DUAL DEGREE PROGRAM: BIOMEDICAL ENGINEERING COMBINED WITH 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. In addition, it is required that students retake any Electrical Engineering course at the 300-level or below in which they receive a grade below C (2.000).

Requirements
Effective Fall 2025

In order to maintain professional standards required of practicing engineers, the Department of Electrical and Computer Engineering

Freshman

		AUCC	Credits
CHEM 111	General Chemistry I (GT-SC2)	3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	1
CO 150	College Composition (GT-CO2)	1A	3
ENGR 111	Fundamentals of Engineering		3
ENGR 114	Engineering for Grand Challenges		3
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
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			**29**

Sophomore

		AUCC	Credits
BIOM 200	Fundamentals of Biomedical Engineering		2
CS 165	CS2--Data Structures		4
ECE 205	Analog Circuits I		2
ECE 206	Analog Circuits II		3
ECE 232	Introduction to Project Practices		1
ECE 252	Introduction to Digital Circuits		3
ECE 303/STAT 303	Introduction to Communications Principles		3
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
MATH 261	Calculus for Physical Scientists III		4
MATH 340	Intro to Ordinary Differential Equations		4
Total Credits			**30**

Junior

			Credits
BIOM 300	Problem-Based Learning Biomedical Engr Lab		4

BMS 300	Principles of Human Physiology		4
CS 214	Software Development		3
ECE 253	Microcontrollers and C for Internet-of-Things		3
ECE 311	Linear System Analysis I		3
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
Computer Engineering (CpE) Electives/Technical Electives (see lists below)[2]			4
	Total Credits		**31**

Senior

BIOM 431/ECE 431	Biomedical Signal and Image Processing		3
CHEM 113	General Chemistry II		3
CHEM 245	Fundamentals of Organic Chemistry		4
CS 220	Discrete Structures and the Applications		4
CT 301	C++ Fundamentals		2
MECH 262	Engineering Mechanics		4
MECH 337	Thermodynamics		4
Select one course from the following:			3-4
DSCI 369	Linear Algebra for Data Science		
MATH 369	Linear Algebra I		
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	
Computer Engineering (CpE) Electives/Technical Electives (see lists below)[2]			4
	Total Credits		**34-35**

Fifth Year

BIOM 486A	Biomedical Design Practicum: Capstone Design I	4A,4B,4C	4
BIOM 486B	Biomedical Design Practicum: Capstone Design II	4A,4B,4C	4
ECON 202	Principles of Microeconomics (GT-SS1)	3C	3
BME Technical Electives (see list below)[2]			3
Computer Engineering (CpE) Electives/Technical Electives (see lists below)[2]			10
1C (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
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:		**157-158**

Computer Engineering (CpE) Electives (11-17 credits)

Code	Title	Credits
Group 1 - Select 11 credits from the following: [2]		11
ECE 450	Digital System Design Laboratory	
ECE 451	Digital System Design	
ECE 452	Computer Organization and Architecture	
ECE 456	Computer Networks	
ECE 528/CS 528	Embedded Systems and Machine Learning	
Group 2 - Select 0-6 credits from the following: [2]		0-6
DSCI 320/ MATH 320	Optimization Methods in Data Science	
ECE 312	Linear System Analysis II	
Group 3 - Select 0-6 credits from the following: [2,3]		0-6
ECE 101	Foundations in ECE	
ECE 395A	Independent Study [3]	
ECE 395B	Independent Study: Open Option Project [3]	
ECE 395C	Independent Study : Vertically Integrated Project [3]	

Technical Electives (1-7 credits)

Code	Title	Credits
Select 1-7 credits from the following: [2,3]		
CS 310H/IDEA 310H	Design Thinking Toolbox: Mixed Reality Design	3
CS 314	Software Engineering	3
CS 320	Algorithms--Theory and Practice	3

Code	Title	Credits
CS 345	Machine Learning Foundations and Practice	3
CS 356	Systems Security	3
CS 370	Operating Systems	3
CS 4XX Any CS course at the 400-level, excluding CS 457 and CS 470		
CS 5XX Any CS course at the 500-level		
DSCI 475	Topological Data Analysis	2
ECE 340	Electromagnetics for Computer Engineering	3
ECE 495A	Independent Study [3]	1-3
ECE 495B	Independent Study: Open Option Project [3]	1
ECE 495C	Independent Study: Vertically Integrated Projects [3]	1
ECE 4XX Any ECE course at the 400-level		
ECE 5XX Any ECE course at the 500-level, excluding ECE 532/SYSE 532		
MATH 360	Mathematics of Information Security	3
MATH 450	Introduction to Numerical Analysis I	3
MATH 451	Introduction to Numerical Analysis II	3
MATH 460	Information and Coding Theory	3
MECH 564	Fundamentals of Robot Mechanics and Controls	3
STAT 421	Introduction to Stochastic Processes	3

Biomedical Engineering (BME) Technical Electives (3 credits)

