

# Biological and Agricultural Engineering Technology (BS)

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
<b>Orientation</b>			
ALS 103	Freshman Transitions and Diversity in Agriculture & Life Sciences	1	
or ALS 303	Transfer Transitions and Diversity in Agriculture & Life Sciences		
<b>Communication</b>		<b>3</b>	
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		
<b>Mathematical Sciences</b>			
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
BAET 200	Computer Applications in Biological and Agricultural Engineering Technology	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

**BAET Electives**

BAET Electives (p. 2)	9
Restricted Electives (p. 3)	12

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

ARE Electives (p. 2)	6
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**GEP Courses**

ENG 101	Academic Writing and Research <sup>1</sup>	4
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )	6	
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )	3	
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )	2	
GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )	3	
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )	5	
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)		

Foreign Language Proficiency (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/>) (verify requirement)

<b>Free Elective</b>	
Free Elective <sup>2</sup>	1
<b>Total Hours</b>	<b>120</b>

<sup>1</sup> A grade of C- or higher is required.

<sup>2</sup> Students should consult their academic advisors to determine which courses fill this requirement.

**BAET Electives**

Code	Title	Hours	Counts towards
BAET 333	Processing Agricultural Products	4	
BAET 411	Agricultural Machinery and Power Units	4	
BAET 443	Environmental Restoration Implementation	3	
BAE 325	Introductory Geomatics	3	
BAE 435	Precision Agriculture Technology	3	
BAE 535	Precision Agriculture Technology	3	
GIS 510	Fundamentals of Geospatial Information Science and Technology	3	

**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
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### 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	3
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	ENT 425	General Entomology	3
BIO 267	Research in the Life Sciences I: Research Skills	3	FOR 402	Forest Entomology	3
BIO 414	Cell Biology	3	FS 231	Principles of Food and Bioprocess Engineering	4
BIO 434	Hormones and Behavior	3	FS 301	Introduction to Human Nutrition	3
BIO 440	The Human Animal: An Evolutionary Perspective	3	FS 401	Advanced Nutrition and Metabolism	3
BIT 410	Manipulation of Recombinant DNA	4	FS 402	Chemistry of Food and Bioprocessed Materials	4
BIT 462		2	FS 403	Analytical Techniques in Food & Bioprocessing Science	4
BIT 463	Fermentation of Recombinant Microorganisms	2	FS 405	Food Microbiology	3
BIT 464	Protein Purification	2	FS 406	Food Microbiology Lab	1
BIT 466	Animal Cell Culture Techniques	2	FS 501	Advanced Nutrition and Metabolism	3
BIT 467	PCR and DNA Fingerprinting	2	FS 502	Chemistry of Food and Bioprocessed Materials	4
BIT 468		2	FS 505	Food Microbiology	3
BIT 476	Applied Bioinformatics	2	FS 506	Food Microbiology Lab	1
BIT 481	Plant Tissue Culture and Transformation	2	FW 313	Mountain Wildlife Ecology and Management	1
BIT 501	Ethical Issues in Biotechnology	1	FW 353	Wildlife Management	3
BIT 562		2	FW 403	Urban Wildlife Management	3
BIT 564	Protein Purification	2	FW 404	Wildlife Habitat Management	3
BIT 566	Animal Cell Culture Techniques	2	FW 453	Principles of Wildlife Science	4
BIT 567	PCR and DNA Fingerprinting	2	HS 215	Agricultural Genetics	3
BIT 568		2	MB 101	Introduction to Microbiology and Biochemistry Laboratory Practices	3
CHE 463	Fermentation of Recombinant Microorganisms	2	MB 405	Food Microbiology	3
CHE 563	Fermentation of Recombinant Microorganisms	2			
ENT 201	Insects and People	3			
ENT 207	Insects and Human Disease	3			
ENT 402	Forest Entomology	3			

