

AEROSPACE ENGINEERING SCIENCES

Aerospace Engineering Sciences prepares students for successful and rewarding careers in aerospace and other high-tech industries, national research laboratories, government services and academia. This program provides students unique opportunities to develop in-depth technical knowledge, effective communication skills and a systems engineering perspective that enables them to develop creative solutions to complex problems. The curriculum encompasses core aerospace engineering subjects including fluid dynamics, thermodynamics, materials and structures, dynamical systems, orbital mechanics, air and space vehicle design with multidisciplinary applications including bioastronautics, unmanned systems, remote sensing and GPS.

The mission of the Ann and H.J. Smead Department of Aerospace Engineering Sciences (<https://www.colorado.edu/aerospace/>) is to provide students the highest quality education in aerospace engineering sciences, emphasizing hands-on learning, and to conduct fundamental, applied and interdisciplinary research to meet societal needs through analysis, design and implementation of aerospace systems, leveraging synergies between aerospace engineering and related sciences.

The department is uniquely characterized by:

- Blending aeronautics, astronautics and science applications.
- Providing an undergraduate experience characterized by rigorous preparation in mathematics and engineering sciences, a hands-on experiential approach to learning and an extensive emphasis on design in a systems context.
- Emphasizing our graduate education and research programs in the forefront of aerospace fundamentals, technology development, and integration of engineering and science activities to solve critical problems in the earth and space sciences.
- Creating graduates who are broadly educated, interdisciplinary, agile, team-oriented engineers and scientists, with end-to-end mission and systems perspectives.

Course code for this program is ASEN.

Bachelor's Degree

- Aerospace Engineering Sciences - Bachelor of Science (BSAE) (<https://catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/aerospace-engineering-sciences/aerospace-engineering-science-bachelor-science-bsae/>)

Faculty

While many faculty teach both undergraduate and graduate students, some instruct students at the undergraduate level only. For more information, contact the faculty member's home department.

Ahmed, Nisar R. (https://experts.colorado.edu/display/fisid_153237/)
Associate Professor; PhD, Cornell University

Akos, Dennis M. (https://experts.colorado.edu/display/fisid_131119/)
Professor; PhD, Ohio University

Ali, Hisham
Assistant Professor; PhD, Georgia Institute of Technology

Anderson, Allison P. (https://experts.colorado.edu/display/fisid_156275/)
Assistant Professor; PhD, Massachusetts Institute of Technology

Argrow, Brian M. (https://experts.colorado.edu/display/fisid_102860/)
Professor; PhD, University of Oklahoma

Axelrad, Penina (https://experts.colorado.edu/display/fisid_100792/)
Distinguished Professor, Endowed/Named Professor; PhD, Stanford University

Bosanac, Natasha (https://experts.colorado.edu/display/fisid_158199/)
Assistant Professor; PhD, Purdue University

Boyd, Iain (https://experts.colorado.edu/display/fisid_165828/)
Professor; PhD, University of Southampton (England)

Brasseur, James G. (https://experts.colorado.edu/display/fisid_156801/)
Research Professor; PhD, Stanford University

Braun, Robert D. (https://experts.colorado.edu/display/fisid_158523/)
Professor Adjunct; PhD, Stanford University

Chu, Xinzhaoh (https://experts.colorado.edu/display/fisid_141893/)
Professor; PhD, Peking University (China)

Clark, Torin K. (https://experts.colorado.edu/display/fisid_155959/)
Assistant Professor; PhD, Massachusetts Institute of Technology

Constantine, Paul (https://experts.colorado.edu/display/fisid_159755/)
Assistant Professor; PhD, Stanford University

Correll, Nikolaus J. (https://experts.colorado.edu/display/fisid_147555/)
Associate Professor; PhD, Ecole Polytech Federale de Lausanne (Switzerland)

Culp, Robert D.
Professor Emeritus; PhD, University of Colorado Boulder

Davis, Kate E. (https://experts.colorado.edu/display/fisid_147882/)
Lecturer; PhD, University of Colorado Boulder