Code	Title	Credits
BC 351	Principles of Biochemistry	4
BC 401	Comprehensive Biochemistry I	3
BC 403	Comprehensive Biochemistry II	3
BC 404	Comprehensive Biochemistry Laboratory	2
BC 411	Physical Biochemistry	4
BC 463	Molecular Genetics	3
BC 465	Molecular Regulation of Cell Function	3
BC 565	Molecular Regulation of Cell Function	4
BIOM 304	Global Challenges and Collaborations in BME	3
BIOM 350A	Study Abroad--Ecuador: Prosthetics	1-3
BIOM 421	Transport Phenomena in Biomedical Engineering	3
BIOM 422	Quantitative Systems and Synthetic Biology	3
BIOM 441	Biomechanics and Biomaterials	3
BIOM 476	Biomedical Engineering Clinical Practicum [3]	1-3
BIOM 495	Independent Study [3]	1-6
BIOM 504/CBE 504	Fundamentals of Biochemical Engineering	3
BIOM 518/ECE 518	Biophotonics	3
BIOM 522/CBE 522	Bioseparation Processes	3
BIOM 525/MECH 525	Cell and Tissue Engineering	3
BIOM 526/ECE 526	Biological Physics	3
BIOM 531/MECH 531	Materials Engineering	3
BIOM 533/CIVE 533	Biomolecular Tools for Engineers	3
BIOM 537/ECE 537	Biomedical Signal Processing	3
BIOM 570/MECH 570	Bioengineering	3
BIOM 572/MECH 572	Regenerative Bioengineering with Stem Cells	3
BIOM 573/MECH 573	Structure and Function of Biomaterials	3
BIOM 574/MECH 574	Bio-Inspired Surfaces	3
BIOM 576/MECH 576	Quantitative Systems Physiology	4
BIOM 578/MECH 578	Musculoskeletal Biosolid Mechanics	3
BMS 301	Human Gross Anatomy	5
BMS 302	Laboratory in Principles of Physiology	2
BMS 310	Anatomy for the Health Professions	4
BMS 320	Virtual Laboratory in Physiology	2
BMS 325	Cellular Neurobiology	3
BMS 345	Functional Neuroanatomy	4
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3
BMS 409	Human and Animal Reproductive Biology	3
BMS 420	Cardiopulmonary Physiology	3
BMS 430	Endocrinology	3
BMS 450	Pharmacology	3
BMS 500	Mammalian Physiology I	4
BMS 501	Mammalian Physiology II	4
BMS 503/NB 503	Developmental Neurobiology	3
BZ 311	Developmental Biology	4
BZ 350	Molecular and General Genetics	4
BZ 476/BZ 576	Genetics of Model Organisms	3
CBE 330	Process Simulation	3
CBE 543	Membranes for Biotechnology and Biomedicine	3
CHEM 334	Quantitative Analysis Laboratory	1
CHEM 335	Introduction to Analytical Chemistry	3
CHEM 343	Modern Organic Chemistry II	3
CHEM 344	Modern Organic Chemistry Laboratory	2
CHEM 346	Organic Chemistry II	4
CHEM 433	Clinical Chemistry	3
CHEM 539A	Principles of NMR and MRI: Basic NMR Principles	1
CHEM 539B	Principles of NMR and MRI: NMR Diffusion Measurements-2D NMR and MRI	1
CHEM 539C	Principles of NMR and MRI: Advanced NMR and MRI Techniques	1
ECE 569/MECH 569	Micro-Electro-Mechanical Devices	3
ENGR 533	Spaceflight and Biological Systems	3
ERHS 332	Principles of Epidemiology	3
ERHS 450	Introduction to Radiation Biology	3
ERHS 502	Fundamentals of Toxicology	3
ERHS 510/VS 510	Cancer Biology	3
ERHS 540	Principles of Ergonomics	3
FSHN 470	Integrative Nutrition and Metabolism	3
HES 307	Biomechanical Principles of Human Movement	3
HES 319	Neuromuscular Aspects of Human Movement	4

HES 403	Physiology of Exercise	3
HES 420	Electrocardiography and Exercise Management	3
HES 476	Exercise and Chronic Disease	3
MATH 455	Mathematics in Biology and Medicine	3
MECH 432	Engineering of Nanomaterials	3
MECH 543	Biofluid Mechanics	3
MIP 300	General Microbiology	3
MIP 302	General Microbiology Laboratory	2
MIP 342	Immunology	4
MIP 343	Immunology Laboratory	2
MIP 351	Medical Bacteriology	3
MIP 352	Medical Bacteriology Laboratory	3
MIP 420	Medical and Molecular Virology	4
MIP 443	Microbial Physiology	3
MIP 450	Microbial Genetics	3
NB 500/BMS 502	Readings in Cellular Neurobiology	1
NB 501	Cellular and Molecular Neurophysiology	2
NB 505/BMS 505	Neuronal Circuits, Systems and Behavior	3

1 Students must take a total of 7 credits from either of these groups: Group A: CS 150B + CS 164 - OR - Group B: AUCC 3B + CS 163 - OR - Group C: AUCC 3B + CS 152 + CS 162. Recommended sequence for most incoming students is Group A: **CS 150B** to **CS 164**.