MB 406	Food Microbiology Lab	1
MB 505	Food Microbiology	3
MB 506	Food Microbiology Lab	1
NTR 301	Introduction to Human Nutrition	3
NTR 401	Advanced Nutrition and Metabolism	3
NTR 415	Comparative Nutrition	3
NTR 419	Human Nutrition and Chronic Disease	3
NTR 454	Lactation, Milk and Nutrition	3
NTR 501	Advanced Nutrition and Metabolism	3
NTR 515	Comparative Nutrition	3
PB 103	Perspectives on Botany	1
PB 200	Plant Life	4
PB 205	Our Green World	3
PB 208	Agricultural Biotechnology: Issues and Implications	3
PB 213	Plants and Civilization	3
PB 215	Medicinal Plants	3
PB 219	Plants in Folklore, Myth, and religion	3
PB 220	Local Flora	3
PB 250	Plant Biology	4
PB 277	Space Biology	3
PB 321	Introduction to Whole Plant Physiology	3
PB 360	Ecology	4
PB 400	Plant Diversity and Evolution	4
PB 403	Systematic Botany	4
PB 413	Plant Anatomy	2
PB 421	Plant Physiology	3
PB 445	Paleobotany	4
PB 464	Rare Plants of North Carolina	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
PB 564	Rare Plants of North Carolina	3
PB 580	Introduction to Plant Biotechnology	3
PHY 452	Comparative Reproductive Physiology and Biotechnology	3
PHY 552	Comparative Reproductive Physiology and Biotechnology	3
PO 415	Comparative Nutrition	3
PO 466	Animal Cell Culture Techniques	2
PO 515	Comparative Nutrition	3
PO 566	Animal Cell Culture Techniques	2
PP 150	Introduction to Plant Molecular Biology	3
PP 222	Kingdom of Fungi	3
<b>Group A - Biological Sciences</b>		
AEC 419	Freshwater Ecology	4
AEC 419	Freshwater Ecology	4
AEC 420	Introduction to Fisheries Science	3
AEC 423	Introduction to Fisheries Sciences Laboratory	1
AEC 441	Biology of Fishes	3
AEC 442	Biology of Fishes Laboratory	1
AEC 460	Field Ecology and Methods	4
AEC 519	Freshwater Ecology	4
ANS 215	Agricultural Genetics	3
ANS 415	Comparative Nutrition	3

ANS 515	Comparative Nutrition	3	BIT 210	Phage Hunters	3
BEC 463	Fermentation of Recombinant Microorganisms	2	BIT 211	Phage Genomics	2
BEC 563	Fermentation of Recombinant Microorganisms	2	BIT 463	Fermentation of Recombinant Microorganisms	2
BIO 140	Survey of Animal Diversity	3	BIT 563	Fermentation of Recombinant Microorganisms	2
BIO 141	Animal Diversity Laboratory	1	BME 301	Human Physiology : Electrical Analysis	3
BIO 227	Understanding Structural Diversity through Biological Illustration	3	BME 302	Human Physiology: Mechanical Analysis	3
BIO 315	General Parasitology	3	CHE 463	Fermentation of Recombinant Microorganisms	2
BIO 330	Evolutionary Biology	3	CHE 563	Fermentation of Recombinant Microorganisms	2
BIO 361	Developmental Biology	3	CS 211	Plant Genetics	3
BIO 370	Developmental Anatomy of the Vertebrates	3	ENT 425	General Entomology	3
BIO 375	Developmental Anatomy Laboratory	2	FS 301	Introduction to Human Nutrition	3
BIO 405	Functional Histology	3	FS 405	Food Microbiology	3
BIO 414	Cell Biology	3	FS 406	Food Microbiology Lab	1
BIO 424	Endocrinology	3	FS 505	Food Microbiology	3
BIO 482	Capstone Course in Molecular, Cellular, and Developmental Biology	3	FS 506	Food Microbiology Lab	1
BIO 483	Capstone Course in Integrative Physiology and Neurobiology	3	FW 353	Wildlife Management	3
BIO 484	Capstone Course in Human Biology	3	GN 301	Genetics in Human Affairs	3
BIO 485	Capstone Course in Ecology, Evolution, and Conservation Biology	3	GN 311	Principles of Genetics	4
BIO 488	Neurobiology	3	GN 312	Elementary Genetics Laboratory	1
BIO 588	Neurobiology	3	GN 421	Molecular Genetics	3
BIT 210	Phage Hunters	3	GN 423	Population, Quantitative and Evolutionary Genetics	3
BIT 211	Phage Genomics	2	GN 425	Advanced Genetics Laboratory	2
BIT 463	Fermentation of Recombinant Microorganisms	2	GN 434	Genes and Development	3
			GN 441	Human and Biomedical Genetics	3
			GN 451	Genome Science	3
			GN 490	Genetics Colloquium	1

