

MAJOR IN ELECTRICAL ENGINEERING, AEROSPACE CONCENTRATION

Aerospace engineering is a broad and dynamic field that centers on the design, construction, and science behind aircraft and spacecraft. Intended for undergraduate electrical engineering majors, the aerospace concentration offers students an electrical engineering degree foundation and specialized training in the aerospace discipline. Coursework will focus on applications of key electrical engineering principles in the areas of deep-space communications, robotics, embedded systems, flight avionics, and more. These courses will enable and encourage students to solve complex engineering problems in aerospace such as improved satellite communications, electric propulsion technologies, and remote sensing methods. Electrical engineering students concentrating

in aerospace will experience first-hand the necessity of their major in innovating new solutions to support humanity's ascent to the stars.

Requirements Effective Fall 2023

In order to maintain professional standards required of practicing engineers, the Department of Electrical and Computer Engineering requires a cumulative grade point average of at least 2.000 in ECE courses as a graduation requirement. It is the responsibility of any student who fails to maintain a 2.000 average to work with their advisor to correct grade point deficiencies. In addition, ECE courses required for the major at the 100, 200, and 300 level must be passed with a minimum grade of C (2.000); grades below a C will require the student to retake the course. ECE courses designated as an elective are exempt from the C or higher minimum grade requirement.

Freshman

		AUCC	Credits
CO 150	College Composition (GT-CO2)	1A	3
ECE 102	Digital Circuit Logic		4
ECE 103	DC Circuit Analysis		3
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
Select one group from the following: ¹			7
Group A:			
CS 150B	Culture and Coding: Python (GT-AH3)	3B	
CS 164	CS1—Computational Thinking with Java		
Group B:			
CS 152	Python for STEM		
CS 162	CS1—Introduction to Java Programming		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	
Group C:			
CS 163	CS1—No Prior Programming Experience		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	
Total Credits			30

Sophomore

CHEM 111	General Chemistry I (GT-SC2)	3A	4
ECE 202	Circuit Theory Applications		4
ECE 232	Introduction to Project Practices		1
ECE 251	Introduction to Microcontrollers and IoT		4
ECE 303/STAT 303	Introduction to Communications Principles		3
MATH 261	Calculus for Physical Scientists III		4
MATH 340	Intro to Ordinary Differential Equations		4
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
Science/Math/Engineering Electives (See list below)			3
Total Credits			32

Junior

ECE 311	Linear System Analysis I		3
ECE 312	Linear System Analysis II		3
ECE 331	Electronics Principles I		4
ECE 332	Electronics Principles II	4A	4
ECE 341	Electromagnetic Fields and Devices I		3
ECE 342	Electromagnetic Fields and Devices II		3
Select one course from the following:			3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
Science/Math/Engineering Electives (See list below)			5
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)			1C 3
Total Credits			31

Senior

ECE 401	Senior Design Project I	4A,4B	3
ECE 402	Senior Design Project II	4C	3
ECON 202	Principles of Microeconomics (GT-SS1)	3C	3
Aerospace Technical Electives (See list below)			12
Electrical Engineering Technical Electives (See list below)			6
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			3B 3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			3D 3
Total Credits			33

Program Total Credits: 126

Science/Math/Engineering Electives

Code	Title	Credits
BC 351	Principles of Biochemistry	4
BIOM 100	Overview of Biomedical Engineering	1
BIOM 200	Fundamentals of Biomedical Engineering	2
BMS 300	Principles of Human Physiology	4
BMS 301	Human Gross Anatomy	5
BMS 325	Cellular Neurobiology	3
BMS 345	Functional Neuroanatomy	4
BZ 310	Cell Biology	4
CBE 101	Introduction to Chemical and Biological Engr	3
CBE 101A	Introduction to Chemical and Biological Engr: Lecture	2
CBE 101B	Introduction to Chemical and Biological Engr: Laboratory	1
CHEM 112	General Chemistry Lab I (GT-SC1)	1
CHEM 245	Fundamentals of Organic Chemistry	4
CHEM 246	Fundamentals of Organic Chemistry Laboratory	1
CIVE 102	Introduction to Civil and Environmental Engr	3
CIVE 260	Engineering Mechanics-Statics	3

