

DUAL DEGREE PROGRAM: BIOMEDICAL ENGINEERING COMBINED WITH ELECTRICAL ENGINEERING, ELECTRICAL ENGINEERING CONCENTRATION

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

Requirements Effective Fall 2024

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

Freshman

		AUCC	Credits
BIOM 100	Overview of Biomedical Engineering		1
CHEM 111	General Chemistry I (GT-SC2)	3A	4
CO 150	College Composition (GT-CO2)	1A	3
ECE 102	Digital Circuit Logic		4
ECE 103	DC Circuit Analysis		3
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
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
Total Credits			32

Sophomore

BIOM 200	Fundamentals of Biomedical Engineering		2
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	1
ECE 202	Circuit Theory Applications		4
ECE 232	Introduction to Project Practices		1
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
MECH 262	Engineering Mechanics		4
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
Select from one of the following groups: ¹			3-4
Group A:			
CS 150B	Culture and Coding: Python (GT-AH3)	3B	
Group B:			
CS 152	Python for STEM		
CS 162	CS1—Introduction to Java Programming		
Group C:			
CS 163	CS1—No Prior Programming Experience		
Total Credits			31-32

Junior

BIOM 300	Problem-Based Learning Biomedical Engr Lab		4
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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	4
ECE 341	Electromagnetic Fields and Devices I	3
ECE 342	Electromagnetic Fields and Devices II	3
Select from the following to complete group sequence: ¹		3-4
Group A:		
CS 164	CS1--Computational Thinking with Java	
Group B:		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B
Group C:		
Arts and Humanities (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B

Total Credits	27-28
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Senior

BIOM 431/ECE 431	Biomedical Signal and Image Processing	3
BMS 300	Principles of Human Physiology	4
CHEM 113	General Chemistry II	3
CHEM 245	Fundamentals of Organic Chemistry	4
ECE 251	Introduction to Microcontrollers and IoT	4
ECON 202	Principles of Microeconomics (GT-SS1)	3C
MECH 337	Thermodynamics	4
ECE Technical Electives (See list below)		6
BME Broad Elective (See list below)		3
Total Credits		34

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
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	
BME Technical Electives (See list below)			6
ECE Technical Electives (See list below)			7
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
Diversity, Equity, and Inclusion (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-equity-inclusion)		1C	3
Total Credits			33

Program Total Credits:	157-159
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BME Technical Electives - Select 6 credits

Code	Title	Credits			
BC 351	Principles of Biochemistry	4	BC 463	Molecular Genetics	3
BC 401	Comprehensive Biochemistry I	3	BC 465	Molecular Regulation of Cell Function	3
BC 403	Comprehensive Biochemistry II	3	BC 565	Molecular Regulation of Cell Function	4
BC 404	Comprehensive Biochemistry Laboratory	2	BIOM 304	Global Challenges and Collaborations in BME	3
BC 411	Physical Biochemistry	4	BIOM 350A	Study Abroad--Ecuador: Prosthetics	1-3