Doostan, Alireza (https://experts.colorado.edu/display/fisid_147382/)
Professor, Faculty Fellow; PhD, Johns Hopkins University

Emery, William J.
Professor Emeritus; PhD, University of Hawaii

Evans, John A. (https://experts.colorado.edu/display/fisid_152970/)
Associate Professor; PhD, University of Texas at Austin

Farnsworth, John A. (https://experts.colorado.edu/display/fisid_153255/)
Assistant Professor; PhD, Rensselaer Polytechnic Institute

Felippa, Carlos A. (https://experts.colorado.edu/display/fisid_105701/)
Professor Emeritus; PhD, University of California, Berkeley

Forbes, Jeffrey M.
Professor Emeritus, Research Professor; PhD, Harvard University

Frew, Eric W. (https://experts.colorado.edu/display/fisid_134685/)
Professor, Associate Chair; PhD, Stanford University

Gates, Harvey
Associate Professor Adjunct; PhD, University of Denver

Gerren, Donna S. (https://experts.colorado.edu/display/fisid_108563/)
Teaching Professor; PhD, University of Kansas

Gremban, Keith (https://experts.colorado.edu/display/fisid_166519/)
Research Professor; PhD, Carnegie Mellon University

Hamlington, Peter Edward (https://experts.colorado.edu/display/fisid_149800/)
Associate Professor; PhD, University of Michigan Ann Arbor

Heckman, Christoffer (https://experts.colorado.edu/display/fisid_155294/)
Assistant Professor; PhD, Cornell University

Hieb, Rick
Scholar in Residence; MS, University of Colorado

Holzinger, Marcus J. (https://experts.colorado.edu/display/fisid_164054/)
Associate Professor, Associate Chair; PhD, University of Colorado Boulder

Humbert, J. Sean (https://experts.colorado.edu/display/fisid_156202/)
Professor; PhD, California Institute of Technology

Hussein, Mahmoud I. (https://experts.colorado.edu/display/fisid_144300/)
Professor; PhD, University of Michigan Ann Arbor

Jansen, Kenneth E. (https://experts.colorado.edu/display/fisid_147360/)
Professor; PhD, Stanford University

Kantha, Lakshmi H. (https://experts.colorado.edu/display/fisid_100231/)
Professor Emeritus; PhD, Massachusetts Institute of Technology

Klaus, David M. (https://experts.colorado.edu/display/fisid_107103/)
Professor; PhD, University of Colorado Boulder

Knipp, Delores Jane (https://experts.colorado.edu/display/fisid_147655/)
Research Professor; PhD, University of California, Los Angeles

Koster, Jean N.
Professor Emeritus; PhD, Karlsruher Institut für Technologie (Germany)

Kubitschek, Daniel (https://experts.colorado.edu/display/fisid_144283/)
Lecturer; PhD, University of Colorado Boulder

Lahijanjan, Morteza Mehdi (https://experts.colorado.edu/display/fisid_164179/)
Assistant Professor; PhD, Boston University

Larson, Kristine M.
Professor Emerita, Research Professor; PhD, Scripps Institution of Oceanography

Lawrence, Dale A. (https://experts.colorado.edu/display/fisid_104057/)
Professor; PhD, Cornell University

Le Moine, Alexandra
Teaching Assistant Professor; MS, University of Wisconsin

Leben, Robert R.
Research Professor Emeritus; PhD, University of Colorado Boulder

Li, Xinlin (https://experts.colorado.edu/display/fisid_100016/)
Professor; PhD, Dartmouth College

Liu, Hanli
Associate Professor Adjunct; PhD, University of Michigan

Lopez Jimenez, Francisco (https://experts.colorado.edu/display/fisid_157867/)
Assistant Professor; PhD, California Institute of Technology

Macdonald, Robyn (https://experts.colorado.edu/display/fisid_165823/)
Assistant Professor; PhD, University of Illinois at Urbana-Champaign

