of the aerospace industry with a strong focus on aircraft and spacecraft design.

Aerospace Engineering students can choose between an Aeronautics or Astronautics concentration. Within Aeronautics, students learn the fundamentals of aerodynamics, flight mechanics, materials, structures, propulsion, and stability and control. Within Astronautics, students learn the fundamentals of orbital mechanics, space environment, space structures, telecommunications, attitude dynamics and control, and rocket propulsion. Both concentrations culminate with a Senior Design capstone course where students put theory into practice using a disciplined systems engineering approach to either aircraft or spacecraft design.

The BS degree program in Aerospace Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org/. It places emphasis on both analysis and design, with supplementary basic work in laboratory projects. Throughout the entire program there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

The program maintains laboratory facilities for fabrication, air breathing and space propulsion, structures and composites, aerodynamics, dynamics and control, flight simulation and flight test, aerothermodynamics, advanced computation, and design.

Aerospace students may participate in two student chapters of national professional societies—the American Institute of Aeronautics and Astronautics and the Society for the Advancement of Material and Process Engineering. There is also a student chapter of the national aerospace engineering honor society, Sigma Gamma Tau. In addition, students have the opportunity to work on CubeSats and Autonomous Flight Systems, through other club activities or faculty research.

Undergraduate Programs

BS Aerospace Engineering

The Bachelor of Science degree in Aerospace Engineering prepares students for engineering work in the exciting aerospace industry. The aerospace industry is known for designing and building complex systems which push the limits of technology. Therefore a strong emphasis is placed on turning theory into practice and problem solving using a disciplined systems engineering approach. The program’s faculty have developed a number of educational objectives to support this mission. These objectives are:

• Be life-long learners who continue to pursue professional development;
• Participate and thrive in a multi-disciplinary, systems-oriented work environment;
• Contribute to the solution of complex technical problems that exist in the aerospace industry; and
• Understand their ethical role as a professional engineer and strive to promote a practice of integrity, tolerance, and respect in the workplace.

Multidisciplinary Design Minor

The minor enhances students’ ability to work in multidisciplinary engineering teams. The students develop an understanding of the design process and the role of systems engineering in product design and development including costs analysis. They also learn the systems integration process and how different subsystems are interfaced to develop a successful product.

Graduate Programs

MS Aerospace Engineering

General Characteristics

The Master of Science program in Aerospace Engineering prepares the student for entry into a well-established field of aerospace engineering. The Master of Science program in Aerospace Engineering prepares the student for entry into a well-established field of aerospace engineering. The MS program emphasizes engineering science and research activity. Graduates have an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to a Ph.D. or advanced positions within industry.
Prerequisites
For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination.

An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Department of Aerospace Engineering.

Program of Study
A thesis is required as a culminating experience. Students work with their advisor and the Department Graduate Coordinator to develop a program of study which supports their thesis topic. A thesis topic would typically be in an area of faculty research interest.

For the most recent, comprehensive list of courses offered by the department, please contact the Department Graduate Coordinator or see the listing at http://aero.calpoly.edu.

Program Learning Objectives
1. Competency in advanced mathematics, science, and aerospace engineering knowledge.
2. Ability to apply advanced mathematics, science, and aerospace engineering knowledge to a project that is conducted independently.
3. Make a specific contribution to a field that is relevant to aerospace professionals.
4. Ability to convey effectively engineering ideas and results both orally and in writing.
5. Awareness of professional and ethical responsibility.
6. Awareness of global, contemporary issues related to aerospace engineering and the society at large.
7. Awareness of rapid advancement of modern technology and ability for life-long learning.

MS Aerospace Engineering, Specialization in Research
Characteristics
Emphasizes engineering science and research activity. Graduates have an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to the Doctor of Engineering or Ph.D. or advanced positions within industry.

Program of Study
A thesis is required as a culminating experience. Students work with their advisor and the Department Graduate Coordinator to develop a program of study which supports their thesis topic. A thesis topic would typically be in an area such as: dynamics and control, fluid dynamics and aerodynamics, multidisciplinary design and optimization, aerospace propulsion, aerospace structures, and systems engineering.

For the most recent, comprehensive list of courses offered by the department, please contact the Department Graduate Coordinator or see the listing at http://aero.calpoly.edu.

MS Aerospace Engineering, Specialization in Space Systems Engineering
Characteristics
Emphasizes space systems and systems engineering. It is designed to accommodate students with undergraduate degrees in science or engineering disciplines other than aerospace engineering. Students develop an understanding of all subsystems in a space vehicle and how they are combined to form a complete space vehicle. The program also presents the basic principles of systems engineering and their application to space vehicle design. A project is required as a culminating experience.

Graduate Certificate Program
Space Systems Technology
General Characteristics
Space-based systems are complex in nature and require a multidisciplinary team of hard working engineers to develop, deploy and operate. The particular technologies involved in space-based systems are also complex and require engineers with a broad knowledge base. Furthermore, space-based systems operate on the edge of their design performance. Therefore, understanding the interaction of the functional units and technologies is exceedingly important.

The graduate certificate in Space Systems Technology will prepare the engineer working in the space industry in key areas of spacecraft technology. Students will learn about all major functional units of a space-based system from spacecraft dynamics to software architecture. The goal of the graduate certificate in Space Systems Technology is to educate working engineers with a system-level awareness in the complex technologies of space-based systems. The certificate is designed with the non-aerospace engineering in mind, but is open to all those working in the industry.

Program Goals
1. Understand how and why a spacecraft functions as a system in an operational context.
2. Evaluate the interconnectedness of spacecraft functional elements and analyze and assess the results of this evaluation.
3. Understand the role and function of software as a functional element and its integration/interconnections with other components and operations of a space system.
4. Analyze and understand the orbital and attitude dynamics of the spacecraft with regard to mission objectives.
5. Effectively communicate (read, write, speak, and listen) with any engineer working on any functional element of a space program to define system requirements and interfaces.
6. Create opportunities for professional growth and career advancement through continued learning and interaction with the space technology community.
Admission Requirements
Successful applicants to the Space System Technology certificate program will have a bachelor's degree in engineering or relevant field of study (minimum 3.0 GPA) from an accredited institution. Applicants with non-engineering degrees in areas commonly found within the Aerospace Engineering Industry (e.g. physics and mathematics) will be considered for admission at the discretion of the program. Additionally, the applicant must have at least 2 years of engineering work experience. Work experience may substitute, at the discretion of the program, for the relevancy of the bachelor's degree and for the minimum GPA requirements.

Tuition and Fees
As a special session program through Extended Education, the Space Systems Technology graduate certificate is administratively and academically completely self-supporting. As such, the program carries a separate tuition and fee schedule.

Blended BS + MS Aerospace Engineering
The blended program provides motivated students with an accelerated route to the MS Aerospace Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility
Students majoring in BS Aerospace Engineering may be eligible to pursue the blended program toward the MS Aerospace Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 3.0 required. Students are selected by a faculty committee. Please see Graduate Programs (http://catalog.calpoly.edu/graduateeducation/#graduateandpostbaccalaureateadmissionrequirements) for eligibility criteria.

Program of Study
The program allows students to complete a more meaningful capstone experience that integrates the senior design course with the graduate thesis. This arrangement also increases opportunities for industry interaction.

The blended program allows students to double count up to four units of coursework to fulfill the requirements for the BS and MS degrees.