BIOM 421	Transport Phenomena in Biomedical Engineering	3	CBE 330	Process Simulation	3
BIOM 422	Quantitative Systems and Synthetic Biology	3	CBE 505	Biochemical Engineering Laboratory	1
BIOM 441	Biomechanics and Biomaterials	3	CBE 543	Membranes for Biotechnology and Biomedicine	3
Select a maximum of 3 credits from the following:			CHEM 334	Quantitative Analysis Laboratory	1
BIOM 476	Biomedical Engineering Clinical Practicum		CHEM 335	Introduction to Analytical Chemistry	3
BIOM 495	Independent Study		CHEM 343	Modern Organic Chemistry II	3
BIOM 504/CBE 504	Fundamentals of Biochemical Engineering	3	CHEM 344	Modern Organic Chemistry Laboratory	2
BIOM 518/ECE 518	Biophotonics	3	CHEM 346	Organic Chemistry II	4
BIOM 522/CBE 522	Bioseparation Processes	3	CHEM 433	Clinical Chemistry	3
BIOM 525/MECH 525	Cell and Tissue Engineering	3	CHEM 539A	Principles of NMR and MRI: Basic NMR Principles	1
BIOM 526/ECE 526	Biological Physics	3	CHEM 539B	Principles of NMR and MRI: NMR Diffusion Measurements-2D NMR and MRI	1
BIOM 527A/ ECE 527A	Biosensing: Cells as Circuits	1	CHEM 539C	Principles of NMR and MRI: Advanced NMR and MRI Techniques	1
BIOM 527B/ ECE 527B	Biosensing: Signal and Noise in Biosensors	1	ECE 569/MECH 569	Micro-Electro-Mechanical Devices	3
BIOM 527C/ ECE 527C	Biosensing: Sensor Circuit Fundamentals	1	ERHS 332	Principles of Epidemiology	3
BIOM 527D/ ECE 527D	Biosensing: Electrochemical Sensors	1	ERHS 450	Introduction to Radiation Biology	3
BIOM 527E/ ECE 527E	Biosensing: Affinity Sensors	1	ERHS 502	Fundamentals of Toxicology	3
BIOM 527F/ ECE 527F	Biosensing: Biophotonic Sensors Using Refractive Index	1	ERHS 510/VS 510	Cancer Biology	3
BIOM 531/MECH 531	Materials Engineering	3	ERHS 540	Principles of Ergonomics	3
BIOM 533/CIVE 533	Biomolecular Tools for Engineers	3	FSHN 470	Integrative Nutrition and Metabolism	3
BIOM 537/ECE 537	Biomedical Signal Processing	3	HES 307	Biomechanical Principles of Human Movement	3