GN 521	Molecular Genetics	3	MB 520	Fundamentals of Microbial Cell Biotransformations	2
GN 541	Human and Biomedical Genetics	3	MEA 200	Introduction to Oceanography	3
HS 215	Agricultural Genetics	3	MEA 210	Oceanography Lab	1
HS 451	Plant Nutrition	3	MEA 220	Marine Biology	3
HS 551	Plant Nutrition	3	MEA 250	Introduction to Coastal Environments	3
MB 180	Introduction to Microbial Bioprocessing	3	MEA 251	Introduction to Coastal Environments Laboratory	1
MB 200	The Fourth Horseman: Plagues that Changed the World	3	MEA 369	Life on Earth: Principles of Paleontology	3
MB 210	Phage Hunters	3	NTR 301	Introduction to Human Nutrition	3
MB 211	Phage Genomics	2	NTR 415	Comparative Nutrition	3
MB 351	General Microbiology	3	NTR 419	Human Nutrition and Chronic Disease	3
MB 352	General Microbiology Laboratory	1	NTR 420		3
MB 354	Inquiry-Guided Microbiology Lab	1	NTR 421		3
MB 405	Food Microbiology	3	NTR 490	Senior Capstone Experience in Nutrition	4
MB 406	Food Microbiology Lab	1	NTR 515	Comparative Nutrition	3
MB 411	Medical Microbiology	3	NTR 521		3
MB 412	Medical Microbiology Laboratory	1	PO 404	Avian Anatomy and Physiology	4
MB 414	Microbial Metabolic Regulation	3	PO 404	Avian Anatomy and Physiology	4
MB 420	Fundamentals of Microbial Cell Biotransformations	2	PO 415	Comparative Nutrition	3
MB 441	Immunology	3	PO 504	Avian Anatomy and Physiology	4
MB 451	Microbial Diversity	3	PO 515	Comparative Nutrition	3
MB 452	Microbial Diversity Lab	2	SSC 200	Soil Science	3
MB 455	Microbial Biotechnology	3	SSC 201	Soil Science Laboratory	1
MB 461	Molecular Virology	3	SSC 332	Environmental Soil Microbiology	3
MB 480	Current Issues in Microbiology	1	SSC 470	Wetland Soils	3
MB 505	Food Microbiology	3	SSC 570	Wetland Soils	3
MB 506	Food Microbiology Lab	1	ZO 233	Human-Animal Interactions	3
			ZO 250	Animal Anatomy and Physiology	4
			ZO 317	Primate Ecology and Evolution	3

ZO 333	Captive Animal Biology	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

**Group A - Biological Sciences**

ANS 225	Principles of Animal Nutrition	3
BIT 100	Current Topics in Biotechnology	4
BIT 465	Real-time PCR Techniques	2
BIT 471	RNA Interference and Model Organisms	2
BIT 473	Protein Interactions	2
BIT 474	Plant Genetic Engineering	2
BIT 565	Real-time PCR Techniques	2
BIT 571	RNA Interference and Model Organisms	2
BIT 573	Protein Interactions	2
BIT 574	Plant Genetic Engineering	2
ENT 305	Introduction to Forensic Entomology	3

**Group A - Physical Sciences**

AEE 226	Computer Applications and Information Technology in Agricultural & Extension Ed	3
BAE 200	Computer Methods in Biological Engineering	2
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3

BUS 340	Information Systems Management	3
BUS 350	Economics and Business Statistics	3
CE 435	Engineering Geology	3
CE 479	Air Quality	3
CE 581	Fluid Mechanics in Natural Environments	3
CH 230	Computational Chemistry Lab I	1
CH 232	Computational Chemistry Lab II	1
CH 315	Quantitative Analysis	3
CH 316	Quantitative Analysis Laboratory	1
CH 331	Introductory Physical Chemistry	4
CH 401	Systematic Inorganic Chemistry I	3
CH 403	Systematic Inorganic Chemistry II	3
CH 415	Analytical Chemistry II	3
CH 431	Physical Chemistry I	3
CH 433	Physical Chemistry II	3
CH 435	Introduction to Quantum Chemistry	3
CH 437	Physical Chemistry for Engineers	4
CH 441	Forensic Chemistry	3
CH 442	Advanced Synthetic Techniques	4
CH 444	Advanced Synthetic Techniques II	4
CH 452	Advanced Measurement Techniques I	4
CH 454	Advanced Measurement Techniques II	4
CH 463	Molecular Origins of Life	3



