

Biological and Agricultural Engineering Technology (BS): Environmental Systems Management Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

The BAET curriculum is administered by the College of Agriculture and Life Sciences and is intended to uniquely prepare students for hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both production personnel as well as the designers and implementers of technological systems.

The program objectives of the Biological and Agricultural Engineering Technology (BAET) Bachelor of Science (B.S.) degree are to:

- Develop technical knowledge of physical and biological sciences used in agricultural and environmental systems;
- Apply critical thinking, existing technology and practical approaches to solve problems in agricultural and environmental systems;
- Produce technologists able to work in teams and effectively communicate to audiences; and
- Develop in students an appreciation for life-long education that supports their careers.

Plan Requirements

Major GPA must be 2.0 or higher for graduation.

Code	Title	Hours	Counts towards
Orientation			
ALS 103	Freshman Transitions and Diversity in Agriculture & Life Sciences	1	
or ALS 303	Transfer Transitions and Diversity in Agriculture & Life Sciences		
Communication		3	
COM 110	Public Speaking		
ENG 331	Communication for Engineering and Technology		
ENG 332	Communication for Business and Management		

ENG 333	Communication for Science and Research	
Mathematical Sciences		
MA 131	Calculus for Life and Management Sciences A	3
MA 114	Introduction to Finite Mathematics with Applications	3
ST 350	Economics and Business Statistics	3
Natural & Physical Sciences		
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory	4
PY 211	College Physics I	4
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
SSC 200 & SSC 201	Soil Science and Soil Science Laboratory	4
Physical Science Elective		4
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory	
or PY 212	College Physics II	
Major Requirements		
BAE 100	Introduction to Biological and Agricultural Engineering and Technology	1
BAE 200	Computer Methods in Biological Engineering	2
BAET 201	Shop Processes and Management	3
BAET 323	Water Management	3
BAET 332	Management of Animal Environments	4
BAET 333	Processing Agricultural Products	4

BAET 343	Agricultural Electrification	4
BAET 432	Agricultural and Environmental Safety and Health	3
BAET 450	Biological and Agricultural Engineering Technology Capstone	3
GC 120	Foundations of Graphics	3
ARE 201	Introduction to Agricultural & Resource Economics	3
AEE 323	Leadership Development in Agriculture and Life Sciences	3

Environmental Systems Management

BAET 411	Agricultural Machinery and Power Units	4
BAE 325	Introductory Geomatics	3
BAET 443	Environmental Restoration Implementation	3
GIS 280	Introduction to GIS	3

BAET Electives

ARE Electives (p. 2)	6
Restricted Electives (p. 3)	9

Restricted electives can emphasize agricultural, environmental, or business areas and be effectively used for a minor.

GEP Courses

ENG 101	Academic Writing and Research ¹	4
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6	
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3	
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2	

GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)	3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	5
GEP U.S. Diversity (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/) (verify requirement)	
GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)	
Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/) (verify requirement)	

Total Hours **120**

¹ A grade of C- or higher is required.

ARE Electives

Code	Title	Hours	Counts towards
ARE 303	Farm Management	3	
ARE 304	Agribusiness Management	3	
ARE 306	Agricultural Law	3	
ARE 309	Environmental Law & Economic Policy	3	
ARE 311	Agricultural Markets	3	
ARE 312	Agribusiness Marketing	3	
ARE 321	Agricultural Financial Management	3	
ARE 336	Introduction to Resource and Environmental Economics	3	
EC 336	Introduction to Resource and Environmental Economics	3	

Restricted Electives

Code Title Hours Counts towards

Group A - Biological Sciences

AEC 360	Ecology	4	
AEC 420	Introduction to Fisheries Science	3	
AEC 423	Introduction to Fisheries Sciences Laboratory	1	
AEE 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 105	Introduction to Companion Animal Science	3	
ANS 110	Introduction to Equine Science	3	
ANS 150	Introduction to Animal Science	3	
ANS 151	Introduction to Animal Science Lab	1	
ANS 205	Physiology of Domestic Animals	3	
ANS 206	Anatomy of Domestic Animals Lab	1	
ANS 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 215	Agricultural Genetics	3	
ANS 220	Reproductive Physiology	3	
ANS 221	Reproductive Physiology Lab	1	
ANS 230	Animal Nutrition	3	
ANS 231	Animal Nutrition Lab	1	
ANS 415	Comparative Nutrition	3	
ANS 452	Comparative Reproductive Physiology and Biotechnology	3	
ANS 453	Physiology and Genetics of Growth and Development	3	
ANS 454	Lactation, Milk and Nutrition	3	
ANS 515	Comparative Nutrition	3	

ANS 552	Comparative Reproductive Physiology and Biotechnology	3	
ANS 553	Physiology and Genetics of Growth and Development	3	
ANS 554	Lactation, Milk and Nutrition	3	
BCH 101	Introduction to Microbiology and Biochemistry Laboratory Practices	3	
BCH 220	Role of Biotechnology in Society	3	
BCH 351	General Biochemistry		
BCH 451	Principles of Biochemistry	4	
BCH 452	Introductory Biochemistry Laboratory	2	
BCH 453	Biochemistry of Gene Expression	3	
BCH 454	Advanced Biochemistry Laboratory	4	
BCH 455	Proteins and Molecular Mechanisms	3	
BCH 553	Biochemistry of Gene Expression	3	
BCH 555	Proteins and Molecular Mechanisms	3	
BEC 463	Fermentation of Recombinant Microorganisms	2	
BEC 563	Fermentation of Recombinant Microorganisms	2	
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 267	Research in the Life Sciences I: Research Skills	3	
BIO 414	Cell Biology	3	
BIO 434	Hormones and Behavior	3	
BIO 440	The Human Animal: An Evolutionary Perspective	3	

BIT 410	Manipulation of Recombinant DNA	4	FS 301	Introduction to Human Nutrition	3
BIT 462	Gene Expression Analysis: Microarrays	2	FS 401	Advanced Nutrition and Metabolism	3
BIT 463	Fermentation of Recombinant Microorganisms	2	FS 402	Chemistry of Food and Bioprocessed Materials	4
BIT 464	Protein Purification	2	FS 403	Analytical Techniques in Food & Bioprocessing Science	4
BIT 466	Animal Cell Culture Techniques	2	FS 405	Food Microbiology	3
BIT 467	PCR and DNA Fingerprinting	2	FS 406	Food Microbiology Lab	1
BIT 468	Genome Mapping	2	FS 501	Advanced Nutrition and Metabolism	3
BIT 476	Applied Bioinformatics	2	FS 502	Chemistry of Food and Bioprocessed Materials	4
BIT 481	Plant Tissue Culture and Transformation	2	FS 505	Food Microbiology	3
BIT 501	Ethical Issues in Biotechnology	1	FS 506	Food Microbiology Lab	1
BIT 562	Gene Expression Analysis: Microarrays	2	FW 313	Mountain Wildlife Ecology and Management	1
BIT 564	Protein Purification	2	FW 353	Wildlife Management	3
BIT 566	Animal Cell Culture Techniques	2	FW 403	Urban Wildlife Management	3
BIT 567	PCR and DNA Fingerprinting	2	FW 404	Wildlife Habitat Management	3
BIT 568	Genome Mapping	2	FW 453	Principles of Wildlife Science	4
CHE 463	Fermentation of Recombinant Microorganisms	2	HS 215	Agricultural Genetics	3
CHE 563	Fermentation of Recombinant Microorganisms	2	MB 101	Introduction to Microbiology and Biochemistry Laboratory Practices	3
ENT 201	Insects and People	3	MB 405	Food Microbiology	3
ENT 207	Insects and Human Disease	3	MB 406	Food Microbiology Lab	1
ENT 402	Forest Entomology	3	MB 505	Food Microbiology	3
ENT 425	General Entomology	3	MB 506	Food Microbiology Lab	1
FOR 402	Forest Entomology	3	NTR 301	Introduction to Human Nutrition	3
FS 231	Principles of Food and Bioprocess Engineering	4			