BIOM 570/MECH 570	Bioengineering	3	HES 319	Neuromuscular Aspects of Human Movement	4
BIOM 572/MECH 572	Regenerative Bioengineering with Stem Cells	3	HES 403	Physiology of Exercise	3
BIOM 573/MECH 573	Structure and Function of Biomaterials	3	HES 420	Electrocardiography and Exercise Management	3
BIOM 574/MECH 574	Bio-Inspired Surfaces	3	HES 476	Exercise and Chronic Disease	3
BIOM 576/MECH 576	Quantitative Systems Physiology	4	MATH 455	Mathematics in Biology and Medicine	3
BIOM 578/MECH 578	Musculoskeletal Biosolid Mechanics	3	MECH 543	Biofluid Mechanics	3
BIOM 579/MECH 579	Cardiovascular Biomechanics	3	MIP 300	General Microbiology	3
BMS 301	Human Gross Anatomy	5	MIP 302	General Microbiology Laboratory	2
BMS 302	Laboratory in Principles of Physiology	2	MIP 342	Immunology	4
BMS 310	Anatomy for the Health Professions	4	MIP 343	Immunology Laboratory	2
BMS 320	Virtual Laboratory in Physiology	2	MIP 351	Medical Bacteriology	3
BMS 325	Cellular Neurobiology	3	MIP 352	Medical Bacteriology Laboratory	3
BMS 345	Functional Neuroanatomy	4	MIP 420	Medical and Molecular Virology	4
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3	MIP 443	Microbial Physiology	4
BMS 409	Human and Animal Reproductive Biology	3	MIP 450	Microbial Genetics	3
BMS 420	Cardiopulmonary Physiology	3	NB 500/BMS 502	Readings in Cellular Neurobiology	1
BMS 430	Endocrinology	3	NB 501	Cellular and Molecular Neurophysiology	2
BMS 450	Pharmacology	3	NB 503/BMS 503	Developmental Neurobiology	3
BMS 500	Mammalian Physiology I	4	NB 505/BMS 505	Neuronal Circuits, Systems and Behavior	3
BMS 501	Mammalian Physiology II	4	ECE Technical Electives - Select 13 credits		
BZ 310	Cell Biology	4	Code	Title	Credits
BZ 311	Developmental Biology	4	ATS 550	Atmospheric Radiation and Remote Sensing	3
BZ 350	Molecular and General Genetics	4	CS 314	Software Engineering	3
BZ 476/BZ 576	Genetics of Model Organisms	3	CS 320	Algorithms–Theory and Practice	3

