

BME+CBE Technical Electives

Technical Electives (TEs) are designed to provide additional breadth and depth in the Biomedical and partner major degrees.

BME+CBE students must take 3-5 credits of BME TEs and 5-6 credits of CBE TEs chosen from the following lists.

Key:	
F - Fall	* Available Every Other Year (Even)
S - Spring	** Available Every Other Year (Odd)
SS - Summer	<i>Italics and ++ = DARS changes pending</i>
OAN - offered as needed	
See last page of this document for information on how to obtain course overrides	

NOTE: 1. Classes otherwise required for the degree are not allowed for TE credit.
2. Course availability changes frequently. Please check with individual departments regarding course availability.
3. Crosslisted courses (e.g. BIOM/MECH 570) in BOLD must be taken as *BIOM* courses to count for BME Technical Elective credit.

BME Technical Electives				BME Technical Electives			
• From the following BME Technical Elective list: BME+CBE Students who started SM18 take 3 credits; students who started FA18 and after take 5 credits of BME TEs							
COURSE	NAME	TERM	CR	COURSE	NAME	TERM	CR
BC 401	Comprehensive Biochemistry I	F	3	BMS 501	Mammalian Physiology II	S	4
BC 403	Comprehensive Biochemistry II	S	3	BMS/NB 503	Developmental Neurobiology	S	3
BC 404	Comprehensive Biochemistry Laboratory	F,S	2	BMS/NB 505	Neuronal Circuits, Systems and Behavior	S	3
BC 411	Physical Biochemistry	F	4	BZ 310	Cell Biology	F,S,SS	4
BC 463	Molecular Genetics	F	3	BZ 311	Developmental Biology	S,SS	4
BC 465	Molecular Regulation of Cell Function	S	3	BZ 350	Molecular and General Genetics	F,S,SS	4
BC 565	Molecular Regulation of Cell Function	S	4	BZ 476/BZ 576	Genetics of Model Organisms	F*/F	Δ 3-4
BIOM 382A/350A	Prosthetics in Ecuador (DARS changes pending)	SS	1 or 2	CBE 505	Biochemical Engineering Laboratory	F	1
BIOM/ECE 431	Biomedical Signal and Image Processing	S	3	CHEM 334	Quantitative Analysis Laboratory	F, S	1
BIOM 441	Biomechanics and Biomaterials	F	3	CHEM 335	Introduction to Analytical Chemistry	F,S	3
BIOM 476A/476B ¹	Biomedical Clinical Practicum I & II	F,S,SS	Δ 2-4	CHEM 433	Clinical Chemistry	S**	3
BIOM 495 ¹	BME Independent Study	F,S,SS	Δ1-6	CHEM 539 (A-C)	Principles of NMR and MRI	OAN	1
BIOM/CBE 504	Fundamentals of Biochemical Engineering	F	3	CM 501	Advanced Cell Biology	F	4
BIOM/ECE 518	Biophotonics	F**	3	CM/NB 502	Techniques in Molecular & Cellular Biology	F	2
BIOM/CBE 522	Bioseparation Processes	F	3	ECE/MECH 569	Micro-Electro-Mechanical Devices	S	3
BIOM/MECH 525	Cell and Tissue Engineering	S*	3	ERHS 450	Introduction to Radiation Biology	S	3
BIOM/ECE 526	Biological Physics	F**	3	ERHS 502	Fundamentals of Toxicology	F	3
BIOM527 (A-F)	Biosensors	F,S,SS	1	ERHS 510/ VS 510	Cancer Biology	S	3
BIOM/MECH 531	Materials Engineering	S	3	ERHS 540	Principles of Ergonomics	F	3
BIOM/CIVE 533	Biomolecular Tools for Engineers	F	3	FSHN 470	Integrated Nutrition & Metabolism	F,S	3
BIOM/ECE 537	Biomedical Signal Processing	S*	3	HES 307	Biomechanical Principles of Human Movement	F,S,SS	4
BIOM/CBE 543	Membranes for Biotechnology and Biomedicine	F	3	HES 319	Neuromuscular Aspects of Human Movement	F,S	4
BIOM/MECH 570	Bioengineering	S	3	HES 403	Physiology of Exercise	F,S,SS	4
BIOM/MECH 573	Structure and Function of Biomaterials	S	3	HES 476	Exercise and Chronic Disease	F,S,SS	3
BIOM/MECH 574	Bio-Inspired Surfaces	S	3	MATH 455	Mathematics in Biology and Medicine	F**	3
BIOM/MECH 576	Quantitative Systems Physiology	S	4	MECH 543	Biofluid Mechanics	S**	3
BIOM/MECH 578	Musculoskeletal Biosolid Mechanics	F	3	MIP 300	General Microbiology	F,S,SS	3
BIOM/MECH 579	Cardiovascular Biomechanics	F**	3	MIP 302	General Microbiology Laboratory	F,S,SS	2
BMS 301	Human Gross Anatomy	F,S,SS	5	MIP 342	Immunology	F,S	4
BMS 302	Laboratory in Principles in Physiology	F,S	2	MIP 343	Immunology Laboratory	S	2
BMS 310	Anatomy for the Health Professions (online only)	F,S,SS	4	MIP 351	Medical Bacteriology	S	3
BMS 325	Cellular Neurobiology	F	3	MIP 352	Medical Bacteriology Lab	S	3
BMS 345	Functional Neuroanatomy	F,S	4	MIP 420	Medical and Molecular Virology	F	4
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	S	3	MIP 436	Industrial Microbiology	F*	4
BMS 409	Human and Animal Reproductive Biology	F	3	MIP 443	Microbial Physiology	S	4
BMS 420	Cardiopulmonary Physiology	F	3	MIP 450	Microbial Genetics	F	3
BMS 430	Endocrinology	F	3	MIP/BSPM 576	Bioinformatics	F,S	3
BMS 450	Pharmacology	S	3	NB 500/ BMS 502	Readings in Cellular Neurobiology	F	1
BMS 500	Mammalian Physiology I	F	4				

