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The Pennsylvania State University
Aerospace Engineering Undergraduate Program

Goals

In addition to the University's required General Education component, students will learn the fundamentals of engineering and these essential subjects in aerospace engineering:

1. aeronautics
2. astronautics
3. aerodynamics and fluid dynamics
4. aerospace materials and structures
5. dynamics and automatic control
6. aircraft stability & control *and/or* orbital and attitude dynamics & control
7. air-breathing and rocket propulsion
8. aircraft systems design *and/or* spacecraft systems design

Program Outcomes

The undergraduate program will provide students with the

a.) ability to apply knowledge of mathematics, science and engineering to all of the subjects in 1-8 above,
b.) ability to design and conduct experiments, analyze and interpret data in aerodynamics, propulsion, structures and control systems,
c.) ability to design a system, component or process, integrating knowledge from relevant topics in astronautics and aeronautics, to meet desired needs in aircraft systems and/or in spacecraft systems,
d.) ability to function on multi-disciplinary teams,
e.) ability to identify, formulate, and solve engineering problems,
f.) understanding of professional and ethical responsibility,
g.) ability to communicate effectively,
h.) broad education necessary to understand the impact of engineering solutions in a global and societal context,.
i.) recognition of the need for, and an ability to engage in life-long learning,
j.) knowledge of contemporary issues,
k.) ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
l.) knowledge in all subjects in Category I or in Category II, and in some subjects in the other category: (Category I. aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and stability and control), (Category II: orbital mechanics, space environment, attitude determination and control, telecommunications, space structures, and rocket propulsion).

Detailed Program Objectives

Aerospace engineering B.S. graduates will be able to

1. analyze the dynamics and control characteristics of aerospace vehicles, including the basic translational and rotational dynamics, and the basic theory and practice used to control these motions,
2. analyze fluid dynamics, including the regimes of subsonic, transonic, and supersonic flows, inviscid and viscous flows, and laminar and turbulent flows,
3. apply knowledge of the fundamentals of aeronautics, including aerodynamic characteristics of aircraft, propulsion systems, airplane performance, and elementary aircraft stability & control,
4. apply knowledge of the fundamentals of astronautics, including orbital mechanics, attitude dynamics & control, rocket propulsion, and the space environment,
5. predict performance, and conduct preliminary design, of gas turbine and rocket-based propulsion systems and their components,
6. analyze the detailed dynamics, stability and control of either aircraft or spacecraft,
7. analyze and design structural elements such as bars, beams, plates and thin-walled structures,
8. make measurements to test hypotheses or to characterize the performance of physical systems (aerodynamic, structural, and control), and analyze and interpret the data in written reports,
9. complete the successive stages of conceptual, preliminary, and detailed design of an aircraft or spacecraft mission and the associated vehicle(s),
10. function effectively on teams to solve problems in complex aerospace systems that require knowledge of multiple disciplines,
11. apply an understanding of professional and ethical responsibility to realistic situations,
12. make effective oral and written presentations in the format appropriate for the setting,
13. explain how this profession affects society as a whole, and to demonstrate an appreciation of how technical issues guide societal actions,
14. demonstrate an awareness of the need to stay abreast of technical developments throughout their working careers, and demonstrate that they are able to maintain and extend their learning, and
15. make appropriate and effective use of computer software, hardware, and state-of-the-art laboratory instrumentation.