CH 563	Molecular Origins of Life	3	CSC 316	Data Structures and Algorithms	3
CSC 110	Computer Science Principles - The Beauty and Joy of Computing	3	CSC 326	Software Engineering	4
CSC 111	Introduction to Computing: Python	3	CSC 333	Automata, Grammars, and Computability	3
CSC 112	Introduction to Computing-FORTRAN	3	CSC 342	Applied Web-based Client-Server Computing	3
CSC 113	Introduction to Computing - MATLAB	3	CSC 379	Ethics in Computing	1
CSC 116	Introduction to Computing - Java	3	CSC 401	Data and Computer Communications Networks	3
CSC 200		3	CSC 402	Networking Projects	3
CSC 216	Software Development Fundamentals	3	CSC 405	Computer Security	3
CSC 217	Software Development Fundamentals Lab	1	CSC 406	Architecture Of Parallel Computers	3
CSC 226	Discrete Mathematics for Computer Scientists	3	CSC 411	Introduction to Artificial Intelligence	3
CSC 230	C and Software Tools	3	CSC 412	Compiler Construction	3
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3	CSC 415	Software Security	3
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3	CSC 416	Introduction to Combinatorics	3
CSC 251	Web Page Development	1	CSC 417	Theory of Programming Languages	3
CSC 255	String Processing Languages	1	CSC 422	Automated Learning and Data Analysis	3
CSC 281	Foundations of Interactive Game Design	3	CSC 427	Introduction to Numerical Analysis I	3
CSC 295	Special Topics in Computer Science	1-3	CSC 428	Introduction to Numerical Analysis II	3
CSC 302	Introduction to Numerical Methods	3	CSC 431	File Organization and Processing	3
			CSC 440	Database Management Systems	3
			CSC 442	Introduction to Data Science	3
			CSC 450	Web Services	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 520	Artificial Intelligence I	3
CSC 456	Computer Architecture and Multiprocessors	3	CSC 522	Automated Learning and Data Analysis	3
CSC 461	Computer Graphics	3	CSC 530	Computational Methods for Molecular Biology	3
CSC 462	Advanced Computer Graphics Projects	3	CSC 533	Privacy in the Digital Age	3
CSC 467	Multimedia Technology	3	CSC 540	Database Management concepts and Systems	3
CSC 474	Network Security	3	CSC 541	Advanced Data Structures	3
CSC 481	Game Engine Foundations	3	CSC 546	Management Decision and Control Systems	3
CSC 482	Advanced Computer Game Projects	3	CSC 547	Cloud Computing Technology	3
CSC 484	Building Game AI	3	CSC 548	Parallel Systems	3
CSC 492	Senior Design Project	3	CSC 554	Human-Computer Interaction	3
CSC 495	Special Topics in Computer Science	1-6	CSC 555	Social Computing and Decentralized Artificial Intelligence	3
CSC 499	Independent Research in Computer Science	1-6	CSC 561	Principles of Computer Graphics	3
CSC 501	Operating Systems Principles	3	CSC 562	Introduction to Game Engine Design	3
CSC 503	Computational Applied Logic	3	CSC 563	Visual Interfaces for Mobile Devices	3
CSC 505	Design and Analysis Of Algorithms	3	CSC 565	Graph Theory	3
CSC 506	Architecture Of Parallel Computers	3	CSC 568	Enterprise Storage Architecture	3
CSC 510	Software Engineering	3	CSC 570	Computer Networks	3
CSC 512	Compiler Construction	3	CSC 573	Internet Protocols	3
CSC 513	Electronic Commerce Technology	3	CSC 574	Computer and Network Security	3
CSC 515	Software Security	3	CSC 575	Introduction to Wireless Networking	3
CSC 517	Object-Oriented Design and Development	3	CSC 576	Networking Services: QoS, Signaling, Processes	3
CSC 519	DevOps: Modern Software Engineering Practices	3	CSC 577	Switched Network Management	3

CSC 579	Introduction to Computer Performance Modeling	3	ECG 528	Options and Derivatives Pricing	3
CSC 580	Numerical Analysis I	3	ET 320	Fundamentals of Air Pollution	3
CSC 582	Computer Models of Interactive Narrative	3	FIM 528	Options and Derivatives Pricing	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		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
			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 491	Reading in Honors Mathematics	1-6
MA 402	Mathematics of Scientific Computing	3	MA 493	Special Topics in Mathematics	1-6
MA 403	Introduction to Modern Algebra	3	MA 494	Major Paper in Math	1
MA 405	Introduction to Linear Algebra	3	MA 499	Independent Research in Mathematics	1-6
MA 407	Introduction to Modern Algebra for Mathematics Majors	3	MA 501	Advanced Mathematics for Engineers and Scientists I	3
MA 408	Foundations of Euclidean Geometry	3	MA 502	Advanced Mathematics for Engineers and Scientists II	3
MA 410	Theory of Numbers	3	MA 504	Introduction to Mathematical Programming	3
MA 412	Long-Term Actuarial Models	3	MA 505	Linear Programming	3
MA 413	Short-Term Actuarial Models	3	MA 507	Survey of Real Analysis	3
MA 416	Introduction to Combinatorics	3	MA 508	Survey of Geometry	3
MA 421	Introduction to Probability	3	MA 509	Survey of Abstract Algebra	3
MA 425	Mathematical Analysis I	3	MA 510	Selected Topics In Mathematics For Secondary Teachers	1-6
MA 426	Mathematical Analysis II	3	MA 511	Advanced Calculus I	3
MA 427	Introduction to Numerical Analysis I	3	MA 512		3
MA 428	Introduction to Numerical Analysis II	3	MA 513	Introduction To Complex Variables	3
MA 430	Mathematical Models in the Physical Sciences	3	MA 515	Analysis I	3
MA 432	Mathematical Models in Life Sciences	3	MA 518	Geometry of Curves and Surfaces	3
MA 437	Applications of Algebra	3	MA 520	Linear Algebra	3
MA 440		3	MA 521	Abstract Algebra I	3
MA 444	Problem Solving Strategies for Competitions	1	MA 522	Computer Algebra	3
MA 450	Methods of Applied Mathematics I	3	MA 523	Linear Transformations and Matrix Theory	3
MA 451	Methods of Applied Mathematics II	3	MA 524	Combinatorics I	3
			MA 526	Mathematical Analysis II	3