NTR 401	Advanced Nutrition and Metabolism	3	PB 564	Rare Plants of North Carolina	3
NTR 415	Comparative Nutrition	3	PB 580	Introduction to Plant Biotechnology	3
NTR 419	Human Nutrition and Chronic Disease	3	PHY 452	Comparative Reproductive Physiology and Biotechnology	3
NTR 454	Lactation, Milk and Nutrition	3	PHY 552	Comparative Reproductive Physiology and Biotechnology	3
NTR 501	Advanced Nutrition and Metabolism	3	PO 415	Comparative Nutrition	3
NTR 515	Comparative Nutrition	3	PO 466	Animal Cell Culture Techniques	2
PB 103	Perspectives on Botany	1	PO 515	Comparative Nutrition	3
PB 200	Plant Life	4	PO 566	Animal Cell Culture Techniques	2
PB 205	Our Green World	3	PP 150	Introduction to Plant Molecular Biology	3
PB 208	Agricultural Biotechnology: Issues and Implications	3	PP 222	Kingdom of Fungi	3
PB 213	Plants and Civilization	3	Group A - Biological Sciences		
PB 215	Medicinal Plants	3	AEC 419	Freshwater Ecology	4
PB 219	Plants in Folklore, Myth, and religion	3	AEC 420	Introduction to Fisheries Science	3
PB 220	Local Flora	3	AEC 423	Introduction to Fisheries Sciences Laboratory	1
PB 250	Plant Biology	4	AEC 441	Biology of Fishes	3
PB 277	Space Biology	3	AEC 442	Biology of Fishes Laboratory	1
PB 321	Introduction to Whole Plant Physiology	3	AEC 460	Field Ecology and Methods	4
PB 360	Ecology	4	AEC 519	Freshwater Ecology	4
PB 400	Plant Diversity and Evolution	4	ANS 215	Agricultural Genetics	3
PB 403	Systematic Botany	4	ANS 415	Comparative Nutrition	3
PB 413	Plant Anatomy	2	ANS 515	Comparative Nutrition	3
PB 421	Plant Physiology	3	BEC 463	Fermentation of Recombinant Microorganisms	2
PB 445	Paleobotany	4	BEC 563	Fermentation of Recombinant Microorganisms	2
PB 464	Rare Plants of North Carolina	3	BIO 140	Survey of Animal Diversity	3
PB 480	Introduction to Plant Biotechnology	3			
PB 481	Plant Tissue Culture and Transformation	2			
PB 503	Systematic Botany	4			
PB 513	Plant Anatomy	2			
PB 545	Paleobotany	4			

BIO 141	Animal Diversity Laboratory	1	CHE 463	Fermentation of Recombinant Microorganisms	2
BIO 227	Understanding Structural Diversity through Biological Illustration	3	CHE 563	Fermentation of Recombinant Microorganisms	2
BIO 315	General Parasitology	3	CS 211	Plant Genetics	3
BIO 330	Evolutionary Biology	3	ENT 425	General Entomology	3
BIO 361	Developmental Biology	3	FS 301	Introduction to Human Nutrition	3
BIO 370	Developmental Anatomy of the Vertebrates	3	FS 405	Food Microbiology	3
BIO 375	Developmental Anatomy Laboratory	2	FS 406	Food Microbiology Lab	1
BIO 405	Functional Histology	3	FS 505	Food Microbiology	3
BIO 414	Cell Biology	3	FS 506	Food Microbiology Lab	1
BIO 424	Endocrinology	3	FW 353	Wildlife Management	3
BIO 482	Capstone Course in Molecular, Cellular, and Developmental Biology	3	GN 301	Genetics in Human Affairs	3
BIO 483	Capstone Course in Integrative Physiology and Neurobiology	3	GN 311	Principles of Genetics	4
BIO 484	Capstone Course in Human Biology	3	GN 312	Elementary Genetics Laboratory	1
BIO 485	Capstone Course in Ecology, Evolution, and Conservation Biology	3	GN 421	Molecular Genetics	3
BIO 488	Neurobiology	3	GN 423	Population, Quantitative and Evolutionary Genetics	3
BIO 588	Neurobiology	3	GN 425	Advanced Genetics Laboratory	2
BIT 210	Phage Hunters	3	GN 434	Genes and Development	3
BIT 211	Phage Genomics	2	GN 441	Human and Biomedical Genetics	3
BIT 463	Fermentation of Recombinant Microorganisms	2	GN 451	Genome Science	3
BIT 563	Fermentation of Recombinant Microorganisms	2	GN 490	Genetics Colloquium	1
BME 301	Human Physiology : Electrical Analysis		GN 521	Molecular Genetics	3
BME 302	Human Physiology: Mechanical Analysis	4	GN 541	Human and Biomedical Genetics	3
			HS 215	Agricultural Genetics	3
			HS 451	Plant Nutrition	3
			HS 551	Plant Nutrition	3
			MB 180	Introduction to Microbial Bioprocessing	3

MB 200	The Fourth Horseman: Plagues that Changed the World	3	MEA 251	Introduction to Coastal Environments Laboratory	1
MB 210	Phage Hunters	3	MEA 369	Life on Earth: Principles of Paleontology	
MB 211	Phage Genomics	2	NTR 301	Introduction to Human Nutrition	3
MB 351	General Microbiology	3	NTR 415	Comparative Nutrition	3
MB 352	General Microbiology Laboratory	1	NTR 419	Human Nutrition and Chronic Disease	3
MB 354	Inquiry-Guided Microbiology Lab	1	NTR 420	Applied Nutrition Education	3
MB 405	Food Microbiology	3	NTR 421	Life Cycle Nutrition	3
MB 406	Food Microbiology Lab	1	NTR 490	Senior Capstone Experience in Nutrition	4
MB 411	Medical Microbiology	3	NTR 515	Comparative Nutrition	3
MB 412	Medical Microbiology Laboratory	1	NTR 521	Life Cycle Nutrition	3
MB 414	Microbial Metabolic Regulation	3	PO 404	Avian Anatomy and Physiology	4
MB 420	Fundamentals of Microbial Cell Biotransformation:	2	PO 404	Avian Anatomy and Physiology	4
MB 441	Immunology	3	PO 415	Comparative Nutrition	3
MB 451	Microbial Diversity	3	PO 504	Avian Anatomy and Physiology	4
MB 452	Microbial Diversity Lab	2	PO 515	Comparative Nutrition	3
MB 455	Microbial Biotechnology	3	SSC 200	Soil Science	3
MB 461	Molecular Virology	3	SSC 201	Soil Science Laboratory	1
MB 480	Current Issues in Microbiology	1	SSC 332	Environmental Soil Microbiology	3
MB 505	Food Microbiology	3	SSC 470	Wetland Soils	3
MB 506	Food Microbiology Lab	1	SSC 570	Wetland Soils	3
MB 520	Fundamentals of Microbial Cell Biotransformations	2	ZO 233	Human-Animal Interactions	3
MEA 200	Introduction to Oceanography	3	ZO 250	Animal Anatomy and Physiology	4
MEA 210	Oceanography Lab	1	ZO 317	Primate Ecology and Evolution	3
MEA 220	Marine Biology	3	ZO 333	Captive Animal Biology	3
MEA 250	Introduction to Coastal Environments	3	ZO 350	Animal Phylogeny and Diversity	4
			ZO 402	Invertebrate Biology	4
			ZO 410	Introduction to Animal Behavior	3