¹ A maximum total of 3 credits of BIOM 476 and/or BIOM 495 may be applied towards BME technical elective degree requirements.

CBE Technical Electives for BME+CBE students

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• From the following CBE TE list, BME+CBE students who have taken CBE 160 must take 5 credits:

• From the following CBE TE list, BME+CBE students who have not taken CBE 160 must take 6 credits:

COURSE	NAME	TERM	CR
ATS 555	Air Pollution	S**	3
ATS 560	Air Pollution Measurement	F	2
BC 401	Comprehensive Biochemistry I	F	3
BC 403	Comprehensive Biochemistry II	S	3
BC 404	Comprehensive Biochemistry Lab	F,S	2
BC 411	Physical Biochemistry	F	4
BC 441	3D Molecular Models for Biochemistry	F	1
BC 463	Molecular Genetics	F	3
BC 464	Molecular Genetics Recitation	F	1
BC 517	Metabolism	F,S	2
BC 521/CHEM 521	Principles of Chemical Biology	F	3
BC 563	Molecular Genetics	F	4
BC 565	Molecular Regulation of Cell Function	S	4
BC 571	Quantitative Biochemistry	S	1
BIOM/ECE 517	Advanced Optical Imaging	F*	3
BIOM/MECH 525	Cell and Tissue Engineering	S*	3
BIOM/ECE 526	Biological Physics	F**	3
BIOM/MECH 531	Materials Engineering	S	3
BIOM/MECH 532	Material Issues in Mechanical Design	F	3
BIOM/CIVE 533	Biomolecular Tools for Engineers	F	3
BIOM/ECE 537	Biomedical Signal Processing	S*	3
BIOM/MECH 573	Structure and Function of Biomaterials	S	3
BIOM/MECH 574	Bio-Inspired Surfaces	S	3
BIOM/MECH 576	Quantitative Systems Physiology	S	4
BIOM/MECH 579	Cardiovascular Biomechanics	F**	3
BMS 301	Human Gross Anatomy	F,S,SS	5
BMS 302	Laboratory in Principles in Physiology	F,S	2
BMS 305	Domestic Animal Gross Anatomy	S	4
BMS 325	Cellular Neurobiology	F	3
BMS 330	Microscopic Anatomy	S	4
BMS 345	Functional Neuroanatomy	F,S	4
BMS 409	Human and Animal Reproductive Biology	F	3
BMS 420	Cardiopulmonary Physiology	F	3
BMS 430	Endocrinology	F	3
BMS 450	Pharmacology	S	3
BMS 460	Essentials of Pathophysiology	S	3
BMS 500	Mammalian Physiology I	F	4
BMS 501	Mammalian Physiology II	S	4
BMS/NB 503	Developmental Neurobiology	S	3
BMS/NB 505	Neuronal Circuits, Systems and Behavior	S	3
BMS 521	Comparative Reproductive Physiology	S	3
BMS 545	Neuroanatomy	S	5
BMS 575	Human Anatomy Dissection	F	4
BSPM 302	Applied and General Entomology	F	2
<i>BSPM 310 ++</i>	<i>Understanding Pesticides</i>	S*	3
BSPM 361	Elements of Plant Pathology	S	3