CIVE 371	Study Abroad--Peru: Grand Challenges in Engineering in Peru	3
CS 165	CS2--Data Structures	4
CS 220	Discrete Structures and their Applications	4
CS 253	Software Development with C++	4
CS 310H/IDEA 310H	Design Thinking Toolbox: Mixed Reality Design	3
DSCI 320	Optimization Methods in Data Science	3
DSCI 369	Linear Algebra for Data Science (credit not allowed for both DSCI 369 and MATH 369)	3-4
or MATH 369	Linear Algebra I	
ECE 101	Foundations in ECE	1
Select any course from the following: ²		Var.
ECE 395A	Independent Study	
ECE 395B	Independent Study: Open Option Project	
ECE 395C	Independent Study : Vertically Integrated Project	
ENGR 300	3D Printing Lab for Engineers	1
ENGR 478	Applied Engineering Data Analytics	3
HES 307	Biomechanical Principles of Human Movement	3
LIFE 103	Biology of Organisms-Animals and Plants (GT-SC1)	4
MATH 151	Mathematical Algorithms in Matlab I	1
MATH 229	Matrices and Linear Equations	2

MATH 235	Introduction to Mathematical Reasoning	2
MATH 317	Advanced Calculus of One Variable	3
MATH 332	Partial Differential Equations	3
MATH 360	Mathematics of Information Security	3
MATH 366	Introduction to Abstract Algebra	3
MECH 103	Introduction to Mechanical Engineering	3
MECH 104A	Study Abroad—Germany: Introduction to Mechanical Engineering	3
MECH 200	Introduction to Manufacturing Processes	3
MECH 201	Engineering Design I	2
MECH 237 or MECH 337	Introduction to Thermal Sciences Thermodynamics	3-4
MIP 300	General Microbiology	3
PH 314	Introduction to Modern Physics	4
PH 341	Mechanics	4
PH 353	Optics and Waves	4
PSY 253	Human Factors and Engineering Psychology	3
STAT 158	Introduction to R Programming	1

Aerospace Technical Electives

Code	Title	Credits
ECE 404	Experiments in Optical Electronics	2
ECE 411	Control Systems	3
ECE 412	Digital Control and Digital Filters	3
ECE 415	Semiconductor Physics and Junctions	2
ECE 421	Telecommunications I	3
ECE 441	Optical Electronics	3
ECE 444	Antennas and Radiation	3
ECE 452	Computer Organization and Architecture	3
ECE 455	Introduction to Robot Programming/ Simulation	3
ECE 456	Computer Networks	4
ECE 461	Power Systems	4
ECE 512	Digital Signal Processing	3
ECE 514	Applications of Random Processes	3
ECE 516	Information Theory	3
ECE 520	Optimization Methods—Control and Comm.	3
ECE 521	Satellite Communication	3
ECE 528/CS 528	Embedded Systems and Machine Learning	4
ECE 536	RF Integrated Circuit Design	3
ECE 540	Computational Electromagnetics	3
ECE 541	Applied Electromagnetics	3
ECE 545	FPGA Signal Processing/Software-Defined Radio	3
ECE 548	Microwave Theory and Component Design	3
ECE 549	Radar Systems and Design	3
ECE 554	Computer Architecture	3
ECE 556	AI for Radar and Remote Sensing	3
ECE 561/CS 561	Hardware/Software Design of Embedded Systems	4
ECE 562	Power Electronics I	3
ECE 565/ENGR 565	Electrical Power Engineering	3

ECE 572	Semiconductor Transistors	1
ECE 578	Satellite Data Analysis	3
ECE 579	Global Navigation Satellite Systems	3
ENGR 570	Coupled Electromechanical Systems	3
MECH 518	Orbital Mechanics	3
MECH 519	Aerospace Vehicles Trajectory and Performance	3

Electrical Engineering Technical Electives

Code	Title	Credits
CS 314	Software Engineering	3
CS 320	Algorithms—Theory and Practice	3
CS 345	Machine Learning Foundations and Practice	3
CS 356	Systems Security	3
CS 370	Operating Systems	3
CS 4**	Any CS Course at the 400-level, excluding CS 457 and CS 470	
CS 5**	Any CS Course at the 500-level	
DSCI 475	Topological Data Analysis	2
ECE 4**	Any ECE Course at the 400-level	
Select any course from the following. ²		Var.
ECE 495A	Independent Study	
ECE 495B	Independent Study: Open Option Project	
ECE 495C	Independent Study: Vertically Integrated Projects	
ECE 5**	Any ECE Course at the 500-level	
ENGR 570	Coupled Electromechanical Systems	3
MATH 417	Advanced Calculus I	3
MATH 418	Advanced Calculus II	3
MATH 419	Introduction to Complex Variables	3
MATH 450	Introduction to Numerical Analysis I	3
MATH 451	Introduction to Numerical Analysis II	3
MATH 460	Information and Coding Theory	3
MATH 463	Post-Quantum Cryptography	3
MATH 466	Abstract Algebra I	3
MATH 469	Linear Algebra II	3
MATH 474	Introduction to Differential Geometry	3
MECH 421	Fundamentals of Wind Energy	3
MECH 518	Orbital Mechanics	3
MECH 519	Aerospace Vehicles Trajectory and Performance	3
MECH 564	Fundamentals of Robot Mechanics and Controls	3
PH 315	Modern Physics Laboratory	2
PH 425	Advanced Physics Laboratory	2
PH 451	Introductory Quantum Mechanics I	3
PH 452	Introductory Quantum Mechanics II	3
PH 462	Statistical Physics	3
STAT 421	Introduction to Stochastic Processes	3