ZO 486	Capstone Course in Zoology	3	CE 581	Fluid Mechanics in Natural Environments	
Group A - Biological Sciences			CH 230	Computational Chemistry Lab I	1
ANS 225	Principles of Animal Nutrition	3	CH 232	Computational Chemistry Lab II	1
BIT 100	Current Topics in Biotechnology	4	CH 315	Quantitative Analysis	3
BIT 465	Real-time PCR Techniques	2	CH 316	Quantitative Analysis Laboratory	1
BIT 471	RNA Interference and Model Organisms	2	CH 331	Introductory Physical Chemistry	4
BIT 473	Protein Interactions	2	CH 401	Systematic Inorganic Chemistry I	3
BIT 474	Plant Genetic Engineering	2	CH 403	Systematic Inorganic Chemistry II	3
BIT 565	Real-time PCR Techniques	2	CH 415	Analytical Chemistry II	3
BIT 571	RNA Interference and Model Organisms	2	CH 431	Physical Chemistry I	3
BIT 573	Protein Interactions	2	CH 433	Physical Chemistry II	3
BIT 574	Plant Genetic Engineering	2	CH 435	Introduction to Quantum Chemistry	3
ENT 305	Introduction to Forensic Entomology	3	CH 437	Physical Chemistry for Engineers	4
Group A - Physical Sciences			CH 441	Forensic Chemistry	3
AEE 226	Computer Applications and Information Technology in Agricultural & Extension Ed	3	CH 442	Advanced Synthetic Techniques	4
BAE 200	Computer Methods in Biological Engineering	2	CH 444	Advanced Synthetic Techniques II	4
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3	CH 452	Advanced Measurement Techniques I	4
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3	CH 454	Advanced Measurement Techniques II	4
BUS 340	Information Systems Management	3	CH 463	Molecular Origins of Life	3
BUS 350	Economics and Business Statistics	3	CH 563	Molecular Origins of Life	3
CE 435	Engineering Geology	3	CSC 110	Computer Science Principles - The Beauty and Joy of Computing	3
CE 479	Air Quality	3			

CSC 111	Introduction to Computing: Python	3	CSC 342	Applied Web-based Client-Server Computing	3
CSC 112	Introduction to Computing-FORTRAN	3	CSC 379	Ethics in Computing	1
CSC 113	Introduction to Computing - MATLAB	3	CSC 401	Data and Computer Communications Networks	3
CSC 116	Introduction to Computing - Java	3	CSC 402	Networking Projects	3
CSC 200		3	CSC 405	Computer Security	3
CSC 216	Software Development Fundamentals		CSC 406	Architecture Of Parallel Computers	3
CSC 217	Software Development Fundamentals Lab		CSC 411	Introduction to Artificial Intelligence	3
CSC 226	Discrete Mathematics for Computer Scientists	3	CSC 412	Compiler Construction	3
CSC 230	C and Software Tools	3	CSC 415	Software Security	3
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3	CSC 416	Introduction to Combinatorics	3
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3	CSC 417	Theory of Programming Languages	3
CSC 251	Web Page Development	1	CSC 422	Automated Learning and Data Analysis	3
CSC 255	String Processing Languages	1	CSC 427	Introduction to Numerical Analysis I	3
CSC 281	Foundations of Interactive Game Design	3	CSC 428	Introduction to Numerical Analysis II	3
CSC 295	Special Topics in Computer Science	1-3	CSC 431	File Organization and Processing	3
CSC 302	Introduction to Numerical Methods	3	CSC 440	Database Management Systems	3
CSC 316	Data Structures and Algorithms	3	CSC 442	Introduction to Data Science	3
CSC 326	Software Engineering	4	CSC 450	Web Services	3
CSC 333	Automata, Grammars, and Computability	3	CSC 453	Introduction to Internet of Things (IoT) Systems	3
			CSC 454	Human-Computer Interaction	3
			CSC 455	Social Computing and Decentralized Artificial Intelligence	3

CSC 456	Computer Architecture and Multiprocessors	3	CSC 530	Computational Methods for Molecular Biology	3
CSC 461	Computer Graphics	3	CSC 533	Privacy in the Digital Age	
CSC 462	Advanced Computer Graphics Projects	3	CSC 540	Database Management concepts and Systems	3
CSC 467	Multimedia Technology	3	CSC 541	Advanced Data Structures	3
CSC 474	Network Security	3	CSC 546	Management Decision and Control Systems	3
CSC 481	Game Engine Foundations	3	CSC 547	Cloud Computing Technology	3
CSC 482	Advanced Computer Game Projects	3	CSC 548	Parallel Systems	3
CSC 484	Building Game AI	3	CSC 554	Human-Computer Interaction	3
CSC 492	Senior Design Project	3	CSC 555	Social Computing and Decentralized Artificial Intelligence	3
CSC 495	Special Topics in Computer Science	1-6	CSC 561	Principles of Computer Graphics	3
CSC 499	Independent Research in Computer Science	1-6	CSC 562	Introduction to Game Engine Design	3
CSC 501	Operating Systems Principles	3	CSC 563	Visual Interfaces for Mobile Devices	3
CSC 503	Computational Applied Logic	3	CSC 565	Graph Theory	3
CSC 505	Design and Analysis Of Algorithms	3	CSC 568	Enterprise Storage Architecture	3
CSC 506	Architecture Of Parallel Computers	3	CSC 570	Computer Networks	3
CSC 510	Software Engineering	3	CSC 573	Internet Protocols	3
CSC 512	Compiler Construction	3	CSC 574	Computer and Network Security	3
CSC 513	Electronic Commerce Technology	3	CSC 575	Introduction to Wireless Networking	3
CSC 515	Software Security	3	CSC 576	Networking Services: QoS, Signaling, Processes	3
CSC 517	Object-Oriented Design and Development	3	CSC 577	Switched Network Management	3
CSC 519	DevOps: Modern Software Engineering Practices	3	CSC 579	Introduction to Computer Performance Modeling	3
CSC 520	Artificial Intelligence I	3			
CSC 522	Automated Learning and Data Analysis	3			

CSC 580	Numerical Analysis I	3	ET 320	Fundamentals of Air Pollution	3
CSC 582	Computer Models of Interactive Narrative	3	FIM 528		3
CSC 583	Introduction to Parallel Computing	3	FIM 548	Monte Carlo Methods for Financial Math	3
CSC 584	Building Game AI	3	FIM 549	Financial Risk Analysis	3
CSC 591	Special Topics In Computer Science	1-6	GIS 582	Geospatial Modeling	3
E 531	Dynamic Systems and Multivariable Control I	3	ISE 441	Introduction to Simulation	3
ECE 406	Architecture Of Parallel Computers	3	ISE 505	Linear Programming	3
ECE 460	Embedded System Architectures	3	ISE 546	Management Decision and Control Systems	3
ECE 506	Architecture Of Parallel Computers	3	LOG 201	Logic	3
ECE 514	Random Processes	3	LOG 335	Symbolic Logic	3
ECE 517	Object-Oriented Design and Development	3	MA 105	Mathematics of Finance	3
ECE 547	Cloud Computing Technology	3	MA 205	Elements of Matrix Computations	3
ECE 560	Embedded System Architectures	3	MA 225	Foundations of Advanced Mathematics	3
ECE 570	Computer Networks	3	MA 242	Calculus III	4
ECE 573	Internet Protocols	3	MA 302	Numerical Applications to Differential Equations	1
ECE 574	Computer and Network Security	3	MA 303	Linear Analysis	3
ECE 575	Introduction to Wireless Networking	3	MA 305	Introductory Linear Algebra and Matrices	3
ECE 576	Networking Services: QoS, Signaling, Processes	3	MA 315	Mathematics Methods in Atmospheric Sciences	4
ECE 577	Switched Network Management	3	MA 325	Introduction to Applied Mathematics	3
ECE 579	Introduction to Computer Performance Modeling	3	MA 331	Differential Equations for the Life Sciences	3
ECG 528	Options and Derivatives Pricing	3	MA 335	Symbolic Logic	3
			MA 341	Applied Differential Equations I	3
			MA 351	Introduction to Discrete Mathematical Models	3
			MA 401	Applied Differential Equations II	3