2 Students are required to complete 18 credits of CpE electives (11 - 17 credits of CpE Electives and 1 - 7 credits of Technical Electives), in addition to 3 credits of BME Technical Electives to reach the required 157 total program credits.

3 A maximum total 6 credits of ECE Independent Study may apply toward total degree requirements, including ECE 395A, ECE 395B, ECE 395C and ECE 495A, ECE 495B, ECE 495C combined. A maximum total 3 credits of BIOM Independent Study may apply toward total degree requirements, including BIOM 476 and BIOM 495.

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.

The undergraduate programs in Biomedical Engineering synergize with our partner major undergraduate degrees by providing additional coursework in biology, chemistry, physiology, statics, dynamics and biomedical engineering to synthesize robust dual degree programs.

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. In addition, it is required that students retake any Electrical Engineering course at the 300-level or below in which they receive a grade below C (2.000).

Freshman

Semester 1		Critical	Recommended	AUCC	Credits
CHEM 111	General Chemistry I (GT-SC2)		X	3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)		X	3A	1
ENGR 111	Fundamentals of Engineering	X			3
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				**15**
Semester 2		Critical	Recommended	AUCC	Credits
CO 150	College Composition (GT-CO2)		X	1A	3
ENGR 114	Engineering for Grand Challenges	X			3
MATH 161	Calculus for Physical Scientists II (GT-MA1)	X		1B	4
Remaining course(s) from Group A, B, or C (See options in Program Requirements Tab)		X			4
	Total Credits				**14**

Sophomore

Semester 3		Critical	Recommended	AUCC	Credits
BIOM 200	Fundamentals of Biomedical Engineering	X			2
CS 165	CS2--Data Structures	X			4
ECE 205	Analog Circuits I	X			2
LIFE 102	Attributes of Living Systems (GT-SC1)	X		3A	4
MATH 261	Calculus for Physical Scientists III	X			4
	Total Credits				**16**
Semester 4		Critical	Recommended	AUCC	Credits
ECE 206	Analog Circuits II	X			3
ECE 232	Introduction to Project Practices	X			1

		Critical	Recommended	AUCC	Credits
ECE 252	Introduction to Digital Circuits	X			3
ECE 303/ STAT 303	Introduction to Communications Principles	X			3
MATH 340	Intro to Ordinary Differential Equations	X			4
	Total Credits				**14**

Junior

Semester 5		Critical	Recommended	AUCC	Credits
BMS 300	Principles of Human Physiology		X		4
ECE 311	Linear System Analysis I	X			3
PH 141	Physics for Scientists and Engineers I (GT-SC1)	X		3A	5
CpE Electives/Technical Electives (See lists on Program Requirements tab)			X		4
	Total Credits				**16**

Semester 6		Critical	Recommended	AUCC	Credits
BIOM 300	Problem-Based Learning Biomedical Engr Lab	X			4
CS 214	Software Development	X			3
ECE 253	Microcontrollers and C for Internet-of-Things	X			3
PH 142	Physics for Scientists and Engineers II (GT-SC1)	X		3A	5
	Total Credits				**15**

Senior

Semester 7		Critical	Recommended	AUCC	Credits
CHEM 113	General Chemistry II		X		3
CS 220	Discrete Structures and the Applications	X			4
MECH 337	Thermodynamics		X		4
Select one course from the following:		X			3-4
DSCI 369	Linear Algebra for Data Science		X		
MATH 369	Linear Algebra I		X		
Select one course from the following:			X		3
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
JTC 300	Strategic Writing and Communication (GT-CO3)			2	
	Total Credits				**17-18**

Semester 8		Critical	Recommended	AUCC	Credits
BIOM 431/ ECE 431	Biomedical Signal and Image Processing	X			3
CHEM 245	Fundamentals of Organic Chemistry		X		4
CT 301	C++ Fundamentals	X			2
MECH 262	Engineering Mechanics	X			4
CpE Electives/Technical Electives (See lists on Program Requirements tab)			X		4
	Total Credits				**17**

Fifth Year

Semester 9		Critical	Recommended	AUCC	Credits
BIOM 486A	Biomedical Design Practicum: Capstone Design I	X		4A,4B,4C	4
ECON 202	Principles of Microeconomics (GT-SS1)		X	3C	3
CpE Electives/Technical Electives (See lists on Program Requirements tab)			X		4
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				**17**

Semester 10		Critical	Recommended	AUCC	Credits
BIOM 486B	Biomedical Design Practicum: Capstone Design II	X		4A,4B,4C	4
BME Technical Elective (See list on Program Requirements tab)		X			3
CpE Electives/Technical Electives (See lists on Program Requirements tab)		X			6

1C (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)	X	1C	3
Total Credits			**16**
Program Total Credits:			**157-158**