CS 345	Machine Learning Foundations and Practice	3	BC 406C	Investigative Biochemistry: Cellular Biochemistry	2
CS 356	Systems Security	3	BC 411	Physical Biochemistry	4
CS 370	Operating Systems	3	BC 441	3D Molecular Models for Biochemistry	1
CS 4** - Any CS course at the 400-level, excluding CS 457, CS 470	var.		BC 463	Molecular Genetics	3
CS 5** - Any CS course at the 500-level	var.		BC 464	Molecular Genetics Recitation	1
DSCI 475	Topological Data Analysis	2	BC 465	Molecular Regulation of Cell Function	3
ECE 4** - Any ECE course at the 400-level	var.		BC 517	Metabolism	2
A maximum of 3 credits from the following may be used to satisfy this requirement:		var.	BC 521/CHEM 521	Principles of Chemical Biology	3
ECE 495A	Independent Study		BC 563	Molecular Genetics	4
ECE 495B	Independent Study: Open Option Project		BIOM 304	Global Challenges and Collaborations in BME	3
ECE 495C	Independent Study: Vertically Integrated Projects		BIOM 350A	Study Abroad--Ecuador: Prosthetics	1-3
ECE 5** - Any ECE Course at the 500-level	var.		BIOM 350B	Study Abroad--Portugal: Biomedical Engineering and Healthcare	1
ENGR 570	Coupled Electromechanical Systems	3	BIOM 421	Transport Phenomena in Biomedical Engineering	3
MATH 417	Advanced Calculus I	3	BIOM 422	Quantitative Systems and Synthetic Biology	3
MATH 418	Advanced Calculus II	3	BIOM 431/ECE 431	Biomedical Signal and Image Processing	3
MATH 419	Introduction to Complex Variables	3	BIOM 441	Biomechanics and Biomaterials	3
MATH 450	Introduction to Numerical Analysis I	3	BIOM 504/CBE 504	Fundamentals of Biochemical Engineering	3
MATH 451	Introduction to Numerical Analysis II	3	BIOM 517/ECE 517	Advanced Optical Imaging	3
MATH 460	Information and Coding Theory	3	BIOM 518/ECE 518	Biophotonics	3
MATH 463	Post-Quantum Cryptography	3	BIOM 522/CBE 522	Bioseparation Processes	3
MATH 466	Abstract Algebra I	3	BIOM 525/MECH 525	Cell and Tissue Engineering	3
MATH 469	Linear Algebra II	3	BIOM 526/ECE 526	Biological Physics	3
MATH 474	Introduction to Differential Geometry	3	BIOM 527A/ ECE 527A	Biosensing: Cells as Circuits	1
MECH 518	Orbital Mechanics	3	BIOM 527B/ ECE 527B	Biosensing: Signal and Noise in Biosensors	1
MECH 519	Aerospace Vehicles Trajectory and Performance	3	BIOM 527C/ ECE 527C	Biosensing: Sensor Circuit Fundamentals	1
MECH 564	Fundamentals of Robot Mechanics and Controls	3	BIOM 527D/ ECE 527D	Biosensing: Electrochemical Sensors	1
PH 315	Modern Physics Laboratory	2	BIOM 527E/ ECE 527E	Biosensing: Affinity Sensors	1
PH 425	Advanced Physics Laboratory	2	BIOM 527F/ ECE 527F	Biosensing: Biophotonic Sensors Using Refractive Index	1
PH 451	Introductory Quantum Mechanics I	3	BIOM 531/MECH 531	Materials Engineering	3
PH 452	Introductory Quantum Mechanics II	3	BIOM 532/MECH 532	Materials Issues in Mechanical Design	3
PH 462	Statistical Physics	3	BIOM 533/CIVE 533	Biomolecular Tools for Engineers	3
STAT 421	Introduction to Stochastic Processes	3	BIOM 537/ECE 537	Biomedical Signal Processing	3
BME Broad Electives - Select 3 credits			BIOM 570/MECH 570	Bioengineering	3
Code	Title	Credits	BIOM 572/MECH 572	Regenerative Bioengineering with Stem Cells	3
AB 410	Understanding Pesticides	3	BIOM 573/MECH 573	Structure and Function of Biomaterials	3
ATS 550	Atmospheric Radiation and Remote Sensing	3	BIOM 574/MECH 574	Bio-Inspired Surfaces	3
ATS 555	Air Pollution	3	BIOM 576/MECH 576	Quantitative Systems Physiology	4
ATS 560	Air Pollution Measurement	2	BIOM 578/MECH 578	Musculoskeletal Biosolid Mechanics	3
BC 351	Principles of Biochemistry	4	BIOM 579/MECH 579	Cardiovascular Biomechanics	3
BC 401	Comprehensive Biochemistry I	3	BMS 301	Human Gross Anatomy	5
BC 403	Comprehensive Biochemistry II	3	BMS 302	Laboratory in Principles of Physiology	2
BC 404	Comprehensive Biochemistry Laboratory	2	BMS 305	Domestic Animal Gross Anatomy	4
BC 406A	Investigative Biochemistry: Protein Biochemistry	2			
BC 406B	Investigative Biochemistry: Molecular Genetics	2			