MA 528	Options and Derivatives Pricing	3	MA 584	Numerical Solution of Partial Differential Equations--Finite Difference Methods	3
MA 531	Dynamic Systems and Multivariable Control I	3	MA 587	Numerical Solution of Partial Differential Equations--Finite Element Method	3
MA 532	Ordinary Differential Equations I	3	MA 591	Special Topics	1-6
MA 534	Introduction To Partial Differential Equations	3	MBA 528	Options and Derivatives Pricing	3
MA 537	Nonlinear Dynamics and Chaos	3	MEA 100	Earth System Science: Exploring the Connections	4
MA 540	Uncertainty Quantification for Physical and Biological Models	3	MEA 101	Geology I: Physical	3
MA 544	Computer Experiments In Mathematical Probability	3	MEA 110	Geology I Laboratory	1
MA 546	Probability and Stochastic Processes I	3	MEA 130	Introduction to Weather and Climate	3
MA 547	Stochastic Calculus for Finance	3	MEA 135	Introduction to Weather and Climate Laboratory	1
MA 548	Monte Carlo Methods for Financial Math	3	MEA 202	Geology II: Historical	3
MA 549	Financial Risk Analysis	3	MEA 211	Geology II Laboratory	1
MA 551	Introduction to Topology	3	MEA 300	Environmental Geology	4
MA 555	Introduction to Manifold Theory	3	MEA 312	Atmospheric Thermodynamics	4
MA 561	Set Theory and Foundations Of Mathematics	3	MEA 315	Mathematics Methods in Atmospheric Sciences	4
MA 565	Graph Theory	3	MEA 320	Fundamentals of Air Pollution	3
MA 573	Mathematical Modeling of Physical and Biological Processes I	3	MEA 321	Fundamentals of Air Quality and Climate Change	3
MA 574	Mathematical Modeling of Physical and Biological Processes II	3	MEA 323	Geochemistry of Natural Waters	3
MA 580	Numerical Analysis I	3	MEA 409	Watershed Forensics	3
MA 583	Introduction to Parallel Computing	3	MEA 410	Introduction to Mineralogy	4
			MEA 411	Marine Sediment Transport	3
			MEA 412	Atmospheric Physics	3

MEA 415	Climate Dynamics	3	MEA 470	Introduction to Geophysics	3
MEA 421	Atmospheric Dynamics I	3	MEA 471	Exploration and Engineering Geophysics	3
MEA 422	Atmospheric Dynamics II	3	MEA 473	Principles of Chemical Oceanography	3
MEA 425	Introduction to Atmospheric Chemistry	3	MEA 476	Worldwide River and Delta Systems: Their Evolution and Human Impacts	3
MEA 440	Igneous and Metamorphic Petrology	4	MEA 479	Air Quality	3
MEA 443	Synoptic Weather Analysis and Forecasting	4	MEA 481	Geomorphology: Earth's Dynamic Surface	3
MEA 444	Mesoscale Analysis and Forecasting	4	MEA 485	Introduction to Hydrogeology	3
MEA 449	Principles of Biological Oceanography	3	MEA 488	Meteorology for Media	3
MEA 450	Introductory Sedimentology and Stratigraphy	4	MEA 493	Special Topics in MEAS	1-6
MEA 451	Structural Geology	4	MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
MEA 454	Marine Physical-Biological Interactions	3	MEA 498	Internship in MEAS	1-6
MEA 455	Micrometeorology	3	MEA 507	Discipline-based Education Research in the Geosciences	3
MEA 458	Introduction to Tropical Meteorology	3	MEA 510	Air Pollution Meteorology	3
MEA 459	Field Investigation of Coastal Processes	5	MEA 511	Introduction to Meteorological Remote Sensing	3
MEA 460	Principles of Physical Oceanography	3	MEA 514	Advanced Physical Meteorology	3
MEA 462	Observational Methods and Data Analysis in Marine Physics	3	MEA 515	Climate Dynamics	3
MEA 463	Fluid Physics	3	MEA 517	Fundamentals of Climate Change Science	3
MEA 464	Ocean Circulation Systems	3	MEA 518	Adaptation to Climate Change	3
MEA 465	Geologic Field Camp	4	MEA 519	Barriers to Climate Change Literacy	3
MEA 466	Preparatory Course for Field Camp	1	MEA 525	Introduction to Atmospheric Chemistry	3
MEA 467	Marine Meteorology	3	MEA 540	Principles of Physical Oceanography	3
MEA 469	Ecology of coastal Resources	3			