Mah, John K. (https://experts.colorado.edu/display/fisid_164214/)
Teaching Assistant Professor, Associate Chair; MS, Stanford University

Marshall, Robert A. (https://experts.colorado.edu/display/fisid_155957/)
Associate Professor; PhD, Stanford University

Maslanik, James
Research Professor Emeritus

Matsuo, Tomoko (https://experts.colorado.edu/display/fisid_145041/)
Associate Professor; PhD, SUNY at Stony Brook

Maute, Kurt (https://experts.colorado.edu/display/fisid_113875/)
Professor; PhD, University of Stuttgart (Germany)

McGrath, Michael T. (https://experts.colorado.edu/display/fisid_100133/)
Professor Adjunct; BS, University of Colorado Boulder

McMahon, Jay W. (https://experts.colorado.edu/display/fisid_150062/)
Associate Professor, Associate Chair; PhD, University of Colorado Boulder

Minton, Timothy K. (https://experts.colorado.edu/display/fisid_167230/)
Professor; PhD, University of California Berkeley

Morton, Yu Jade (https://experts.colorado.edu/display/fisid_159076/)
Endowed/Named Professor; PhD, The Pennsylvania State University

Nabity, James A. (https://experts.colorado.edu/display/fisid_153102/)
Associate Professor; PhD, University of Colorado Boulder

Neogi, Sanghamitra (https://experts.colorado.edu/display/fisid_156773/)
Assistant Professor; PhD, Pennsylvania State University

Nerem, R. Steven (https://experts.colorado.edu/display/fisid_118478/)
Professor; PhD, University of Texas at Austin

Palo, Scott E. (https://experts.colorado.edu/display/fisid_109033/)
Professor; PhD, University of Colorado Boulder

Pao, Lucy Y. (https://experts.colorado.edu/display/fisid_107151/)
Professor; PhD, Stanford University

Park, Kwang-Chun
Professor Emeritus; PhD, Clarkson College

Rainville, Nicholas (https://experts.colorado.edu/display/fisid_164756/)
Teaching Assistant Professor; PhD, University of Colorado Boulder

Ruzzene, Massimo (https://experts.colorado.edu/display/fisid_165832/)
Professor; PhD, Politecnico Di Torino (Italy)

Schaub, Hanspeter (https://experts.colorado.edu/display/fisid_143818/)
Endowed/Named Professor, Associate Chair; PhD, Texas A&M University

Scheeres, Daniel J. (https://experts.colorado.edu/display/fisid_145035/)
Distinguished Professor; PhD, University of Michigan Ann Arbor

Scott, Hank
Lecturer; MA, University of Queensland (Australia)

Singer, Howard Joseph
Professor Adjunct; PhD, University of California, Los Angeles

Sirangelo, Mark (https://experts.colorado.edu/individual/fisid_164135/)
Entrepreneur in Residence; JD, Seton Hall University

Sternovsky, Zoltan (https://experts.colorado.edu/display/fisid_115211/)
Associate Professor; PhD, Charles University (Czech Republic)

Stodieck, Louis S. (https://experts.colorado.edu/display/fisid_105272/)
Research Professor; PhD, University of Colorado Boulder

Sunberg, Zachary (https://experts.colorado.edu/individual/fisid_165833/)
Assistant Professor; PhD, Stanford University

Thayer, Jeffrey P. (https://experts.colorado.edu/display/fisid_134469/)
Professor, Endowed/Named Professor; PhD, University of Michigan Ann Arbor

Thomas, Evan (https://experts.colorado.edu/display/fisid_163895/)
Associate Professor; PhD, University of Colorado Boulder

Voss, James S. (https://experts.colorado.edu/display/fisid_140891/)
Scholar in Residence; MS, University of Colorado Boulder

Williams, Christopher (https://experts.colorado.edu/display/fisid_105765/)
Research Professor; PhD, University of Colorado Boulder

Zea, Luis P. (https://experts.colorado.edu/display/fisid_156131/)
Assistant Research Professor; PhD, University of Colorado Boulder

ASEN 1000 (1) Introduction to Aerospace Engineering Sciences

Introduces aerospace history, curriculum, ethics, and the many areas of emphasis within aerospace engineering. Academic and industry speakers are invited to address various aerospace topics.