BMS 310	Anatomy for the Health Professions	4	CHEM 311	Introduction to Nanoscale Science	3
BMS 320	Virtual Laboratory in Physiology	2	CHEM 315	Foundations of Polymer Chemistry	3
BMS 325	Cellular Neurobiology	3	CHEM 320	Chemistry of Additions	3
BMS 330	Microscopic Anatomy	4	CHEM 333	Forensic Chemistry	3
BMS 345	Functional Neuroanatomy	4	CHEM 334	Quantitative Analysis Laboratory	1
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3	CHEM 335	Introduction to Analytical Chemistry	3
BMS 409	Human and Animal Reproductive Biology	3	CHEM 338	Environmental Chemistry	3
BMS 420	Cardiopulmonary Physiology	3	CHEM 343	Modern Organic Chemistry II	3
BMS 430	Endocrinology	3	CHEM 344	Modern Organic Chemistry Laboratory	2
BMS 450	Pharmacology	3	CHEM 346	Organic Chemistry II	4
BMS 460	Essentials of Pathophysiology	3	CHEM 355	Foundations of Sustainable Chemistry	3
BMS 500	Mammalian Physiology I	4	CHEM 431	Instrumental Analysis	4
BMS 501	Mammalian Physiology II	4	CHEM 433	Clinical Chemistry	3
BMS 503/NB 503	Developmental Neurobiology	3	CHEM 440	Advanced Organic Chemistry Laboratory	2
BMS 505/NB 505	Neuronal Circuits, Systems and Behavior	3	CHEM 445	Synthetic Organic Chemistry	3
BMS 545	Neuroanatomy	5	CHEM 448	Medicinal Chemistry	3
BMS 575	Human Anatomy Dissection	4	CHEM 451	Foundations of Catalytic Chemistry	3
BSPM 302	Applied and General Entomology	2	CHEM 461	Inorganic Chemistry	3
BSPM 361	Elements of Plant Pathology	3	CHEM 462	Inorganic Chemistry Laboratory	2
BZ 240	Synthetic Biology-Principles and Applications	3	CHEM 465	Chemistry of Sustainable E-Waste Management	1
BZ 310	Cell Biology	4	CHEM 522	Methods of Chemical Biology	2
BZ 311	Developmental Biology	4	CHEM 532	Advanced Chemical Analysis II	3
BZ 348/MATH 348	Theory of Population and Evolutionary Ecology	4	CHEM 537	Electrochemical Methods	3
BZ 350	Molecular and General Genetics	4	CHEM 539A	Principles of NMR and MRI: Basic NMR Principles	1
BZ 360	Bioinformatics and Genomics	4	CHEM 539B	Principles of NMR and MRI: NMR Diffusion Measurements-2D NMR and MRI	1
BZ 420	Evolutionary Medicine	3	CHEM 539C	Principles of NMR and MRI: Advanced NMR and MRI Techniques	1
BZ 476/BZ 576	Genetics of Model Organisms	3	CHEM 541	Organic Molecular Structure Determination	2
CBE 330	Process Simulation	3	CHEM 543	Structure/Mechanisms in Organic Chemistry	2
CBE 406	Introduction to Transport Phenomena	3	CHEM 545	Synthetic Organic Chemistry I	3
CBE 501	Chemical Engineering Thermodynamics	3	CHEM 547	Physical Organic Chemistry	3
CBE 502	Advanced Reactor Design	3	CHEM 555	Chemistry of Sustainability	3
CBE 503	Transport Phenomena Fundamentals	3	CHEM 560	Foundations of Inorganic Synthesis	1
CBE 505	Biochemical Engineering Laboratory	1	CHEM 566	Bioinorganic Chemistry	3
CBE 514	Polymer Science and Engineering	3	CHEM 567	Crystallographic Computation	1
CBE 521	Mathematical Modeling for Chemical Engineers	3	CHEM 569	Chemical Crystallography	3
CBE 524	Bioremediation	1	CHEM 570	Chemical Bonding	3
CBE 540/CIVE 540	Advanced Biological Wastewater Processing	3	CHEM 575	Fundamentals of Chemical Thermodynamics	1
CBE 560	Engineering of Protein Expression Systems	3	CHEM 576	Statistical Mechanics	2
CBE 570	Biomolecular Engineering/Synthetic Biology	3	CHEM 577	Surface Chemistry	3
CHEM 231	Foundations of Analytical Chemistry	3	CHEM 578A	Computational Chemistry: Electronic Structure	1
CHEM 232	Foundations of Analytical Chemistry Lab	2	CHEM 579	Chemical Kinetics	3
CHEM 246	Fundamentals of Organic Chemistry Laboratory	1	CIVE 322	Basic Hydrology	3
CHEM 261	Fundamentals of Inorganic Chemistry	3	CIVE 330	Ecological Engineering	3
CHEM 263	Foundations of Inorganic Chemistry	4	CIVE 360	Mechanics of Solids	3
CHEM 264	Foundations of Inorganic Chemistry Laboratory	1	CIVE 367	Structural Analysis	3

