

This guide is meant as a reference for students and faculty to understand the requirements of the Aerospace Engineering Minor, and as a planning tool for developing student schedules to meet these requirements. Please see current academic catalog for the latest information.

Aerospace Minor Requirements

1. Complete the following:*

ME451, Aerodynamics (3 credits)

ME452, Introduction to Astrodynamics (3 credits)

2. Complete three of the following:*

ME450, Theory of Flight (3 credits)

ME453, Propulsion Systems (3 credits)

ME408, Mechanical Vibrations (3 credits)

EE434, Instrumentation Systems (4 credits)

EE444, Embedded Systems Design (4 credits)

EE471, Fundamentals of Automatic Control or ME409, Controls (3 credits)

GEOS422, Geoscience Applications of Remote Sensing (3 credits)

3. Minimum credits required—15 credits

Note: This minor may require substantial additional courses for non-ME and non-EE majors.

*These courses have prerequisites that need to be taken into consideration. Students must earn a C- grade or better in each course.

Summary of Course Prerequisites/Co-requisites (AY '14-15 Catalog)

1. Mandatory courses:

ME451, Aerodynamics

ES301, Engineering Analysis

ES341, Fluid Mechanics

ES346, Basic Thermodynamics

~~ME313(c), Mechanical Engineering Thermodynamics~~

ME452, Introduction to Astrodynamics

ES208, Mechanics

or ES210, Dynamics

Math302, Differential Equations

2. Elective Courses:

ME408, Mechanical Vibrations

ES201, Computer Techniques

ES210, Dynamics

ES301, Engineering Analysis

ME409, Controls

ES201, Computer Techniques

ES301, Engineering Analysis

ME450, Theory of Flight

ES346, Basic Thermodynamics

ME453, Propulsion Systems

ES341, Fluid Mechanics

ME313(c), Mechanical Engineering Thermodynamics

EE434, Instrumentation Systems

COMM131X, Fundamentals of Oral Communications: Group Context

or COMM141X, Fundamentals of Oral Communication: Public Context

EE334, Electronic Circuit Design

EE343, Digital Systems Analysis and Design

EE354, Engineering Signal Analysis

ENGL111X, Introduction to Academic Writing

ENGL211X, Academic Writing about Literature

or ENGL213X, Academic Writing about the Social and Natural Sciences

EE444, Embedded Systems Design

COMM131X, Fundamentals of Oral Communications: Group Context

or COMM141X, Fundamentals of Oral Communications: Public Context

EE341, Digital and Computer Analysis and Design,

or EE343, Digital Systems Analysis and Design

EE354, Engineering Signal Analysis

EE443, Computer Engineering Analysis and Design

ENGL111X, Introduction to Academic Writing

ENGL211X, Academic Writing about Literature

or ENGL213X, Academic Writing about the Social and Natural Sciences

EE471, Fundamentals of Automatic Controls

EE353, Circuit Theory

Math302, Differential Equations

Course Descriptions (AY '14-15 Catalog)

ME F408 Mechanical Vibrations

3 Credits, Offered Fall

Response of mechanical systems to internal and external forces. Free and forced vibration, random vibration. Discrete and continuous systems. Vibration parameter measurements and stability criteria. Prerequisites: ES F201, ES F210, ES F301. (2+2)

ME F409, Controls

3 Credits, Offered Fall

Analysis and design of control systems. Block diagrams, transfer functions and frequency analysis. Closed loop systems and system stability. Industrial controllers and system compensation. Prerequisites: ES F201; ES F301. (2+2)

ME F450, Theory of Flight

3 Credits, Offered Fall Even-numbered Years

Airfoil theory in subsonic flow. Performance, stability and control of aircraft. Aircraft design. Prerequisites: ES F346. (3+0)

ME F451, Aerodynamics

3 Credits, Offered Spring Odd-numbered Years

Aerodynamics of non-lifting and lifting airfoils in incompressible irrotational flow, wings of finite span, the Navier-Stokes equations, boundary layers, numerical methods, supersonic and transonic flow past airfoils, rocket aerodynamics, rocket drag. Prerequisites: ES F301, ES F341, ES F346. Prerequisite or co-requisite: ME F313. (3+0)

ME F452, Introduction to Astrodynamics

3 Credits, Offered Fall Odd-numbered Years

Geometry of the solar system, detailed analysis of two-body dynamics and introduction to artificial satellite orbits; Hohmann transfer and patched conics for lunar and interplanetary trajectories. Elements of orbit determination. Prerequisites: ES F208 or ES F210; MATH F302 (3+0)

ME F453, Propulsion Systems

3 Credits, Offered Spring Even-numbered Years

Basic principles of propulsion: turbojet, turboprop and rocket engines. Fluid mechanics and thermodynamics of flow in nozzles, compressors, combustors and turbines. Liquid and solid propellant rockets. Heat transfer in rocket motors and nozzles. Design and testing methods for components of propulsion systems. Prerequisites: ES F341. Prerequisite or co-requisite: ME F313. (3+0)

EE F434 W,O Instrumentation Systems

4 Credits, Offered Spring

Analysis and design of instrumentation systems. Static and dynamic characteristics; accuracy, noise and reliability; sensors; signal conditioning; typical measurement systems and microprocessor applications. Special fees apply. Prerequisites: COMM F131X or COMM F141X; EE F334; EE F343; EE F354; ENGL F111X; ENGL F211X or ENGL F213X or permission of instructor; senior standing. (3+3)