MA 402	Mathematics of Scientific Computing	3	MA 494	Major Paper in Math	1
MA 403	Introduction to Modern Algebra	3	MA 499	Independent Research in Mathematics	1-6
MA 405	Introduction to Linear Algebra	3	MA 501	Advanced Mathematics for Engineers and Scientists I	3
MA 407	Introduction to Modern Algebra for Mathematics Majors	3	MA 502	Advanced Mathematics for Engineers and Scientists II	3
MA 408	Foundations of Euclidean Geometry	3	MA 504	Introduction to Mathematical Programming	3
MA 410	Theory of Numbers	3	MA 505	Linear Programming	3
MA 412	Long-Term Actuarial Models	3	MA 507	Survey of Real Analysis	3
MA 413	Short-Term Actuarial Models	3	MA 508	Survey of Geometry	3
MA 416	Introduction to Combinatorics	3	MA 509	Survey of Abstract Algebra	3
MA 421	Introduction to Probability	3	MA 510	Selected Topics In Mathematics For Secondary Teachers	1-6
MA 425	Mathematical Analysis I	3	MA 511	Introduction to Advanced Calculus	3
MA 426	Mathematical Analysis II	3	MA 512	Advanced Calculus	3
MA 427	Introduction to Numerical Analysis I	3	MA 513	Introduction To Complex Variables	3
MA 428	Introduction to Numerical Analysis II	3	MA 515	Analysis I	3
MA 430	Mathematical Models in the Physical Sciences	3	MA 518	Geometry of Curves and Surfaces	3
MA 432	Mathematical Models in Life Sciences	3	MA 520	Linear Algebra	3
MA 437	Applications of Algebra	3	MA 521	Abstract Algebra I	3
MA 440	Game Theory	3	MA 522	Computer Algebra	3
MA 444	Problem Solving Strategies for Competitions	1	MA 523	Linear Transformations and Matrix Theory	3
MA 450	Methods of Applied Mathematics I	3	MA 524	Combinatorics I	3
MA 451	Methods of Applied Mathematics II	3	MA 526	Mathematical Analysis II	3
MA 491	Reading in Honors Mathematics	1-6	MA 528		3
MA 493	Special Topics in Mathematics	1-6	MA 531	Dynamic Systems and Multivariable Control I	3

MA 532	Ordinary Differential Equations I	3	MA 587	Numerical Solution of Partial Differential Equations--Finite Element Method	3
MA 534	Introduction To Partial Differential Equations	3	MA 591	Special Topics	1-6
MA 537	Nonlinear Dynamics and Chaos	3	MBA 528		3
MA 540	Uncertainty Quantification for Physical and Biological Models	3	MEA 100	Earth System Science: Exploring the Connections	4
MA 544	Computer Experiments In Mathematical Probability	3	MEA 101	Geology I: Physical	3
MA 546	Probability and Stochastic Processes I	3	MEA 110	Geology I Laboratory	1
MA 547	Stochastic Calculus for Finance	3	MEA 130	Introduction to Weather and Climate	3
MA 548	Monte Carlo Methods for Financial Math	3	MEA 135	Introduction to Weather and Climate Laboratory	1
MA 549	Financial Risk Analysis	3	MEA 202	Geology II: Historical	3
MA 551	Introduction to Topology	3	MEA 211	Geology II Laboratory	1
MA 555	Introduction to Manifold Theory	3	MEA 300	Environmental Geology	4
MA 561	Set Theory and Foundations Of Mathematics	3	MEA 312	Atmospheric Thermodynamics	4
MA 565	Graph Theory	3	MEA 315	Mathematics Methods in Atmospheric Sciences	4
MA 573	Mathematical Modeling of Physical and Biological Processes I	3	MEA 320	Fundamentals of Air Pollution	3
MA 574	Mathematical Modeling of Physical and Biological Processes II	3	MEA 321	Fundamentals of Air Quality and Climate Change	3
MA 580		3	MEA 323	Geochemistry of Natural Waters	3
MA 583	Introduction to Parallel Computing	3	MEA 409	Watershed Forensics	3
MA 584	Numerical Solution of Partial Differential Equations-- Finite Difference Methods	3	MEA 410	Introduction to Mineralogy and Petrology	4
			MEA 411	Marine Sediment Transport	3
			MEA 412	Atmospheric Physics	3
			MEA 415	Climate Dynamics	3
			MEA 421	Atmospheric Dynamics I	3
			MEA 422	Atmospheric Dynamics II	3

MEA 425	Introduction to Atmospheric Chemistry	3	MEA 473	Principles of Chemical Oceanography	3
MEA 440	Igneous and Metamorphic Petrology	4	MEA 476	Worldwide River and Delta Systems: Their Evolution and Human Impacts	3
MEA 443	Synoptic Weather Analysis and Forecasting	4	MEA 479	Air Quality	3
MEA 444	Mesoscale Analysis and Forecasting	4	MEA 481	Geomorphology: Earth's Dynamic Surface	3
MEA 449	Principles of Biological Oceanography	3	MEA 485	Introduction to Hydrogeology	3
MEA 450	Introductory Sedimentology and Stratigraphy	4	MEA 488	Meteorology for Media	3
MEA 451	Structural Geology	4	MEA 493	Special Topics in MEAS	1-6
MEA 454	Marine Physical-Biological Interactions	3	MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
MEA 455	Micrometeorology	3	MEA 498	Internship in MEAS	1-6
MEA 458	Introduction to Tropical Meteorology	3	MEA 507	Discipline-based Education Research in the Geosciences	3
MEA 459	Field Investigation of Coastal Processes	5	MEA 510	Air Pollution Meteorology	3
MEA 460	Principles of Physical Oceanography	3	MEA 511	Introduction to Meteorological Remote Sensing	3
MEA 462	Observational Methods and Data Analysis in Marine Physics	3	MEA 514	Advanced Physical Meteorology	3
MEA 463	Fluid Physics	3	MEA 515	Climate Dynamics	3
MEA 464	Ocean Circulation Systems	3	MEA 517	Fundamentals of Climate Change Science	3
MEA 465	Geologic Field Camp	4	MEA 518	Adaptation to Climate Change	3
MEA 466	Preparatory Course for Field Camp	1	MEA 519	Barriers to Climate Change Literacy	3
MEA 467	Marine Meteorology	3	MEA 525	Introduction to Atmospheric Chemistry	3
MEA 469	Ecology of coastal Resources	3	MEA 540	Principles of Physical Oceanography	3
MEA 470	Introduction to Geophysics	3	MEA 549	Principles of Biological Oceanography	3
MEA 471	Exploration and Engineering Geophysics	3	MEA 553	Estuarine Biogeochemistry	3

MEA 554	Marine Physical-Biological Interactions	3
MEA 562	Marine Sediment Transport	3
MEA 570	Geological Oceanography	3
MEA 573	Principles of Chemical Oceanography	3
MEA 574	Advanced Igneous Petrology	3
MEA 577	Electron Microprobe Analysis of Geologic Material	2
MEA 579	Principles of Air Quality Engineering	3
MEA 580	Air Quality Modeling and Forecasting	4
MEA 581	Fluid Mechanics in Natural Environments	3
MEA 582	Geospatial Modeling	3
MEA 585	Physical Hydrogeology	3
MEA 591	Special Topics in Marine Science	1-6
MEA 592	Special Topics in Earth Sciences	1-6
MEA 593	Special Topics in Atmospheric Science	1-6
MEA 599	Regional Geology of North America	1-6
OR 504	Introduction to Mathematical Programming	3
OR 505	Linear Programming	3
OR 531	Dynamic Systems and Multivariable Control I	3
OR 565	Graph Theory	3
OR 579	Introduction to Computer Performance Modeling	3
PSY 240	Introduction to Behavioral Research I	3

PSY 241	Introduction to Behavioral Research I Lab	1
PSY 242	Introduction to Behavioral Research II	3
PSY 243	Introduction to Behavioral Research II Lab	2
PY 414	Electromagnetism I	3
PY 415	Electromagnetism II	3
PY 514	Electromagnetism I	3
PY 515	Electromagnetism II	3
ST 350	Economics and Business Statistics	3
ST 412	Long-Term Actuarial Models	3
ST 413	Short-Term Actuarial Models	3
ST 442	Introduction to Data Science	3
ST 546	Probability and Stochastic Processes I	3
Group A - Physical Sciences		
BME 201	Computer Methods in Biomedical Engineering	3
CSC 442	Introduction to Data Science	3
EC 351	Econometrics I	3
ECE 489	Solid State Solar and Thermal Energy Harvesting	3
ECE 589	Solid State Solar and Thermal Energy Harvesting	3
ECG 561	Applied Econometrics I	3
EMS 519	Teaching and Learning of Statistical Thinking	3
GPH 404	Epidemiology and Statistics in Global Public Health	3
MA 412	Long-Term Actuarial Models	3