CIVE 371	Study Abroad--Peru: Grand Challenges in Engineering in Peru	3	ERHS 448	Environmental Contaminants	3
CIVE 401	Hydraulic Engineering	3	ERHS 450	Introduction to Radiation Biology	3
CIVE 423	Groundwater Engineering	3	ERHS 502	Fundamentals of Toxicology	3
CIVE 438	Fundamentals of Environmental Engr	3	ERHS 503	Toxicology Principles	1
CIVE 439	Applications of Environmental Engr Concepts	3	ERHS 510/VS 510	Cancer Biology	3
CIVE 440	Nonpoint Source Pollution	3	ERHS 530	Radiological Physics and Dosimetry I	3
CIVE 442	Air Quality Engineering	3	ERHS 540	Principles of Ergonomics	3
CIVE 515	River Mechanics	3	ERHS 542	Biostatistical Methods for Qualitative Data	3
CIVE 520	Physical Hydrology	3	ERHS 547	Equipment and Instrumentation	3
CIVE 524/WR 524	Modeling Watershed Hydrology	3	ERHS 560	Health Impact Assessment	2
CIVE 531	Groundwater Hydrology	3	ESS 311	Ecosystem Ecology	3
CIVE 538	Aqueous Chemistry	3	ESS 312	Sustainability Science	3
CIVE 560	Advanced Mechanics of Materials	3	ESS 330	Quantitative Reasoning for Ecosystem Science	3
CIVE 562	Fundamentals of Vibrations	3	ESS 353	Global Change Impacts, Adaptation, Mitigation	3
CS 165	CS2--Data Structures	4	ESS 440	Practicing Sustainability	4
CS 220	Discrete Structures and their Applications	4	ESS 501	Principles of Ecosystem Sustainability	3
CS 253	Software Development with C++	4	ESS 524	Foundations for Carbon/Greenhouse Gas Mgmt	3
CS 270	Computer Organization	4	F 311	Forest Ecology	3
CS 314	Software Engineering	3	FIN 305	Fundamentals of Finance	3
CS 320	Algorithms--Theory and Practice	3	FSHN 470	Integrative Nutrition and Metabolism	3
CS 356	Systems Security	3	FTEC 447	Food Chemistry	3
CS 370	Operating Systems	3	GEOL 150	Dynamic Earth (GT-SC2)	4
CS 4** - any CS course at the 400-level except CS 457, CS 495			GEOL 452	Hydrogeology	4
CS 5** - any CS course at the 500-level			GEOL 454	Geomorphology	4
DSCI 320	Optimization Methods in Data Science	3	GES 362	Systems Thinking and Sustainability	3
DSCI 369	Linear Algebra for Data Science (credit not allowed for both DSCI 369 and MATH 369)	4	GES 441	Analysis of Sustainable Energy Solutions	3
or MATH 369	Linear Algebra I		GES 450	Global Sustainability and Health	3
ECE 312	Linear System Analysis II	3	GES 465/MSE 465	Sustainable Strategies for E-Waste Management	3
ECE 4** - any ECE course at the 400-level except ECE 495			GES 528/CIVE 528	Assessing the Food, Energy, Water Nexus	3
ECE 5** - any ECE course at the 500-level			GES 542	Biobased Fuels, Energy, and Chemicals	3
ENGR 300	3D Printing Lab for Engineers	1	GR 305	Geography of Global Health	3
ENGR 422	Technology Entrepreneurship	3	HES 207	Anatomical Kinesiology	4
ENGR 478	Applied Engineering Data Analytics	3	HES 307	Biomechanical Principles of Human Movement	3
ENGR 502	Engineering Project and Program Management	3	HES 319	Neuromuscular Aspects of Human Movement	4
ENGR 510	Engineering Optimization: Method/ Application	3	HES 345	Population Health and Disease Prevention	3
ENGR 525	Intellectual Property and Invention Systems	3	HES 403	Physiology of Exercise	3
ENGR 531	Engineering Risk Analysis	3	HES 420	Electrocardiography and Exercise Management	3
ENGR 550/ MATH 550	Numerical Methods in Science and Engineering	3	HES 476	Exercise and Chronic Disease	3
ENGR 570	Coupled Electromechanical Systems	3	HORT 579	Mass Spectrometry Omics-Methods and Analysis	3
ERHS 320	Environmental Health--Water Quality	3	IDEA 310B	Design Thinking Toolbox: 3D Modeling	2
ERHS 332	Principles of Epidemiology	3	IDEA 310D	Design Thinking Toolbox: Digital Imaging	1
ERHS 400	Radiation Safety	3	IDEA 310H/CS 310H	Design Thinking Toolbox: Mixed Reality Design	3
ERHS 410	Environmental Health-Air and Waste Management	3	IDEA 455/MGT 455	Designing for Defense	3
ERHS 430	Human Disease and the Environment	3	LIFE 201B	Introductory Genetics: Molecular/ Immunological/Developmental (GT-SC2)	3
ERHS 446	Environmental Toxicology	3			