COURSE	NAME	TERM	CR
BSPM/MIP 576	Bioinformatics	F, S	3
BZ 310	Cell Biology	F,S,SS	4
BZ 311	Developmental Biology	S,SS	4
BZ 348/MATH 348	Theory of Population and Evolutionary Ecology	F	4
BZ 350	Molecular and General Genetics	F,S,SS	4
BZ 360	Bioinformatics and Genomics	S	3
CBE 406	Introduction to Transport Phenomena	F	3
CBE 439/CIVE 539	Environmental Engineering Chemical Concepts	F	3
CBE 501	Chemical Engineering Thermodynamics	F	3
CBE 502	Advanced Reactor Design	F	3
CBE 503	Transport Phenomena Fundamentals	S	3
CBE/BIOM 504	Fundamentals of Biochemical Engineering	F	3
CBE 505	Biochemical Engineering Laboratory	F**	1
CBE 514	Polymer Science and Engineering	S	3
CBE 521	Mathematical Modeling for Chemical Engineers	F	3
CBE 522/BIOM 522	Bioseparation Processes	F	3
CBE 524	Bioremediation	F**	1
CBE/CIVE 540	Advanced Biological Wastewater Processing	F	3
CBE 570	Biomolecular Engineering/Synthetic Biology	S	3
CHEM 261	Fundamentals of Inorganic Chemistry	S	3
CHEM 311	Introduction to Nanoscale Science	S*	3
CHEM 334	Quantitative Analysis Laboratory	F,S	1
CHEM 335	Introduction to Analytical Chemistry	F,S	3
CHEM 338	Environmental Chemistry	S**	3
CHEM 431	Instrumental Analysis	F	4
CHEM 433	Clinical Chemistry	S**	3
CHEM 440	Advanced Organic Chemistry Laboratory	F	2
CHEM 461	Inorganic Chemistry	S	3
CHEM 522	Methods of Chemical Biology	S	2
CHEM 532	Advanced Chemical Analysis II	OAN	3
CHEM 537	Electrochemical Methods	S**	3
CHEM 539 (A-C)	Principles of NMR and MRI	OAN	1
CHEM 541	Organic Molecular Structure Determination	S	2
CHEM 543	Structure/Mechanisms in Organic Chemistry	F	2
CHEM 545	Synthetic Organic Chemistry I	S	3
CHEM 547	Physical Organic Chemistry	OAN	3
CHEM 555	Chemistry of Sustainability	F	3
CHEM 569	Chemical Crystallography	S*	3
CHEM 570	Chemical Bonding	F*	3
CHEM 575	Fundamentals of Chemical Thermodynamics	F	1
CHEM 576	Statistical Mechanics	F	2
CHEM 577	Surface Chemistry	OAN	3
CHEM 579	Chemical Kinetics	F**	3
CIVE 322	Basic Hydrology	F,S	3
CIVE 330	Ecological Engineering	S	3
CIVE 360	Mechanics of Solids	F,S,SS	3