Requisites: Restricted to students with 0-26 credits (Freshmen) Aerospace Engineering (ASEN) or Engineering Open Option majors only.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 1009 (1) Undergraduate Aerospace Seminar

Introduce aerospace undergraduate students to world-class aerospace researchers and technical, policy, and/or current events topics.

Repeatable: Repeatable for up to 2.00 total credit hours.

Requisites: Restricted to Undergraduate Aerospace (ASEN-BSAE) or Undergraduate Engineering Open Option majors only.

ASEN 1022 (3) Materials Science for Aerospace Engineers

Covers prerequisite chemistry topics for materials science and introduces material types, properties and behavior for aerospace engineers.

Topics include review of chemistry; atomic bonding; crystals; diffusion; mechanical/thermal properties; phase diagrams; heat treatment; failure mechanisms; materials selection; and a general introduction to modern materials for aerospace engineering applications including composites and materials with engineered properties. Lab project or tensile testing is included.

Requisites: Requires prereq or coreq of APPM 1350 or MATH 1300 or APPM 1340 or APPM 1345 and ASEN 1320 or CHEN 1310 or CSCI 1300 or CSCI 1310 or CSCI 1320 or ECEN 1310 (min grade C). Restricted to Aerospace Eng (ASEN) majors or IDEN-BSIDE mjrs with Aerospace emphasi

Additional Information: Departmental Category: Structures, Materials, and Structural Dynamics

ASEN 1320 (4) Aerospace Computing and Engineering Applications

Uses problems and tools from Engineering. Teaches techniques for writing computer programs in higher level programming languages to solve problems of interest in Engineering and other domains. Appropriate for students with little or no prior experience in programming.

Requisites: Requires a prerequisite or corequisite course of APPM 1235 or APPM 1340 or APPM 1345 or APPM 1350 or MATH 1150 or MATH 1300 or MATH 1310 (all minimum grade C-). Restricted to College of Engineering majors only.

ASEN 1400 (3) Gateway to Space

Introduces the basics of atmosphere and space sciences, space exploration, spacecraft design, rocketry and orbits. Students design, build, and launch a miniature satellite on a high altitude balloon. Explores the current research in space through lectures from industry.

Equivalent - Duplicate Degree Credit Not Granted: ASTR 2500

Requisites: Restricted to College of Engineering students with a maximum of 50 credit hours.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 1403 (3) Introduction to Rocket Engineering

Introduces students to the engineering profession through completion of a team-based project. Students design, build, and static test-fire a liquid-solid hybrid rocket motor. Topics explored include: pressure vessels, combustion, ideal fluid behavior, systems engineering, data acquisition, and model verification. Learned skills will include technical writing, teamwork, computer modelling and analysis tools, 3D printing and prototyping technologies.

Equivalent - Duplicate Degree Credit Not Granted: ASEN 1400 or GEEN 1400

Requisites: Restricted to College of Engineering students with 50 credits or fewer completed.

ASEN 1969 (3) Pathway to Space

Explore the many paths one can take to be a part of a space-related career in a unique, engaging and interactive course. Students will learn about the following topics: space science and exploration, human spaceflight and life sciences, aeronautics and near space, launch and spacecraft systems, climate and environment, space business, policy and politics, space arts, media, and history.

Additional Information: Departmental Category: Specialized Courses

ASEN 2001 (4) Aerospace 1: Introduction to Statics, Structures, and Materials

Introduces models and analytical/numerical methods for statics and structural analysis. Topics include force/moment equilibrium, truss analysis, beam theory, stress/strain, failure criteria, and structural design. Matlab proficiency required.