LIFE 202B	Introductory Genetics Recitation: Molecular	1	MECH 4** - any MECH course at the 400-level except MECH 495	
LIFE 203	Introductory Genetics Laboratory	2	MECH 5** - any MECH course at the 500-level	
LIFE 210	Introductory Eukaryotic Cell Biology	3	MGT 305	Fundamentals of Management 3
LIFE 211	Introductory Cell Biology Honors Recitation	1	MGT 340	Fundamentals of Entrepreneurship 3
LIFE 212	Introductory Cell Biology Laboratory	2	MIP 300	General Microbiology 3
LIFE 320	Ecology	3	MIP 302	General Microbiology Laboratory 2
LSPA 340	Spanish for Animal Health and Care Fields	3	MIP 315	Pathology of Human and Animal Disease 3
LSPA 346	Spanish for Health Care	3	MIP 334	Food Microbiology 3
MATH 151	Mathematical Algorithms in Matlab I	1	MIP 335	Food Microbiology Laboratory 2
MATH 229	Matrices and Linear Equations	2	MIP 342	Immunology 4
MATH 235	Introduction to Mathematical Reasoning	2	MIP 343	Immunology Laboratory 2
MATH 301	Introduction to Combinatorial Theory	3	MIP 351	Medical Bacteriology 3
MATH 317	Advanced Calculus of One Variable	3	MIP 352	Medical Bacteriology Laboratory 3
MATH 331	Introduction to Mathematical Modeling	3	MIP 410	Foundations of Modern Biotechnology 2
MATH 332	Partial Differential Equations	3	MIP 420	Medical and Molecular Virology 4
MATH 360	Mathematics of Information Security	3	MIP 425	Virology and Cell Culture Laboratory 2
MATH 366	Introduction to Abstract Algebra	3	MIP 432/ESS 432	Microbial Ecology 3
MATH 405	Introduction to Number Theory	3	MIP 433/ESS 433	Microbial Ecology Laboratory 1
MATH 417	Advanced Calculus I	3	MIP 443	Microbial Physiology 4
MATH 418	Advanced Calculus II	3	MIP 450	Microbial Genetics 3
MATH 419	Introduction to Complex Variables	3	MIP 530	Advanced Molecular Virology 4
MATH 430/ECE 430	Fourier and Wavelet Analysis with Apps	3	MIP 543	RNA Biology 3
MATH 450	Introduction to Numerical Analysis I	3	MIP 550	Microbial and Molecular Genetics Laboratory 4
MATH 451	Introduction to Numerical Analysis II	3	MIP 555	Principles and Mechanisms of Disease 3
MATH 455	Mathematics in Biology and Medicine	3	MKT 305	Fundamentals of Marketing 3
MATH 460	Information and Coding Theory	3	MSE 501	Materials Technology Transfer 1
MATH 463	Post-Quantum Cryptography	3	MSE 502A	Materials Science and Engineering Methods: Materials Structure and Scattering 1
MATH 466	Abstract Algebra I	3	MSE 502B	Materials Science and Engineering Methods: Computational Materials Methods 1
MATH 467	Abstract Algebra II	3	MSE 502C	Materials Science and Engineering Methods: Materials Microscopy 1
MATH 469	Linear Algebra II	3	MSE 502D	Materials Science and Engineering Methods: Materials Spectroscopy 1
MATH 470	Euclidean and Non-Euclidean Geometry	3	MSE 502E	Materials Science and Engineering Methods: Bulk Properties and Performance 1
MATH 474	Introduction to Differential Geometry	3	MSE 502F	Materials Science and Engineering Methods: Experimental Methods for Materials Research 1
MATH 525	Optimal Control	3	MSE 503	Mechanical Behavior of Materials 3
MATH 530	Mathematics for Scientists and Engineers	3	MSE 504	Thermodynamics of Materials 3
MATH 532	Mathematical Modeling of Large Data Sets	3	MSE 505	Kinetics of Materials 3
MATH 535	Foundations of Applied Mathematics	3	NR 319	Introduction to Geospatial Science 4
MATH 546	Partial Differential Equations II	3	NR 323/GR 323	Remote Sensing and Image Interpretation 3
MATH 550/ENGR 550	Numerical Methods in Science and Engineering	3	NR 505	Concepts in GIS 4
MATH 560	Linear Algebra	3	PH 314	Introduction to Modern Physics 4
MATH 569A	Linear Algebra for Data Science: Matrices and Vectors Spaces	1	PH 315	Modern Physics Laboratory 2
MATH 569B	Linear Algebra for Data Science: Geometric Techniques for Data Reduction	1	PH 341	Mechanics 4
MATH 569C	Linear Algebra for Data Science: Matrix Factorizations and Transformations	1	PH 351	Electricity and Magnetism 4
MATH 569D	Linear Algebra for Data Science: Theoretical Foundations	1	PH 353	Optics and Waves 4
MECH 200	Introduction to Manufacturing Processes	3	PH 361	Physical Thermodynamics 3
MECH 307	Mechatronics and Measurement Systems	4		
MECH 324	Dynamics of Machines	4		
MECH 325	Machine Design	3		
MECH 331	Introduction to Engineering Materials	4		