MA 413	Short-Term Actuarial Models	3	PY 401	Quantum Physics I	3
MA 546	Probability and Stochastic Processes I	3	PY 402	Quantum Physics II	3
MA 555	Introduction to Manifold Theory	3	PY 407	Introduction to Modern Physics	3
MEA 150	Environmental Issues in Water Resources	4	PY 411	Mechanics I	3
MEA 463	Fluid Physics	3	PY 412	Mechanics II	3
MSE 489	Solid State Solar and Thermal Energy Harvesting	3	PY 413	Thermal Physics	3
MSE 589	Solid State Solar and Thermal Energy Harvesting	3	PY 414	Electromagnetism I	3
NE 528	Introduction to Plasma Physics and Fusion Energy	3	PY 415	Electromagnetism II	3
NE 529	Plasma Physics and Fusion Energy II	3	PY 452	Advanced Physics Laboratory	3
PSY 240	Introduction to Behavioral Research I	3	PY 489	Solid State Solar and Thermal Energy Harvesting	3
PSY 241	Introduction to Behavioral Research I Lab	1	PY 495	Special Topics in Physics	1-4
PSY 242	Introduction to Behavioral Research II	3	PY 499	Independent Research in Physics	1-6
PSY 243	Introduction to Behavioral Research II Lab	2	PY 501	Quantum Physics I	3
PY 123	Stellar and Galactic Astronomy	3	PY 502	Quantum Physics II	3
PY 124	Solar System Astronomy	3	PY 506	Nuclear and Subatomic Physics	3
PY 125	Astronomy Laboratory	1	PY 507	Elementary Particle Physics	3
PY 131	Conceptual Physics	4	PY 509	General Relativity	3
PY 203	University Physics III	4	PY 511	Mechanics I	3
PY 301	Introduction to Quantum Mechanics	3	PY 512	Mechanics II	3
PY 328	Stellar and Galactic Astrophysics	3	PY 514	Electromagnetism I	3
PY 341	Relativity, Gravitation and Cosmology	3	PY 515	Electromagnetism II	3
			PY 516	Physical Optics	3
			PY 517	Atomic and Molecular Physics	3
			PY 519	Biological Physics	3
			PY 525	Computational Physics	3
			PY 528	Introduction to Plasma Physics and Fusion Energy	3
			PY 529	Plasma Physics and Fusion Energy II	3
			PY 543	Astrophysics	3

PY 552	Condensed Matter Physics I	3	ST 430	Introduction to Regression Analysis	3
PY 570	Polymer Physics	3	ST 431	Introduction to Experimental Design	3
PY 581	Matter & Interactions for Teachers I	3	ST 432	Introduction to Survey Sampling	3
PY 582	Matter & Interactions for Teachers II	3	ST 433	Applied Spatial Statistics	3
PY 589	Solid State Solar and Thermal Energy Harvesting	3	ST 434	Applied Time Series	3
PY 590	Special Topics In Physics	1-6	ST 435	Statistical Methods for Quality and Productivity Improvement	3
PY 599	Special Topics in Physics	1-6	ST 437	Applied Multivariate and Longitudinal Data Analysis	3
SSC 200	Soil Science	3	ST 440	Applied Bayesian Analysis	3
SSC 201	Soil Science Laboratory	1	ST 445	Introduction to Statistical Computing and Data Management	3
ST 311	Introduction to Statistics	3	ST 446	Intermediate SAS Programming with Applications	3
ST 312	Introduction to Statistics II	3	ST 491	Statistics in Practice	3
ST 370	Probability and Statistics for Engineers	3	ST 495	Special Topics in Statistics	1-6
ST 371	Introduction to Probability and Distribution Theory	3	ST 497	Professional Experience in Statistics	
ST 372	Introduction to Statistical Inference and Regression	3	ST 498	Independent Study In Statistics	1-6
ST 380	Probability and Statistics for the Physical Sciences	3	ST 499	Research Experience in Statistics	
ST 401	Experiences in Data Analysis	4	ST 501	Fundamentals of Statistical Inference I	3
ST 404	Epidemiology and Statistics in Global Public Health	3	ST 502	Fundamentals of Statistical Inference II	3
ST 405	Applied Nonparametric Statistics	3	ST 503	Fundamentals of Linear Models and Regression	3
ST 412	Long-Term Actuarial Models	3	ST 505	Applied Nonparametric Statistics	3
ST 413	Short-Term Actuarial Models	3	ST 506	Sampling Animal Populations	3
ST 421	Introduction to Mathematical Statistics I	3			
ST 422	Introduction to Mathematical Statistics II	3			

ST 507	Statistics For the Behavioral Sciences I	3	ST 556	Statistical Programming II	3
ST 508	Statistics For the Behavioral Sciences II	3	ST 557	Using Technology to Teach Statistics	3
ST 511	Statistical Methods For Researchers I	3	ST 558	Data Science for Statisticians	3
ST 512	Statistical Methods For Researchers II	3	ST 561	Applied Econometrics I	3
ST 513	Statistics for Management and Social Sciences I	3	ST 562	Data Mining with SAS Enterprise Miner	3
ST 514	Statistics For Management and Social Sciences II	3	ST 563	Introduction to Statistical Learning	3
ST 515	Experimental Statistics for Engineers I	3	ST 590	Special Topics	1-6
ST 516	Experimental Statistics For Engineers II	3	ST 701	Statistical Theory I	3
ST 517	Applied Statistical Methods I	3	ST 702	Statistical Theory II	3
ST 519	Teaching and Learning of Statistical Thinking	3	ST 705	Linear Models and Variance Components	3
ST 520	Statistical Principles of Clinical Trials	3	TE 570	Polymer Physics	3
ST 524	Statistics In Plant Science	3	Group B - Economics & Business		
ST 533	Applied Spatial Statistics	3	ACC 210	Concepts of Financial Reporting	3
ST 534	Applied Time Series	3	ACC 220	Introduction to Managerial Accounting	3
ST 535	Statistical Methods for Quality and Productivity Improvement	3	ACC 280	Survey of Financial and Managerial Accounting	3
ST 537	Applied Multivariate and Longitudinal Data Analysis	3	ACC 310	Intermediate Financial Accounting I	3
ST 540	Applied Bayesian Analysis	3	ACC 311	Intermediate Financial Accounting II	3
ST 542	Statistical Practice	3	ACC 330	An Introduction To Income Taxation	3
ST 544	Applied Categorical Data Analysis	3	ACC 340	Accounting Information Systems	3
ST 555	Statistical Programming I	3	ACC 411	Business Valuation	3
			ACC 420	Cost Accounting for Effective Management	3
			ACC 440	Enterprise Resource Planning Systems	3