Requisites: Requires prereqs PHYS 1110 APPM 1360 or MATH 2300 CSCI 1300 or 1310 or 1320 or ASEN 1320 or CHEN 1310 or ECEN 1310 (all minimum grade C). Requires prereqs or coreqs ASEN 2012 APPM 2350 or MATH 2400. Restricted to Aerospace Engineering (ASEN) mjrs.

Additional Information: Departmental Category: Structures, Materials, and Structural Dynamics

ASEN 2002 (4) Aerospace 2: Introduction to Thermodynamics and Aerodynamics

Introduces the fundamental principles and concepts of thermodynamics and fluid dynamic systems. Emphasizes the synthesis of basic science (physics), mathematics and experimental methods that form the basis for quantitative and qualitative analyses of general aerospace technology systems. Proficiency in Matlab required.

Requisites: Requires prereqs PHYS 1110 and (APPM 1360 or MATH 2300) and CSCI 1300 or 1310 or 1320 or ASEN 1320 or CHEN 1310 or ECEN 1310 (all min C). Requires prereq or coreq of ASEN 2012 and (APPM 2350 or MATH 2400). Rstr to Aero Eng (ASEN) mjrs.

Additional Information: Departmental Category: Aerodynamics and Fluid Mechanics

ASEN 2012 (2) Experimental and Computational Methods in Aerospace Engineering Sciences

Introduces statistical, experimental, and computational methods used in aerospace engineering sciences. Usage of MatLab is extensive.

Requisites: Requires prereq courses ASEN 1320 or CSCI 1300 or CHEN 1310 or ECEN 1310 and PHYS 1110 (all minimum grade C). Requires prereq or coreq course APPM 2360 or MATH 2130 MATH 3430 (min grade C). Restricted to UG ASEN and IDEN mjrs with Aerospace emphasis.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 2519 (1-3) Special Topics

Studies specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower-division level. Course content is indicated in the online Schedule Planner. Department enforced prerequisites: varies.

Repeatable: Repeatable for up to 10.00 total credit hours. Allows multiple enrollment in term.

Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

Additional Information: Departmental Category: Specialized Courses

ASEN 2701 (3) Introduction to Statics, Structures, and Materials

Introduce the fundamental analytical tools for statics and structural analysis in the context of the physics of aerospace materials. Topics include force/moment equilibrium, truss analysis, failure criteria, stress and strain analysis, stiffness and strength of material, and beam theory.

Requisites: Requires prereqs of APPM 1360 or MATH 2300 and PHYS 1110 (all min grade C). Requires prereq or coreq of APPM 2360 or MATH 2130 MATH 3430 (all min grade C). Restricted to Aero Eng (ASEN) majors Integ Design Engr (IDEN-BSIDE) mjrs w Aerospace emphasi

ASEN 2702 (3) Introduction to Thermodynamics and Aerodynamics

Introduces the fundamental principles and concepts of thermodynamics and aerodynamics. Topics include the first law of thermodynamics, properties of pure substances, control volume analysis, one-dimensional incompressible and compressible flows, two-dimensional lift and drag, and introduction to viscous flows.

Requisites: Requires prereqs of APPM 1360 or MATH 2300 and PHYS 1110 (all min grade C). Requires prereq or coreq of APPM 2360 or MATH 2130 MATH 3430 (all min grade C). Restricted to Aero Eng (ASEN) majors Integ Design Engr (IDEN-BSIDE) mjrs w Aerospace emphasi

ASEN 2802 (1) Aerospace Sciences Lab I

Provides an introductory laboratory experience in aerospace sciences, with a focus on statics, structural mechanics, thermodynamics, and aerodynamics. Emphasizes model-based design, experimental data collection, and interpretation of experimental data.

Requisites: Requires prereq ASEN 1320 or CHEN 1310 or CSCI 1300 or 1310 or 1320 or ECEN 1310 (min grade C). Requires prereqs or coreqs ASEN 2012 and ASEN 2701 ASEN 2702 (min grade C). Restricted to Aero (ASEN) mjrs Integ Design (IDEN) mjrs w/ Aerospace emphasis

ASEN 2849 (1-3) Independent Study

Study of special projects agreed upon by student and instructor. Department consent required.

Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.

Additional Information: Departmental Category: Specialized Courses

ASEN 3036 (3) Introduction to Human Spaceflight

Introduces students to the challenges of human space flight. Historical and current space programs and spacecraft are discussed with emphasis on those systems specific to sustaining human crews. Other topics include space environment with respect to sustaining human life and health, physiological and psychological concerns in a space habitat, astronaut selection and training, anomalies, mission operations motivation, costs rationale for human space exploration, and future program directions. Not accepted as a Professional Area Elective for ASEN majors.

Additional Information: Departmental Category: Bioastronautics and Microgravity Science

ASEN 3046 (3) Introduction to Humans in Aviation

Investigates the history of crewed aviation accomplished through a review of the history of flight, the physiological and psychological limitations facing aviators, and investigates the human related causal factors in aviation accidents. The course also looks at the social and economic impacts of aviation in modern society. Not accepted as a Professional Area Elective for ASEN majors.

Additional Information: Departmental Category: Bioastronautics and Microgravity Science

ASEN 3111 (4) Aerodynamics

Develops the fundamental concepts of aerodynamics and provides a working knowledge for their application to the design of aircraft and launch vehicles operating at various speeds and altitudes, as well as the atmospheric forces on satellites.

Requisites: Requires prerequisite courses of ASEN 2004 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 3430 and MATH 2130 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Integrated Design Eng majors with an Aerospace emphasis.

Additional Information: Departmental Category: Aerodynamics and Fluid Mechanics

ASEN 3112 (4) Structures

Teaches Mechanics of Materials methods of stress and deformation analysis applicable to the design and verification of aircraft and space structures. It offers an introduction to matrix and finite element methods for truss structures, and to mechanical vibrations.

Requisites: Requires prerequisite courses ASEN 2003 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 2130 MATH 3430 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Integrated Design Engr majors with an Aerospace emphasis.

Additional Information: Departmental Category: Structures, Materials, and Structural Dynamics

ASEN 3113 (4) Thermodynamics and Heat Transfer

Focuses on the applications of the first and second laws of thermodynamics to control volumes and teaches the fundamental concepts of different modes of energy and heat transfer. Learn to use these concepts in gas dynamics, high-speed vehicle spacecraft design, environmental systems, and energy analysis.

Requisites: Requires prerequisite courses ASEN 2002 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 2130 MATH 3430 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Engineering Plus majors with an Aerospace emphasis.

Additional Information: Departmental Category: Thermodynamics and Propulsion

ASEN 3128 (4) Aircraft Dynamics

Develops the fundamental concepts of aircraft dynamics. Covers flight mechanics, performance, dynamics and control of aircraft and how they impact aircraft design.

Requisites: Requires prerequisite courses ASEN 2003 and ASEN 2004 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 2130 MATH 3430 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Engineering Plus majors with an Aerospace emphasis.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 3200 (4) Orbital Mechanics/Attitude Dynamics and Control

Presents the fundamentals of orbital mechanics, 3D rigid body dynamics and satellite attitude dynamics and controls.

Requisites: Requires prerequisite courses ASEN 2003 and ASEN 2004 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 2130 MATH 3430 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Integrated Design Eng majors with an Aerospace emphasis.

Additional Information: Departmental Category: Astrodynamics and Orbital Mechanics

ASEN 3300 (4) Aerospace Electronics and Communications

Provides the fundamentals of electronics and communications widely used in aerospace engineering. Includes analog instrumentation electronics, data acquisition, digital electronics and radio communication.

Requisites: Requires prerequisite courses ASEN 2003 and PHYS 1120 and APPM 2350 or MATH 2400 and APPM 2360 or MATH 2130 MATH 3430 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Engineering Plus majors with an Aerospace emphasis.

Additional Information: Departmental Category: Systems and Control

ASEN 3519 (1-3) Special Topics

Studies specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the online Schedule Planner.