¹ Recommended sequence for most incoming students is Group A: CS 150B to CS 164.

² A total of 6 credits of Independent Study may apply toward degree requirements. This includes credit for ECE 395A, ECE 395B, ECE 395C and ECE 495A, ECE 495B, and ECE 495C combined.

In order to maintain professional standards required of practicing engineers, the Department of Electrical and Computer Engineering requires a cumulative grade point average of at least 2.000 in electrical engineering courses as a graduation requirement. It is the responsibility of any student who fails to maintain a 2.000 average to work with their advisor to correct grade point deficiencies. ECE courses required for the major at the 100, 200, and 300 level must be passed with a minimum grade of C (2.000); grades below a C will require the student to retake the course. ECE courses designated as an elective are exempt from the C or higher minimum grade requirement.

Major Completion Map

Distinctive Requirements for Degree Program:

TO PREPARE FOR FIRST SEMESTER: The curriculum for this major assumes students enter college prepared to take calculus.

Freshman

Semester 1		Critical	Recommended	AUCC	Credits
CO 150	College Composition (GT-CO2)		X	1A	3
ECE 102 or 103	Digital Circuit Logic DC Circuit Analysis	X			3-4
MATH 160	Calculus for Physical Scientists I (GT-MA1)	X		1B	4
First course from Group A, B, or C (See options in Program Requirements Tab)		X		3B	3
Total Credits					14

Semester 2		Critical	Recommended	AUCC	Credits
ECE 103 or 102	DC Circuit Analysis Digital Circuit Logic	X			3-4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	X		1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	X		3A	5
Remaining course(s) from Group A, B, or C (See options in Program Requirements Tab)		X			4
Total Credits					16

Sophomore

Semester 3		Critical	Recommended	AUCC	Credits
ECE 251	Introduction to Microcontrollers and IoT	X			4
MATH 261	Calculus for Physical Scientists III	X			4
PH 142	Physics for Scientists and Engineers II (GT-SC1)	X		3A	5
Science/Math/Engineering Electives (See List on Program Requirements Tab)			X		3
Total Credits					16

Semester 4		Critical	Recommended	AUCC	Credits
CHEM 111	General Chemistry I (GT-SC2)		X	3A	4
ECE 202	Circuit Theory Applications	X			4
ECE 232	Introduction to Project Practices	X			1
ECE 303/ STAT 303	Introduction to Communications Principles	X			3
MATH 340	Intro to Ordinary Differential Equations	X			4
Total Credits					16

Junior

Semester 5		Critical	Recommended	AUCC	Credits
ECE 311	Linear System Analysis I	X			3
ECE 331	Electronics Principles I	X			4
ECE 341	Electromagnetic Fields and Devices I	X			3
Select one course from the following:					3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)		X	2	
JTC 300	Strategic Writing and Communication (GT-CO3)		X	2	
Science/Math/Engineering Electives (See List on Program Requirements Tab)			X		2
Total Credits					15

Semester 6		Critical	Recommended	AUCC	Credits
ECE 312	Linear System Analysis II	X			3
ECE 332	Electronics Principles II	X		4A	4
ECE 342	Electromagnetic Fields and Devices II	X			3
Science/Math/Engineering Electives (See List on Program Requirements Tab)			X		3
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)			X	1C	3
Total Credits					16
Senior					
Semester 7		Critical	Recommended	AUCC	Credits
ECE 401	Senior Design Project I	X		4A,4B	3
Technical Electives (See List on Concentration Requirements Tab)		X			9
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			X	3B	3
Historical Perspectives (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
Total Credits					18
Semester 8		Critical	Recommended	AUCC	Credits
ECE 402	Senior Design Project II	X		4C	3
ECON 202	Principles of Microeconomics (GT-SS1)	X		3C	3
Technical Electives (See List on Concentration Requirements Tab)		X			9
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.		X			
Total Credits					15
Program Total Credits:					126