ACC 450	Auditing and Assurance Services	3	BUS 420	Financial Management of Corporations	3
ACC 451	Internal Auditing	3	BUS 422	Investments and Portfolio Management	3
ACC 460	Governmental and Nonprofit Accounting	3	BUS 425	Advanced Personal Financial Management	3
ARE 215	Small Business Accounting	3	BUS 426	International Financial Management	3
ARE 301	Intermediate Microeconomics	3	BUS 440	Database Management	3
ARE 303	Farm Management	3	BUS 441	Business Data Communications and Networking	3
ARE 304	Agribusiness Management	3	BUS 442	Information Systems Development	3
ARE 306	Agricultural Law	3	BUS 443	Web Development for Business Applications	3
ARE 309	Environmental Law & Economic Policy	3	BUS 444	Systems Analysis and Design	3
ARE 311	Agricultural Markets	3	BUS 461	Channel and Retail Marketing	3
ARE 312	Agribusiness Marketing	3	BUS 462	Marketing Research	3
ARE 321	Agricultural Financial Management	3	BUS 464	International Marketing	3
ARE 336	Introduction to Resource and Environmental Economics	3	BUS 465	Traditional and Digital Brand Promotion	3
ARE 345	Global Agribusiness Management	3	BUS 466	Personal Selling	3
ARE 404	Advanced Agribusiness Management	3	BUS 467	Product and Brand Management	3
ARE 413	Applied Agribusiness Marketing	3	BUS 468	Marketing Strategy	3
ARE 433	U.S. Agricultural Policy	3	BUS 469	Digital Marketing Practicum	3
ARE 490	Career Seminar in Agriculture & Resource Economics	1	BUS 470	Operations Modeling and Analysis	3
BUS 225	Personal Finance	3	BUS 472	Operations Planning and Control Systems	3
BUS 320	Financial Management	3	BUS 473	Supply Chain Strategy	3
BUS 340	Information Systems Management	3	BUS 475	Purchasing and Supply Management	3
BUS 360	Marketing Methods	3			
BUS 370	Operations and Supply Chain Management	3			

BUS 479	Supply Chain Management Undergraduate Practicum	3	ARE 412	Advanced Agribusiness Marketing	3
EC 301	Intermediate Microeconomics	3	BUS 340	Information Systems Management	3
EC 336	Introduction to Resource and Environmental Economics	3	BUS 449	Information Technology Capstone	3
FTM 482	Global Brand Management in Textiles and Apparel	3	BUS 474	Logistics Management	3
M 100	Personal and Professional Identity Development	1	EC 202	Principles of Macroeconomics	3
MIE 201	Introduction to Business Processes	3	EC 301	Intermediate Microeconomics	3
MIE 305	Legal and Regulatory Environment	3	EC 302	Intermediate Macroeconomics	3
MIE 330	Human Resource Management	3	EC 305	A Closer Look at Capitalism	3
MIE 335	Organizational Behavior	3	EC 336	Introduction to Resource and Environmental Economics	3
MIE 432	Labor and Employee Relations	3	EC 348	Introduction to International Economics	3
MIE 434	Compensation Systems	3	EC 351	Econometrics I	3
MIE 435	Leadership and Management	3	EC 404	Money, Financial Markets, and the Economy	3
MIE 436	Training and Development	3	EC 410	Public Finance	3
MIE 438	Staffing	3	EC 413	Industrial Organization	3
MIE 480	Business Policy and Strategy	3	EC 431	Labor Economics	3
PRT 406	Sports Law	3	EC 437		3
Group B - Economics & Business			EC 449	International Finance	3
ACC 220	Introduction to Managerial Accounting	3	EC 451	Econometrics II	3
ACC 280	Survey of Financial and Managerial Accounting	3	EC 474	Economics of Financial Institutions and Markets	3
ARE 301	Intermediate Microeconomics	3	EC 480		3
ARE 332	Human Resource Management for Agribusiness	3	EC 490	Research Seminar in Economics	3
ARE 336	Introduction to Resource and Environmental Economics	3	FTM 482	Global Brand Management in Textiles and Apparel	3
			MIE 412	Finance and Accounting for Entrepreneurs	3
			MIE 413	New Venture Planning	3
			MIE 419	Entrepreneurship Practicum	3

PRT 406	Sports Law	3	AEE 427	Student Teaching in Agriculture	8
Group C - Applied Sci & Tech			AEE 433	Leadership and Management of Volunteers in Agricultural and Extension Education	3
AEE 101	Introduction to Career and Technical Education	1	AEE 435	Professional Presentations in Agricultural Organizations	3
AEE 208	Agricultural Biotechnology: Issues and Implications	3	AEE 460	Organizational Leadership Development in Agriculture and Life Sciences	3
AEE 230	Introduction to Cooperative Extension	3	AEE 478	Advanced Issues in Extension Education	3
AEE 303	Administration and Supervision of Student Organizations	3	AEE 490	Seminar in Agricultural and Extension Education	1
AEE 311	Communication Methods and Media	3	AEE 533	Leadership and Management of Volunteers in Agricultural and Extension Education	3
AEE 322	Experiential Learning in Agriculture	3	BAET 201	Shop Processes and Management	
AEE 323	Leadership Development in Agriculture and Life Sciences	3	BAET 323	Water Management	
AEE 325	Planning and Delivering Non-Formal Education	3	BAET 332	Management of Animal Environments	
AEE 326	Teaching Diverse Learners in AED	3	BAET 323	Water Management	
AEE 327	Conducting Summer Programs in Agricultural Education	1	BAET 332	Management of Animal Environments	
AEE 350	Personal Leadership Development in Agriculture and Life Sciences	3	BAET 333	Processing Agricultural Products	
AEE 360	Developing Team Leadership in Agriculture and Life Sciences	3	BAET 343	Agricultural Electrification	
AEE 423	Practicum in Agricultural Extension/ Industry	8	BAET 411	Agricultural Machinery and Power Units	
AEE 424	Planning Agricultural Educational Programs	3	BAET 432	Agricultural and Environmental Safety and Health	
AEE 426	Methods of Teaching Agriculture	3	BAET 443	Environmental Restoration Implementation	

ALS 110	Academic and Career Skills Seminar	1	ANS 525	Feed Manufacturing Technology	3
ANS 105	Introduction to Companion Animal Science	3	ANS 540	Animal Genetic Improvement	3
ANS 110	Introduction to Equine Science	3	ANS 553	Physiology and Genetics of Growth and Development	3
ANS 150	Introduction to Animal Science	3	ANS 554	Lactation, Milk and Nutrition	3
ANS 151	Introduction to Animal Science Lab	1	BAE 100	Introduction to Biological and Agricultural Engineering and Technology	1
ANS 201	Techniques of Animal Care	2	BAE 202	Introduction to Biological and Agricultural Engineering Methods	4
ANS 208	Agricultural Biotechnology: Issues and Implications	3	BAE 302	Transport Phenomena	3
ANS 225	Principles of Animal Nutrition	3	BAE 322	Introduction to Food Process Engineering	3
ANS 303	Principles of Equine Evaluation	2	BAE 361	Analytical Methods in Engineering Design	3
ANS 304	Dairy Cattle Evaluation	2	BAE 371	Fundamentals of Hydrology for Engineers	3
ANS 309	Livestock Evaluation	3	BAE 401	Sensors and Controls	3
ANS 322	Muscle Foods and Eggs	3	BAE 435	Precision Agriculture Technology	3
ANS 324	Milk and Dairy Products	3	BAE 451	Engineering Design I	2
ANS 400	Companion Animal Management	3	BAE 452	Engineering Design II	2
ANS 402	Beef Cattle Management	3	BAE 462	Machinery Design and Applications	3
ANS 403	Swine Management	3	BAE 472	Irrigation and Drainage	3
ANS 404	Dairy Cattle Management	3	BAE 473	Introduction to Hydrologic and Water Quality Modeling	3
ANS 408	Small Ruminant Management	3	BAE 474	Principles and Applications of Ecological Engineering	3
ANS 410	Equine Breeding Farm Management	3	BAE 481	Structures & Environment	3
ANS 425	Feed Manufacturing Technology	3			
ANS 440	Animal Genetic Improvement	3			
ANS 453	Physiology and Genetics of Growth and Development	3			
ANS 454	Lactation, Milk and Nutrition	3			