CBE Technical Electives for BME+CBE students (Continued)			
Course	Name	Term	Cr
CIVE 401	Hydraulic Engineering	S	3
CIVE 413	Environmental River Mechanics	F	3
CIVE 423	Groundwater Engineering	S	3
CIVE 425	Soil and Water Engineering	S	3
CIVE 438	Environmental Engineering Concepts	F,S	3
CIVE 440	Nonpoint Source Pollution	F	3
CIVE 442	Air Quality Engineering	S	3
CIVE 504	Wind Engineering	F	3
CIVE 520	Physical Hydrology	F	3
CIVE 531	Groundwater Hydrology	F	3
CIVE 538	Aqueous Chemistry	S	3
CIVE 560	Advanced Mechanics of Materials	F	3
CM 501	Advanced Cell Biology	F	4
CM 502/NB 502	Techniques in Molecular & Cellular Biology	F	2
CS 165	CS2 -- Data Structures	F,S	4
CS 220	Discrete Structures and their Applications	F,S	4
CS 270	Computer Organization	F,S	4
ECE 204	Introduction to Electrical Engineering	S	3
ECE/MATH 430 ++	<i>Fourier and Wavelet Analysis with Apps</i>	S	3
ENGR 510/VS 510	Engineering Optimization: Method/Application	F	3
ENGR 550/MATH 550	Numerical Methods in Science and Engineering	F,S	3
ERHS 320 ++	<i>Environmental Health - Water and Food Safety</i>	F	3
ERHS 332 ++	<i>Principles of Epidemiology</i>	S	3
ERHS 410 ++	<i>Environmental Health and Waste Management</i>	S	3
ERHS 446	Environmental Toxicology	F	3
ERHS 448	Environmental Contaminants: Exposure and Fate	F	3
ERHS 450	<i>Introduction to Radiation Biology</i>	S	3
ERHS 502	Fundamentals of Toxicology	F	3
ERHS 503 ++	<i>Toxicology Principles</i>	S	1
ERHS 510/ VS 510	Cancer Biology	S	3
ERHS 530 ++	<i>Radiological Physics and Dosimetry I</i>	F	3
ERHS 542 ++	<i>Biostatistical Methods for Qualitative Data</i>	F	3
ERHS 547	Equipment and Instrumentation	S	3
F 311	Forest Ecology	F,S	3
FTEC 447/ANEQ 447	Food Chemistry	S**	2
GEOL 150	Physical Geology for Scientists and Engineers	F	4
GEOL 452	Hydrogeology	F	4
GEOL 454	Geomorphology	S	4
GES 441	Analysis of Sustainable Energy Solutions	S	3
GES 542	Biobased Fuels, Energy, and Chemicals	S	3
HES 307	Biomechanical Principles of Human Movement	F,S,SS	4
HES 319	Neuromuscular Aspects of Human Movement	F,S	4
HES 403	Physiology of Exercise	F,S,SS	4
HES 420 ++	<i>Electrocardiography and Exercise Management</i>	F,S	3
HORT 579	Metabolomics Methods and Analysis	S	2
LIFE 201B	Introductory Genetics	F,S	3
LIFE 202B	Introductory Genetics Recitation	F,S	1
LIFE 203	Introductory Genetics Laboratory	S	2
LIFE 211	Introductory Cell Biology Honors Recitation	F,S	1
LIFE 212	Introductory Cell Biology Laboratory	F,S	2