MEA 549	Principles of Biological Oceanography	3	OR 579	Introduction to Computer Performance Modeling	3
MEA 553	Estuarine Biogeochemistry	3	PSY 240	Introduction to Behavioral Research I	3
MEA 554	Marine Physical-Biological Interactions	3	PSY 241	Introduction to Behavioral Research I Lab	1
MEA 562	Marine Sediment Transport	3	PSY 242	Introduction to Behavioral Research II	3
MEA 570	Geological Oceanography	3	PSY 243	Introduction to Behavioral Research II Lab	2
MEA 573	Principles of Chemical Oceanography	3	PY 414	Electromagnetism I	3
MEA 574	Advanced Igneous Petrology	3	PY 415	Electromagnetism II	3
MEA 577	Electron Microprobe Analysis of Geologic Material	2	PY 514	Electromagnetism I	3
MEA 579	Principles of Air Quality Engineering	3	PY 515	Electromagnetism II	3
MEA 580	Air Quality Modeling and Forecasting	4	ST 350	Economics and Business Statistics	3
MEA 581	Fluid Mechanics in Natural Environments	3	ST 412	Long-Term Actuarial Models	3
MEA 582	Geospatial Modeling	3	ST 413	Short-Term Actuarial Models	3
MEA 585	Physical Hydrogeology	3	ST 442	Introduction to Data Science	3
MEA 591	Special Topics in Marine Science	1-6	ST 546	Probability and Stochastic Processes I	3
MEA 592	Special Topics in Earth Sciences	1-6	<b>Group A - Physical Sciences</b>		
MEA 593	Special Topics in Atmospheric Science	1-6	BME 201	Computer Methods in Biomedical Engineering	3
MEA 599	Regional Geology of North America	1-6	CSC 442	Introduction to Data Science	3
OR 504	Introduction to Mathematical Programming	3	EC 351	Econometrics I	3
OR 505	Linear Programming	3	ECE 489	Solid State Solar and Thermal Energy Harvesting	3
OR 531	Dynamic Systems and Multivariable Control I	3	ECE 589	Solid State Solar and Thermal Energy Harvesting	3
OR 565	Graph Theory	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	PY 328	Stellar and Galactic Astrophysics	3
MA 412	Long-Term Actuarial Models	3	PY 341	Relativity, Gravitation and Cosmology	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 514	Electromagnetism I	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	ST 421	Introduction to Mathematical Statistics I	3
PY 529	Plasma Physics and Fusion Energy II	3	ST 422	Introduction to Mathematical Statistics II	3
PY 543	Astrophysics	3	ST 430	Introduction to Regression Analysis	3
PY 552	Condensed Matter Physics I	3	ST 431	Introduction to Experimental Design	3
PY 570	Polymer Physics	3	ST 432	Introduction to Survey Sampling	3
PY 581	Matter & Interactions for Teachers I	3	ST 433	Applied Spatial Statistics	3
PY 582	Matter & Interactions for Teachers II	3	ST 434	Applied Time Series	3
PY 589	Solid State Solar and Thermal Energy Harvesting	3	ST 435	Statistical Methods for Quality and Productivity Improvement	3
PY 590	Special Topics In Physics	1-6	ST 437	Applied Multivariate and Longitudinal Data Analysis	3
PY 599	Special Topics in Physics	1-6	ST 440	Applied Bayesian Analysis	3
SSC 200	Soil Science	3	ST 445	Introduction to Statistical Computing and Data Management	3
SSC 201	Soil Science Laboratory	1	ST 446	Intermediate SAS Programming with Applications	3
ST 311	Introduction to Statistics	3	ST 491	Statistics in Practice	3
ST 312	Introduction to Statistics II	3	ST 495	Special Topics in Statistics	1-6
ST 370	Probability and Statistics for Engineers	3	ST 497	Professional Experience in Statistics	1-3
ST 371	Introduction to Probability and Distribution Theory	3	ST 498	Independent Study In Statistics	1-6
ST 372	Introduction to Statistical Inference and Regression	3	ST 501	Fundamentals of Statistical Inference I	3
ST 380		3	ST 502	Fundamentals of Statistical Inference II	3
ST 401	Experiences in Data Analysis	4	ST 503	Fundamentals of Linear Models and Regression	3
ST 404	Epidemiology and Statistics in Global Public Health	3			
ST 405	Applied Nonparametric Statistics	3			
ST 412	Long-Term Actuarial Models	3			
ST 413	Short-Term Actuarial Models	3			

ST 505	Applied Nonparametric Statistics	3	ST 546	Probability and Stochastic Processes I	3
ST 506		3	ST 555	Statistical Programming I	3
ST 507	Statistics For the Behavioral Sciences I	3	ST 556	Statistical Programming II	3
ST 508		3	ST 557	Using Technology to Teach and Learn with Data	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		3	<b>Group B - Economics &amp; Business</b>		
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
			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
ACC 451	Internal Auditing	3
ACC 460	Governmental and Nonprofit Accounting	3
ARE 215	Small Business Accounting	3
ARE 301	Intermediate Microeconomics	3
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
ARE 345	Global Agribusiness Management	3
ARE 404	Advanced Agribusiness Management	3
ARE 413	Applied Agribusiness Marketing	3
ARE 433	U.S. Agricultural Policy	3
ARE 490	Career Seminar in Agriculture & Resource Economics	1
BUS 225	Personal Finance	3
BUS 320	Financial Management	3
BUS 340	Information Systems Management	3
BUS 360	Marketing Methods	3