Department enforced prerequisite: varies.

Repeatable: Repeatable for up to 9.00 total credit hours.

Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

Additional Information: Departmental Category: Specialized Courses

ASEN 3930 (6) Aerospace Engineering Cooperative Education

Students will participate in a previously arranged, department-sponsored cooperative education program with a government agency or industry. 0.

Requisites: Restricted to students with 57-180 credits (Junior or Senior) Aerospace Engineering (ASEN) majors only.

Recommended: Prerequisite GPA above 3.

Additional Information: Departmental Category: Specialized Courses

ASEN 4013 (3) Foundations of Propulsion

Describes aerothermodynamics and design of both rocket and air-breathing engines. Includes ramjets, turbojets, turbofans, and turboprop engines, as well as liquid, solid, and hybrid rockets.

Requisites: Requires prerequisite courses of ASEN 3111 and ASEN 3113 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) or Aerospace Engineering Concurrent Degree (C-ASEN) majors only.

Additional Information: Departmental Category: Thermodynamics and Propulsion

ASEN 4018 (4) Senior Projects 1: Design Synthesis

Focuses on the synthesis of technical knowledge, project management, design process, leadership, and communications within a team environment. Students progress through the design process beginning with requirements development, then preliminary design and culminating with critical design. Offered fall only.

Requisites: Requires prereq courses of ASEN 1022, 3111, 3112, 3113, 3128, 3200 and 3300 (all min grade C). Restricted to students with 87-180 credits (Senior, Fifth Year Senior) Aerospace Engr (ASEN) Aerospace or Engr-Concurrent Degree (C-ASEN) students majors only

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 4028 (4) Senior Projects 2: Design Practicum

Focuses on the fabrication, integration, verification and validation of designs produced in ASEN 4018. Students work within the same teams from ASEN 4018. Offered spring only.

Requisites: Requires prerequisite course of ASEN 4018 (minimum grade C). Restricted to Aerospace Engineering (ASEN) majors and Engineering Plus majors with an Aerospace emphasis.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 4057 (3) Aerospace Software

Provides an overview of prevalent software and hardware computing concepts utilized in practice and industry. Establishes the background necessary to tackle programming projects on different computing platforms with various software tools and programming languages.

Requisites: Requires prerequisite course of CSCI 1320 or ECEN 1310 or CHEN 1310 (minimum grade C). Restricted to Aerospace Engineering (ASEN) or Aerospace Engineering Concurrent Degree (C-ASEN) majors only.

Additional Information: Departmental Category: Computational and Analytic Methods

ASEN 4067 (3) Microavionics: Introduction to PIC Microcontrollers for Aerospace Systems

Provide students an introduction into embedded systems that teaches a basic understanding about the fundamental architecture of a microcontroller and how it operates and interfaces with both sensors and actuators applicable to aerospace engineering. The goal of this course is to learn how to interface sensors to a PIC microcontroller, collect input, make decisions and take an action in real-time. To gain a full appreciation about how microcontrollers work, students develop their own software code using MPLAB X to program the development board hardware, which uses the Microchip PIC18F87K22 microcontroller as the foundation of the course. Students "learn by doing" through lab assignments and a semester final project. This includes programming in assembly language and then C, to collect data from external sources such as a serial terminal, temperature and rotary sensors, etc. and outputting results to a liquid crystal display (LCD), and sending commands to an actuator such as a servo. Previously offered as a s

Requisites: Requires prerequisite courses of (ASEN 1320 or CSCI 1300 or CSCI 1310 or CHEN 1310 or ECEN 1310) and ASEN 3300 (all minimum grade C).

ASEN 4090 (3) Global Positioning Systems Applications

Focuses on GPS technology, software development, and applications. Lectures will cover the principal concepts used in GPS, and weekly laboratories will apply that knowledge. Culminates in student design projects using GPS.

Requisites: Requires prerequisite courses of APPM 2360 and CHEN 1310 (all minimum grade C).