CBE Technical Electives for BME+CBE students (Continued)			
Course	Name	Term	Cr
LIFE 320	Ecology	F,S	3
MATH 301	Introduction to Combinatorial Theory	F	3
MATH 331	Introduction to Mathematical Modeling	F	3
MATH 332	Partial Differential Equations	S	3
MATH/BZ 348	Theory of Population and Evolutionary Ecology	F	4
MATH 360	Mathematics of Information Security	F	3
MATH 366	Introduction to Abstract Algebra	F,S,SS	3
MATH 369	Linear Algebra I	F,S,SS	3
MATH 405	Introduction to Number Theory	S*	3
MATH 419	Introduction to Complex Variables	F	3
MATH 430/ECE 430	Fourier and Wavelet Analysis with Apps	S	3
MATH 450	Introduction to Numerical Analysis I	F	3
MATH 451	Introduction to Numerical Analysis II	F	3
MATH 455	Mathematics in Biology and Medicine	F**	3
MATH 460	Information and Coding Theory	S	3
MATH 466	Abstract Algebra I	F	3
MATH 467	Abstract Algebra II	S**	3
MATH 469	Linear Algebra II	S	3
MATH 525	Optimal Control	S**	3
MATH 530	Mathematics for Scientists and Engineers	F	4
MATH 532	Mathematical Modeling of Large Data Sets	S	3
MATH 535	Foundations of Applied Mathematics	F	3
MATH 546	Partial Differential Equations II	S	3
MATH/ENGR 550	Numerical Methods in Science and Engineering	F,S	3
MATH 560	Linear Algebra	F	3
MECH 303	Energy Engineering	F	3
MECH 307	Mechatronics and Measurement Systems	F,S	4
MECH 324	Dynamics of Machines	F	4
MECH 325	Machine Design	S	3
MECH 331	Introduction to Engineering Materials	F,S	4
MECH 407	Laser Applications in Mechanical Engineering	F	3
MECH 424	Advanced Dynamics	S	3
MECH 425	Mechanical Engineering Vibrations	F	4
MECH 431	Metals and Alloys	F	3
MECH 432	Engineering of Nanomaterials	F*	3
MECH 502	Advances/Additive Manufacturing Engineering	S	3
MECH 507	Laser Diagnostics for Thermosciences	S**	3
MECH 509	Design and Analysis in Engineering Research	S	3
MECH 513	Simulation Modeling and Experimentation	S	3
MECH 524	Principles of Dynamics	F	3
MECH 527	Hybrid Electric Vehicle Powertrains	F	3
MECH 529	Advanced Mechanical Systems	F	3
MECH 530	Advanced Composite Materials	F	3
MECH 543	Biofluid Mechanics	S**	3
MECH 552	Applied Computational Fluid Dynamics	F**	3
MIP 300	General Microbiology	F,S,SS	3
MIP 302	General Microbiology Laboratory	F,S,SS	2
MIP 315	Pathology of Human and Animal Disease	F,S	3
MIP 334	Food Microbiology	F	3
MIP 335	Food Microbiology Laboratory	F**	2

CBE Technical Electives for BME+CBE students (Continued)			
Course	Name	Term	Cr
MIP 342	Immunology	F,S	4
MIP 343	Immunology Laboratory	S	2
MIP 350	Microbial Diversity	S**	3
MIP 351	Medical Bacteriology	S	3
MIP 352	Medical Bacteriology Laboratory	S	3
MIP 420	Medical and Molecular Virology	F	4
MIP 425	Virology and Cell Culture Laboratory	F	2
MIP 432/ESS 432	Microbial Ecology	S*	3
MIP 433/ESS 433	Microbial Ecology Laboratory	S*	1
MIP 436	Industrial Microbiology	F*	4
MIP 443	Microbial Physiology	S	4
MIP 450	Microbial Genetics	F	3
MIP 530	Advanced Molecular Virology	S*	4
MIP 543	RNA Biology	F**	3
MIP 550	Microbial and Molecular Genetics Laboratory	S	4
MIP 555	Principles and Mechanisms of Disease	F	3
MIP 578/ BZ 578	Genetics of Natural Populations	F	4
MSE 501	Materials Technology Transfer	F	1
MSE 502 (A-F)	Materials Science & Engineering Methods	F,S	1
MSE 503	Mechanical Behaviors of Materials	S	3
MSE 504	Thermodynamics of Materials	F	3
MSE 505	Kinetics of Materials	S	3
NR 319	Geospatial Applications in Natural Resources	F,S	4
NR/GR 323	Remote Sensing and Image Interpretation	F	3
NR 505	Concepts in GIS	F	4
PH 314	Introduction to Modern Physics	S	4
PH 315	Modern Physics Laboratory	S	2
PH 341	Mechanics	F	4
PH 351	Electricity and Magnetism	S	4
PH 353	Optics and Waves	F	4
PH 361	Physical Thermodynamics	S	3
PH 451	Introductory Quantum Mechanics I	F	3
PH 452	Introductory Quantum Mechanics II	S	3
PH 517	Chaos, Fractals, and Non-linear Dynamics	S	3
PH 521	Introduction to Lasers	S	3
PH 522	Introductory Laser Laboratory	S	1
PH 531	Introductory Condensed Matter Physics	S	3
PH 561	Elementary Particle Physics	S	3