BUS 370	Operations and Supply Chain Management	3
BUS 420	Financial Management of Corporations	3
BUS 422	Investments and Portfolio Management	3
BUS 425	Advanced Personal Financial Management	3
BUS 426	International Financial Management	3
BUS 440	Database Management	3
BUS 441	Business Data Communications and Networking	3
BUS 442	Information Systems Development	3
BUS 443	Web Development for Business Applications	3
BUS 444	Systems Analysis and Design	3
BUS 461	Channel and Retail Marketing	3
BUS 462	Marketing Research	3
BUS 464	International Marketing	3
BUS 465	Traditional and Digital Brand Promotion	3
BUS 466	Personal Selling	3
BUS 467	Product and Brand Management	3
BUS 468	Marketing Strategy	3
BUS 469	Digital Marketing Practicum	3
BUS 470	Operations Modeling and Analysis	3
BUS 472	Operations Planning and Control Systems	3
BUS 473	Supply Chain Strategy	3
BUS 475	Purchasing and Supply 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
<b>Group B - Economics &amp; Business</b>			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
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**Group C - Applied Sci & Tech**

AEE 101	Introduction to Career and Technical Education	1
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AEE 208	Agricultural Biotechnology: Issues and Implications	3
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AEE 230	Introduction to Cooperative Extension	3
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AEE 303	Administration and Supervision of Student Organizations	3
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AEE 311	Communication Methods and Media	3
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AEE 322	Experiential Learning in Agriculture	3
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AEE 323	Leadership Development in Agriculture and Life Sciences	3
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AEE 325	Planning and Delivering Non-Formal Education	3
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AEE 326	Teaching Diverse Learners in AED	3
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AEE 327	Conducting Summer Programs in Agricultural Education	1
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AEE 350	Personal Leadership Development in Agriculture and Life Sciences	3
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AEE 360	Developing Team Leadership in Agriculture and Life Sciences	3
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AEE 423	Practicum in Agricultural Extension/ Industry	8
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AEE 424	Planning Agricultural Educational Programs	3
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AEE 426	Methods of Teaching Agriculture	3
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AEE 427	Student Teaching in Agriculture	8
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AEE 433	Leadership and Management of Volunteers in Agricultural and Extension Education	3
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AEE 435	Professional Presentations in Agricultural Organizations	3
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AEE 460	Organizational Leadership Development in Agriculture and Life Sciences	3
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AEE 478	Advanced Issues in Extension Education	3
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AEE 490	Seminar in Agricultural and Extension Education	1
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AEE 533	Leadership and Management of Volunteers in Agricultural and Extension Education	3
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BAET 201	Shop Processes and Management	3
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BAET 323	Water Management	3
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BAET 332	Management of Animal Environments	4
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BAET 333	Processing Agricultural Products	4
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BAET 343	Agricultural Electrification	4
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BAET 411	Agricultural Machinery and Power Units	4
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BAET 432	Agricultural and Environmental Safety and Health	3
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BAET 443	Environmental Restoration Implementation	3
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ALS 110	Academic and Career Skills Seminar	1
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ANS 105	Introduction to Companion Animal Science	3
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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	BAE 501	Sensors and Controls	3
ANS 440	Animal Genetic Improvement	3	BAE 535	Precision Agriculture Technology	3
ANS 453	Physiology and Genetics of Growth and Development	3			
ANS 454	Lactation, Milk and Nutrition	3			
ANS 525	Feed Manufacturing Technology	3			
ANS 540	Animal Genetic Improvement	3			

BAE 572	Irrigation and Drainage	3
BAE 573	Introduction to Hydrologic and Water Quality Modeling	3
BEC 330	Principles and Applications of Bioseparations	2
BEC 436	Introduction to Downstream Process Development	2
BEC 440		3
BEC 536	Introduction to Downstream Process Development	2
BEC 540		3
BME 540	Nanobiotechnology Processing, Characterization, and Applications	3
BME 203		3
BME 207	Biomedical Electronics	4
BME 342		3
BME 365	Linear Systems in Biomedical Engineering	3
BME 385	Bioinstrumentation	3
BME 412	Biomedical Signal Processing	3
BME 425	Bioelectricity	3
BME 525	Bioelectricity	3
CS 470	Advanced Turfgrass Pest Management	2
ECI 424	Student Teaching in Modern Foreign Languages	12
ENT 470	Advanced Turfgrass Pest Management	2
FM 425	Feed Manufacturing Technology	3
FM 525	Feed Manufacturing Technology	3
FS 322	Muscle Foods and Eggs	3
FS 324	Milk and Dairy Products	3