Recommended: Prerequisite junior/senior standing in engineering.

Additional Information: Departmental Category: Global Positioning Systems

ASEN 4114 (3) Automatic Control Systems

Methods of analysis and design of feedback control for dynamic systems. Covers nyquist, bode and linear quadratic methods based on frequency domain and state space models. Laboratory experiments provide exposure to computation for simulation and real time control, and typical control system sensors and actuators.

Equivalent - Duplicate Degree Credit Not Granted: ASEN 5114

Requisites: Requires prerequisite courses of ASEN 3128 and ASEN 3200 (all minimum grade C). Restricted to Aerospace Engineering (ASEN) majors only.

Additional Information: Departmental Category: Systems and Control

ASEN 4123 (3) Vibration Analysis

Highlights free and forced vibration of discrete and continuous systems. Examines Lagrange's equation, Fourier series, Laplace transforms, and matrix and computational methods. Applies knowledge to practical engineering problems.

Equivalent - Duplicate Degree Credit Not Granted: MCEN 4123

Requisites: Requires prerequisite course of ASEN 3112 or MCEN 3030 (minimum grade C). Restricted to Aerospace Engineering (ASEN) majors only.

Additional Information: Departmental Category: Thermodynamics and Propulsion

ASEN 4128 (3) Human Factors in Engineering and Design

Introduces the field of human factors engineering and investigates human psychological, physiological and performance limitations in complex systems and why it is vital for engineers to understand human operational limitations when designing complex systems. Course includes studies of real accidents caused by human error, good and bad designs, latent conditions and accident-producing designs. Goal is an understanding of how to conduct engineering design with consideration of human factors.

Requisites: Restricted to students with 57-180 credits (Juniors or Seniors).

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 4138 (3) Aircraft Design

Two lectures and one lab per week. Examines principles of aircraft configuration and design to meet given performance specifications, taking into account aerodynamic, stability and control, and flying quality considerations, as well as airworthiness regulations. Includes preliminary design of the major elements of an aircraft.

Requisites: Requires prerequisite course of ASEN 3128 (minimum grade C). Restricted to Aerospace Engineering (ASEN) or Aerospace Engineering Concurrent Degree (C-ASEN) majors only.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 4218 (3) Large Space Structures Design

Develops the necessary structural analysis skills for conducting conceptual and preliminary designs of large space structures with a practical emphasis on structures considered by NASA over the past 20 years. Applies analysis skills to a broad range of space missions requiring large space structures, emphasizing low cost and practical design.

Equivalent - Duplicate Degree Credit Not Granted: ASEN 5218

Requisites: Restricted to students with 87-180 credits (Senior, Fifth Year Senior) Aerospace Engineering (ASEN) or Mechanical Engineering (MCEN) majors only.

Additional Information: Departmental Category: Aerospace Design and System Engineering

ASEN 4338 (3) Computer Analysis of Structures

Covers basic structural design concepts and finite element modeling techniques. Emphasizes use of finite element static and dynamic analysis to validate and refine an initial design. Introduces basic design optimization and tailoring. Proficiency in Matlab required.

Requisites: Requires prerequisite course of ASEN 3112 (minimum grade C). Restricted to Aerospace Engineering (ASEN) majors only

Additional Information: Departmental Category: Structures, Materials, and Structural Dynamics

ASEN 4519 (1-3) Special Topics

Studies specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the online Schedule Planner.

Department enforced prerequisite varies.

Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

Requisites: Restricted to College of Engineering (ENGRU) undergraduates only.

Additional Information: Departmental Category: Specialized Courses

ASEN 4849 (1-3) Independent Study

Special projects agreed upon by student and instructor. Department consent required.

Repeatable: Repeatable for up to 6.00 total credit hours.

Additional Information: Departmental Category: Specialized Courses

ASEN 4859 (1-6) Undergraduate Research

Assigns a research problem on an individual basis. Department consent required.

Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

Additional Information: Departmental Category: Specialized Courses