CBE Technical Electives for BME+CBE students (Continued)			
Course	Name	Term	Cr
PH 571	Mathematical Methods for Physics I	F	3
PH 572	Mathematical Methods for Physics II	S	3
PHIL 410	Gödel's Incompleteness Theorems	OAN	3
SOCR 330	Principles of Genetics	F,S,SS	3
SOCR 400	Soils and Global Change: Science and Impacts	F	3
SOCR 430	Applications of Plant Biotechnology	F*	3
SOCR 455	Soil Microbiology	F	3
SOCR 456	Soil Microbiology Laboratory	F	1
SOCR 467	Soil and Environmental Chemistry	S	3
SOCR 470	Soil Physics	F	3
SOCR 471	Soil Physics Laboratory	F	1
SOCR 567	Environmental Soil Chemistry	S	4
STAT 305	Sampling Techniques	F	3
STAT 340	Multiple Regression Analysis	S,SS	3
STAT 341	Statistical Data Analysis I	F	3
STAT 342	Statistical Data Analysis II	S	3
STAT 350	Design of Experiments	F,SS	3
STAT 400	Statistical Computing	F	3
STAT 420	Probability and Mathematical Statistics I	F	3
STAT 421	Introduction to Stochastic Processes	S	3
STAT 430	Probability and Mathematical Statistics II	S	3
STAT 460	Applied Multivariate Analysis	F,S,SS	3
STAT 512	Design and Data Analysis for Researchers II	S	4
STAT 548/CS 548	Bioinformatics Algorithms	F	4
A maximum of 3 credits may be selected from the following courses for CBE TEs:			
ENGR 422	Technology Entrepreneurship	S	3
ENGR 502	Engineering Project and Program Management	F,S	3
ENGR 525	Intellectual Property and Invention Systems	S	3
FIN 305	Fundamentals of Finance	F,S,SS	3
IDEA 310B	Design Thinking Toolbox: 3D Modeling	OAN	2
IDEA 310D	Design Thinking Toolbox: Digital Imaging	OAN	1
MGT 305	Fundamentals of Management	F,S,SS	3
MGT 340	Fundamentals of Entrepreneurship	F,S,SS	3
MKT 305	Fundamentals of Marketing	F,S,SS	3

NOTE: Other courses may be available as CBE Technical electives; contact the CBE department for further information.

To Request Overrides - Include your CSU ID and verification that you meet prerequisites. If you need an override for a non-engineering course, reach out to the prof and request override. For engineering courses, follow procedures as indicated below.

For 500-level BIOM courses, request permission from Sara.Mattern@colostate.edu (BME grad adviser) to request override.

For 500-level CBE courses, you should be able to register if you meet the pre-requisites. If you need an override, request from prof; forward permission to Claire.Lavelle@colostate.edu.

For 500-level ECE courses, you should be able to register if you meet the pre-requisites. If you need an override, request from prof; forward permission to Courtney.Johnsrud@colostate.edu

For CIVE courses, email your BME adviser with the reason you want the override (e.g. meet pre-reqs but are not in the major) and she will forward request to the department on your behalf.

For MECH courses, request approval via your BME adviser, who will forward to MECH on your behalf. Include your CSU ID#, whether you meet pre-reqs, and any extenuating circumstances/reason(s) for your request. If you do not have a 3.0+ GPA or meet prerequisites for 500-level courses, request permission from the prof and forward permission to your BME adviser with your request for override.

To request overrides for other courses (e.g. non-engr, 500-level or prereq override), email the course professor or the department teaching the course.