EE F444 W,O Embedded Systems Design

4 Credits, Offered Spring

Issues surrounding the design and implementation of microcontroller-based embedded systems. Topics include hardware architecture and glue logic, embedded programs design, analysis, and optimization, hardware/firmware partitioning, firmware architecture and design. Includes laboratory exercises using evaluation board and a complete embedded system design project. Emphasis on robust designs, energy efficiency, and proper documentation. Special fees apply. Prerequisites: COMM F131X or COMM F141X; EE F343 or EE F341; EE F354; EE F443; ENGL F111X; ENGL F211X or ENGL F213X or permission of instructor; senior standing. Recommended: CS F301. Stacked with EE F645. (3+3)

EE F471, Fundamentals of Automatic Controls

3 Credits, Offered Spring

Linear system representation by transfer functions, signal flow graphics and state equations. Feedback, time and frequency response of linear systems. Identification, controllability and observability. Stability analysis by Routh-Hurwitz criterion and frequency domain methods. Specifications of higher order linear systems. System design and compensation. Prerequisites: EE F353; MATH F302. (3+0)

GEOS F422 Geoscience Applications of Remote Sensing (n)

3 Credits, Offered Fall

Remote sensing and its applications to geologic, environmental and physical sciences. Includes physical principles, digital image processing and hands-on project experience using satellite images for mapping and change detection. Course is not available for audit. Prerequisites: ~~GEOS/GEOG F222~~ or permission of instructor. (2+3)

Selected Prerequisite Course Descriptions (AY '14-15 Catalog)

ES F201 Computer Techniques

3 Credits

Basic computer programming, in C/C++, with applications from all fields of engineering. Introduction to MATLAB. Prerequisites: MATH F107X and MATH F108 OR enrollment in MATH F200X. (2+3)

ES F208 Mechanics

4 Credits

Engineering-oriented coverage of statics and dynamics. Vector methods used where appropriate. Prerequisites: ES F101 or GE F101 or MIN F103 or PETE F104; MATH F201X; PHYS F211X. (3+3)

ES F301 Engineering Analysis

3 Credits

Application of mathematical tools to typical engineering design problems. Selected topics from all fields of engineering. Prerequisites: ES F201; Prerequisites or co-requisites: MATH F302. (3+0)

ES F341 Fluid Mechanics

4 Credits

Statics and dynamics of fluids; energy and momentum principles. Dimensional analysis; flow in open channels, closed conduits and around submerged bodies. Special fees apply. Prerequisites: ES F208 or ES F210; MATH F201X. (3+3)

ES F346 Basic Thermodynamics

3 Credits

Thermodynamic systems, properties, processes and cycles. Fundamental principles of thermodynamics (first and second laws), and elementary applications. Prerequisites: MATH F201X; PHYS F211X. (3+0)

ME F313 Mechanical Engineering Thermodynamics

3 Credits, Offered Spring

Continuation of ES F346 including power and refrigeration cycles (Rankine, Brayton, Otto, and Diesel), compressible flow (isentropic, shock waves, and flow in ducts with friction), combustion and gas vapor mixtures. Prerequisites: ES F346. (3+0)

MATH F302 Differential Equations

3 Credits

Nature and origin of differential equations, first order equations and solutions, linear differential equations with constant coefficients, systems of equations, power series solutions, operational methods, and applications. Prerequisites: MATH F202X. (3+0)

EE F334 Electronic Circuit Design

4 Credits, Offered Spring

Application of semiconductor devices in circuit design in computation, automatic control and communication. Special fees apply. Prerequisites: EE F333. (3+3)

EE F341 Digital and Computer Analysis and Design

4 Credits, Offered Fall

Modular structure of computer systems. Analysis, design and implementation of combinational and sequential logic machines. Introduction to microprocessor architecture and microprocessor programming. Design with traditional and hardware description language techniques. Special fees apply. Prerequisites: CS F201; one year of college physics. (3+3)

EE F343 Digital Systems Analysis and Design

4 Credits, Offered Fall

Fundamental principles and practices of digital design. Analysis, design and implementation of combinational and sequential logic machines. Introduction to microprocessor architecture and microprocessor programming. Analysis of digital data transmission techniques and microprocessor interfacing. Design with traditional and hardware description language techniques. Implementation with both medium and large scale integrated (M/LSI) chips and programmable logic devices (PLDs). Special fees apply. Prerequisites: ES F201 or CS F201; EE F204; EE F333. Note: EE F333 may be taken concurrently. (3+3)

EE F353 Circuit Theory

3 Credits, Offered Fall

Analysis by Laplace transform, state variable, and Fourier methods, convolution, frequency selective networks, and two-port circuits. Prerequisites: EE F204; ES F201 or CS F201; MATH F202X. Prerequisite or Co-requisite: MATH F302. (3+0)

EE F354 Engineering Signal Analysis

3 Credits, Offered Spring

Analog signals and Fourier transformations. Discrete time signals and FFT. Probability theory and random variables. Random signals and noise. Prerequisites: EE F353; MATH F302. (3+0)

EE F443 Computer Engineering Analysis and Design

4 Credits, Offered Spring

Advanced digital design, and principles and practices of computer engineering. Analysis and design of computer architecture and organization. Digital signal processing techniques and hardware. Microprocessor operation, control and interfacing. Design with traditional and hardware description language techniques. Implementation with both medium and large scale integrated (M/LSI) chips and programmable logic devices (PLDs). Special fees apply. Prerequisites: EE F341 or EE F343. (3+3)