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
PH 517	Chaos, Fractals, and Nonlinear Dynamics	3
PH 521	Introduction to Lasers	3
PH 522	Introductory Laser Laboratory	1
PH 531	Introductory Condensed Matter Physics	3
PH 561	Elementary Particle Physics	3
PH 571	Mathematical Methods for Physics I	3
PH 572	Mathematical Methods for Physics II	3
PHIL 322	Biomedical Ethics	3
PHIL 410	Gödel's Incompleteness Theorems	3
PSY 253	Human Factors and Engineering Psychology	3
SOCR 322	Principles of Microclimatology	3
SOCR 330	Principles of Genetics	3
SOCR 375	Soil Biogeochemistry	3
SOCR 400	Soils and Global Change-Impacts and Solutions	3
SOCR 455	Microbiomes of Soil Systems	3
SOCR 456	Soil Microbiology Laboratory	1
SOCR 467	Soil and Environmental Chemistry	3
SOCR 470	Soil Physics	3
SOCR 471	Soil Physics Laboratory	1
SOCR 567	Environmental Soil Chemistry	4
SPCM 434	Intercultural Communication	3
STAR 512	Design and Data Analysis for Researchers II	4
STAT 158	Introduction to R Programming	1
STAT 305	Sampling Techniques	3
STAT 307	Introduction to Biostatistics	3
STAT 331	Intermediate Applied Statistical Methods	3
STAT 341	Statistical Data Analysis I	3
STAT 342	Statistical Data Analysis II	3
STAT 400	Statistical Computing	3
STAT 420	Probability and Mathematical Statistics I	3
STAT 421	Introduction to Stochastic Processes	3
STAT 430	Probability and Mathematical Statistics II	3
STAT 460	Applied Multivariate Analysis	3
SYSE 501	Foundations of Systems Engineering	3
SYSE 530	Overview of Systems Engineering Processes	3
SYSE 532/ECE 532	Dynamics of Complex Engineering Systems	3
SYSE 534	Human Systems Integration	3
VS 333	Domestic Animal Anatomy	4

² CS 152, CS 162, CS 163 and CS 164 may be taken as BME Broad Electives ONLY when not taken to fulfill degree requirements. Credit not allowed for both CS 163 and CS 164.

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: CS 152 + CS 162. Recommended sequence for most incoming students is Group A: CS 150B to CS 164.