BAE 501	Sensors and Controls	3	ECI 424	Student Teaching in Modern Foreign Languages	12
BAE 535	Precision Agriculture Technology	3	ENT 470	Advanced Turfgrass Pest Management	2
BAE 572	Irrigation and Drainage	3	FM 425	Feed Manufacturing Technology	3
BAE 573	Introduction to Hydrologic and Water Quality Modeling	3	FM 525	Feed Manufacturing Technology	3
BEC 330	Principles and Applications of Bioseparations	2	FS 322	Muscle Foods and Eggs	3
BEC 436	Introduction to Downstream Process Development	2	FS 324	Milk and Dairy Products	3
BEC 440	Expression Systems in Biomanufacturing 1	3	FS 435	Food Safety Management Systems	3
BEC 536	Introduction to Downstream Process Development	2	FS 535	Food Safety Management Systems	3
BEC 540	Expression Systems in Biomanufacturing 1	3	MSE 203	Introduction to the Materials Science of Biomaterials	3
BME 540	Nanobiotechnology Processing, Characterization, and Applications	3	NTR 425	Feed Manufacturing Technology	3
BME 203	Introduction to the Materials Science of Biomaterials	3	NTR 454	Lactation, Milk and Nutrition	3
BME 207	Biomedical Electronics	4	NTR 525	Feed Manufacturing Technology	3
BME 342	Analytical and Experimental Methods for Biomedical Engineers	3	PB 208	Agricultural Biotechnology: Issues and Implications	3
BME 365	Linear Systems in Biomedical Engineering		PO 322	Muscle Foods and Eggs	3
BME 385	Bioinstrumentation	3	PO 425	Feed Manufacturing Technology	3
BME 412	Biomedical Signal Processing	3	PO 525	Feed Manufacturing Technology	3
BME 425	Bioelectricity	3	PP 470	Advanced Turfgrass Pest Management	2
BME 525	Bioelectricity	3	SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
CS 470	Advanced Turfgrass Pest Management	2			

SSC 473	Introduction to Hydrologic and Water Quality Modeling	3	ANS 425	Feed Manufacturing Technology	3
SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3	ANS 525	Feed Manufacturing Technology	3
SSC 573	Introduction to Hydrologic and Water Quality Modeling	3	BAE 325	Introductory Geomatics	3
USC 291	Service Learning Program Leader Development I	1	BAE 425	Industrial Microbiology and Bioprocessing	3
USC 292	Service Learning Program Leader Development II	2	BAE 435	Precision Agriculture Technology	3
Group C - Applied Sci & Tech					
AEC 420	Introduction to Fisheries Science	3	BAE 525	Industrial Microbiology and Bioprocessing	3
AEE 206	Introduction to Teaching Agriculture	3	BAE 535	Precision Agriculture Technology	3
AEE 303	Administration and Supervision of Student Organizations	3	BBS 201	Introduction to Biopharmaceutical Science	3
AEE 322	Experiential Learning in Agriculture	3	BBS 301	Process Validation Science	3
AEE 327	Conducting Summer Programs in Agricultural Education	1	BBS 426	Upstream Biomanufacturing Laboratory	2
AEE 424	Planning Agricultural Educational Programs	3	BBS 526	Upstream Biomanufacturing Laboratory	2
AEE 426	Methods of Teaching Agriculture	3	BCH 220	Role of Biotechnology in Society	3
AEE 427	Student Teaching in Agriculture	8	BEC 426	Upstream Biomanufacturing Laboratory	2
ANS 322	Muscle Foods and Eggs	3	BEC 483	Tissue Engineering Technologies	2
ANS 324	Milk and Dairy Products	3	BEC 526	Upstream Biomanufacturing Laboratory	2
ANS 330	Laboratory Animal Science	3	BEC 583	Tissue Engineering Technologies	2
ANS 411	Management of Growing and Performance Horses	3	BME 375	Biomedical Microcontroller Applications	
			BME 444	Orthopaedic Biomechanics	3
			BME 451	BME Senior Design: Product Development	3

BME 452	BME Senior Design: Product Implementation and Strategy	3	CS 430	Advanced Agroecology	4
BME 466	Polymeric Biomaterials Engineering	3	CS 465	Turf Management Systems and Environmental Quality	3
BME 467	Mechanics of Tissues & Implants Requirements	3	CS 524	Seed Physiology	3
BME 483	Tissue Engineering Technologies	2	CS 565	Turf Management Systems and Environmental Quality	3
BME 484	Fundamentals of Tissue Engineering	3	CSSC 490	Senior Seminar in Crop Science and Soil Science	1
BME 544	Orthopaedic Biomechanics	3	ECI 424	Student Teaching in Modern Foreign Languages	12
BME 566	Polymeric Biomaterials Engineering	3	ENT 203	An Introduction to the Honey Bee and Beekeeping	3
BME 583	Tissue Engineering Technologies	2	ENT 401	Honey Bee Biology and Management	3
BME 584	Fundamentals of Tissue Engineering	3	ES 100	Introduction to Environmental Sciences	3
CS 200	Introduction to Turfgrass Management	4	ES 200	Climate Change and Sustainability	3
CS 210	Lawns and Sports Turf	3	ES 300	Energy and Environment	3
CS 213	Crop Science	3	ES 400	Analysis of Environmental Issues	3
CS 216	Southern Row Crop Production - Cotton, Peanuts, and Tobacco	3	FM 425	Feed Manufacturing Technology	3
CS 218	Southern Row Crop Production - Corn, Small Grains and Soybeans	3	FM 460	Feed Mill Operations and Leadership	3
CS 230	Introduction to Agroecology	3	FM 480	Feed Quality Assurance & Formulation	3
CS 312	Grassland Management for Natural Resources Conservation	3	FM 490	Feed Science Seminar	1
CS 400	Turf Cultural Systems	3	FM 525	Feed Manufacturing Technology	3
CS 411	Crop Ecology	3	FOR 318	Forest Pathology	3
CS 413	Plant Breeding	2	FOR 420	Watershed and Wetlands Hydrology	4
CS 414	Weed Science	4	FOR 472	Forest Soils	4
CS 415	Integrated Pest Management	3	FOR 520	Watershed and Wetlands Hydrology	4
CS 424	Seed Physiology	3	FS 201	Introduction to Food Science	3

FS 290	Careers in Food and Bioprocessing Sciences	1	FW 314	Coastal Ecology and Management	1
FS 322	Muscle Foods and Eggs	3	FW 353	Wildlife Management	3
FS 324	Milk and Dairy Products	3	FW 403	Urban Wildlife Management	3
FS 330	Science of Food Preparation	3	FW 411	Human Dimensions of Wildlife and Fisheries	3
FS 354	Food Sanitation	3	FW 453	Principles of Wildlife Science	4
FS 416	Quality Control in Food and Bioprocessing	3	FW 460	International Wildlife Management and Conservation	3
FS 421	Food Preservation	3	FW 465	African Ecology and Conservation	4
FS 426	Upstream Biomanufacturing Laboratory	2	FW 511	Human Dimensions of Wildlife and Fisheries	3
FS 435	Food Safety Management Systems		FW 560	International Wildlife Management and Conservation	3
FS 453	Food Laws and Regulations	3	FW 565	African Ecology and Conservation	4
FS 462	Postharvest Physiology	3	GPH 201	Fundamentals of Global Public Health	3
FS 475	Problems and Design in Food and Bioprocessing Science	3	HS 432	Introduction to Permaculture	3
FS 516	Quality Control in Food and Bioprocessing		HS 462	Postharvest Physiology	3
FS 521	Food Preservation	3	HS 532	Introduction to Permaculture	3
FS 526	Upstream Biomanufacturing Laboratory	2	HS 562	Postharvest Physiology	3
FS 535	Food Safety Management Systems	3	IDS 303	Humans and the Environment	3
FS 553	Food Laws and Regulations	3	NR 303	Humans and the Environment	3
FS 562	Postharvest Physiology	3	NR 350	International Sustainable Resource Use	4
FW 221	Conservation of Natural Resources	3	NR 406	Conservation of Biological Diversity	3
FW 311	Piedmont Wildlife Ecology and Management	3	NR 420	Watershed and Wetlands Hydrology	4
FW 312	Fisheries Techniques and Management	1	NR 460	Renewable Natural Resource Management and Policy	3
FW 313	Mountain Wildlife Ecology and Management	1			

NR 520	Watershed and Wetlands Hydrology	4	AEC 423	Introduction to Fisheries Sciences Laboratory	1
NR 560	Renewable Natural Resource Management and Policy	3	AEC 519	Freshwater Ecology	4
NTR 425	Feed Manufacturing Technology	3	ANS 322	Muscle Foods and Eggs	3
NTR 525	Feed Manufacturing Technology	3	ANS 425/525	Feed Manufacturing Technology	3
PO 322	Muscle Foods and Eggs	3	BAET 323	Water Management	
PO 424	Poultry Meat Production	3	BIO 227	Understanding Structural Diversity through Biological Illustration	3
PO 425	Feed Manufacturing Technology	3	BME 204	Biomedical Measurements	3
PO 435	Poultry Incubation & Breeding	4	BME 217	Biomedical Electronics Laboratory	1
PO 525	Feed Manufacturing Technology	3	BME 298	Biomedical Engineering Design and Manufacturing I	
PP 318	Forest Pathology	3	BME 398	Biomedical Engineering Design and Manufacturing II	2
SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3	CS 470	Advanced Turfgrass Pest Management	2
SSC 462	Soil-Crop Management Systems	3	CSSC 490	Senior Seminar in Crop Science and Soil Science	1
SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3	ENT 470	Advanced Turfgrass Pest Management	2
TE 466	Polymeric Biomaterials Engineering	3	FM 425	Feed Manufacturing Technology	3
TE 467	Mechanics of Tissues & Implants Requirements	3	FM 525	Feed Manufacturing Technology	3
TE 566	Polymeric Biomaterials Engineering	3	FOR 318	Forest Pathology	3
VMP 401	Poultry Diseases	4	FOR 420	Watershed and Wetlands Hydrology	4
VMP 420	Disease of Farm Animals	3	FOR 472	Forest Soils	4
Group C - Applied Sci & Tech			FOR 520	Watershed and Wetlands Hydrology	4
AEC 419	Freshwater Ecology	4	FS 322	Muscle Foods and Eggs	3

FS 435	Food Safety Management Systems	3	HS 400	Residential Landscaping	6
FS 462	Postharvest Physiology	3	HS 411	Nursery Management	3
FS 535	Food Safety Management Systems	3	HS 416	Planting Design	4
FS 562	Postharvest Physiology	3	HS 421	Temperate-Zone Tree Fruits: Physiology and Culture	3
FW 221	Conservation of Natural Resources	3	HS 422	Small Fruit Production	3
FW 404	Wildlife Habitat Management	3	HS 423	Viticulture	3
FW 460	International Wildlife Management and Conservation	3	HS 431	Vegetable Production	4
FW 560	International Wildlife Management and Conservation	3	HS 440	Greenhouse Management	3
HS 200	Home Horticulture	3	HS 442	Floriculture Crop Production	3
HS 201	The World of Horticulture: Principles and Practices	3	HS 462	Postharvest Physiology	3
HS 203	Home Plant Propagation	3	HS 471	Landscape Ecosystem Management	4
HS 242	Introduction to Small Scale Landscape Design	3	HS 516	Planting Design	4
HS 250	Home Landscape Design: Creating Garden Spaces	3	HS 521	Temperate-Zone Tree Fruits: Physiology and Culture	3
HS 252	Landscape Graphic Communication	2	HS 523	Viticulture	3
HS 272	Landscape Design/Build	6	HS 423	Viticulture	3
HS 290	Horticulture: Careers and Opportunities	1	HS 562	Postharvest Physiology	3
HS 301	Plant Propagation	4	IDS 303	Humans and the Environment	3
HS 302	Gardening with Herbaceous Perennials	3	NR 300	Natural Resource Measurements	4
HS 303	Ornamental Plant Identification I	3	NR 303	Humans and the Environment	3
HS 304	Ornamental Plant Identification II	3	NR 400	Natural Resource Management	4
HS 357	Landscape Grading and Drainage	4	NR 420	Watershed and Wetlands Hydrology	4
			NR 421	Wetland Science and Management	3
			NR 460	Renewable Natural Resource Management and Policy	3
			NR 484	Environmental Impact Assessment	4
			NR 500	Natural Resource Management	4
			NR 520	Watershed and Wetlands Hydrology	4

NR 521	Wetland Science and Management	3
NR 560	Renewable Natural Resource Management and Policy	3
NTR 420	Applied Nutrition Education	3
NTR 425	Feed Manufacturing Technology	3
NTR 525	Feed Manufacturing Technology	3
PO 201	Poultry Science and Production	3
PO 201A	Poultry Science and Production	3
PO 202	Poultry Science and Production Laboratory	1
PO 202A	Poultry Science and Production Laboratory	1
PO 290	Poultry Seminar	1
PO 322	Muscle Foods and Eggs	3
PO 340	Live Poultry and Poultry Product Evaluation, Grading, and Inspection	3
PO 410	Production and Management of Game Birds in Confinement	3
PO 411	Agrosecurity	3
PO 421	Commercial Egg Production	3
PO 425	Feed Manufacturing Technology	3
PO 433	Poultry Processing and Products	3
PO 525	Feed Manufacturing Technology	3
PO 533	Poultry Processing and Products	3
PP 315	Principles of Plant Pathology	4
PP 318	Forest Pathology	3
PP 470	Advanced Turfgrass Pest Management	2
SSC 185	Land and Life	3

SSC 341	Soil Fertility and Nutrient Management	3
SSC 342	Soil and Plant Nutrient Analysis	1
SSC 421	Role of Soils in Environmental Management	3
SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 442	Soil and Environmental Biogeochemistry	3
SSC 452	Soil Classification	4
SSC 461	Soil Physical Properties and Plant Growth	3
SSC 462	Soil-Crop Management Systems	3
SSC 470	Wetland Soils	3
SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 570	Wetland Soils	3
TOX 201	Poisons, People and the Environment	3
TOX 401	Principles of Toxicology	4
TOX 415	Environmental Toxicology and Chemistry	4
TOX 501	Principles of Toxicology	4

Semester Sequence

This is a sample.

First Year

		Hours
ALS 103 or ALS 303	Freshman Transitions and Diversity in Agriculture & Life Sciences or Transfer Transitions and Diversity in Agriculture & Life Sciences	1
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
GEP Social Sciences	(http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3
ENG 101	Academic Writing and Research	4

MA 114	Introduction to Finite Mathematics with Applications	3
Hours		15
Spring Semester		
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory	4
MA 131	Calculus for Life and Management Sciences A	3
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
GC 120	Foundations of Graphics	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
BAE 100	Introduction to Biological and Agricultural Engineering and Technology	1
Hours		15
Second Year		
Fall Semester		
BAET 201	Shop Processes and Management	3
PY 211	College Physics I	4
BAET 200	Computer Applications in Biological and Agricultural Engineering Technology	2
SSC 200 & SSC 201	Soil Science and Soil Science Laboratory	4
Hours		13
Spring Semester		
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		3
Physical Science Elective (p. 1)		4
Restricted Electives (p. 3)		3
ARE 201	Introduction to Agricultural & Resource Economics	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
Hours		14
Third Year		
Fall Semester		
ST 350	Economics and Business Statistics	3
BAE 325	Introductory Geomatics	3
BAET 343	Agricultural Electrification	4
Agriculture and Resource Economics Elective (p. 2)		3
Communications Elective (p. 1)		3
Hours		16
Spring Semester		
BAET 332	Management of Animal Environments	4
BAET 323	Water Management	3
BAET 333	Processing Agricultural Products	4
Agriculture and Resource Economics Elective (p. 2)		3
GIS 280	Introduction to GIS	3
Hours		17

Fourth Year**Fall Semester**

BAET 432	Agricultural and Environmental Safety and Health	3
BAET 443	Environmental Restoration Implementation	3
AEE 323	Leadership Development in Agriculture and Life Sciences	3
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
BAET 411	Agricultural Machinery and Power Units	4

Hours **16**

Spring Semester

Restricted Electives (p. 3)		3
Restricted Electives (p. 3)		3
BAET 450	Biological and Agricultural Engineering Technology Capstone	3
GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)		3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		2

Hours **14**

Total Hours **120**

Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization through selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor's of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The BAET curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum's flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture,

environmental systems, agribusiness sales and service, and agricultural extension.