FS 435	Food Safety Management Systems	3
FS 535	Food Safety Management Systems	3
MSE 203		3
NTR 425	Feed Manufacturing Technology	3
NTR 454	Lactation, Milk and Nutrition	3
NTR 525	Feed Manufacturing Technology	3
PB 208	Agricultural Biotechnology: Issues and Implications	3
PO 322	Muscle Foods and Eggs	3
PO 425	Feed Manufacturing Technology	3
PO 525	Feed Manufacturing Technology	3
PP 470	Advanced Turfgrass Pest Management	2
SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 473	Introduction to Hydrologic and Water Quality Modeling	3
SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 573	Introduction to Hydrologic and Water Quality Modeling	3
USC 291	Service Learning Program Leader Development I	1
USC 292	Service Learning Program Leader Development II	2
<b>Group C - Applied Sci &amp; Tech</b>		
AEC 420	Introduction to Fisheries Science	3

AEE 206	Introduction to Teaching Agriculture	3	BBS 301	Process Validation Science	3
AEE 303	Administration and Supervision of Student Organizations	3	BBS 426	Upstream Biomanufacturing Laboratory	2
AEE 322	Experiential Learning in Agriculture	3	BBS 526	Upstream Biomanufacturing Laboratory	2
AEE 327	Conducting Summer Programs in Agricultural Education	1	BCH 220	Role of Biotechnology in Society	3
AEE 424	Planning Agricultural Educational Programs	3	BEC 426	Upstream Biomanufacturing Laboratory	2
AEE 426	Methods of Teaching Agriculture	3	BEC 483	Tissue Engineering Technologies	2
AEE 427	Student Teaching in Agriculture	8	BEC 526	Upstream Biomanufacturing Laboratory	2
ANS 322	Muscle Foods and Eggs	3	BEC 583	Tissue Engineering Technologies	2
ANS 324	Milk and Dairy Products	3	BME 375	Biomedical Microcontroller Applications	3
ANS 330	Laboratory Animal Science	3	BME 444	Orthopaedic Biomechanics	3
ANS 411	Management of Growing and Performance Horses	3	BME 451	BME Senior Design: Product Development	3
ANS 425	Feed Manufacturing Technology	3	BME 452	BME Senior Design: Product Implementation and Strategy	3
ANS 525	Feed Manufacturing Technology	3	BME 466	Polymeric Biomaterials Engineering	3
BAE 325	Introductory Geomatics	3	BME 467	Mechanics of Tissues & Implants Requirements	3
BAE 425	Industrial Microbiology and Bioprocessing	3	BME 483	Tissue Engineering Technologies	2
BAE 435	Precision Agriculture Technology	3	BME 484	Fundamentals of Tissue Engineering	3
BAE 525	Industrial Microbiology and Bioprocessing	3	BME 544	Orthopaedic Biomechanics	3
BAE 535	Precision Agriculture Technology	3	BME 566	Polymeric Biomaterials Engineering	3
BBS 201	Introduction to Biopharmaceutica Science	3	BME 583	Tissue Engineering Technologies	2



BME 584	Fundamentals of Tissue Engineering	3
CS 200	Introduction to Turfgrass Management	4
CS 210	Lawns and Sports Turf	3
CS 213	Crop Science	3
CS 216	Southern Row Crop Production - Cotton, Peanuts, and Tobacco	3
CS 218	Southern Row Crop Production - Corn, Small Grains and Soybeans	3
CS 230	Introduction to Agroecology	3
CS 312		3
CS 400	Turf Cultural Systems	3
CS 411	Crop Ecology	3
CS 413	Plant Breeding	2
CS 414	Weed Science	4
CS 415	Integrated Pest Management	3
CS 424	Seed Physiology	3
CS 430	Advanced Agroecology	4
CS 465	Turf Management Systems and Environmental Quality	3
CS 524	Seed Physiology	3
CS 565	Turf Management Systems and Environmental Quality	3
CSSC 490	Senior Seminar in Crop Science and Soil Science	1
ECI 424	Student Teaching in Modern Foreign Languages	12
ENT 203	An Introduction to the Honey Bee and Beekeeping	3
ENT 401	Honey Bee Biology and Management	3
ES 100	Introduction to Environmental Sciences	3

ES 200	Climate Change and Sustainability	3
ES 300	Energy and Environment	3
ES 400	Analysis of Environmental Issues	3
FM 425	Feed Manufacturing Technology	3
FM 460	Feed Mill Operations and Leadership	3
FM 480	Feed Quality Assurance & Formulation	3
FM 490	Feed Science Seminar	1
FM 525	Feed Manufacturing Technology	3
FOR 318	Forest Pathology	3
FOR 420	Watershed and Wetlands Hydrology	4
FOR 472	Forest Soils	4
FOR 520	Watershed and Wetlands Hydrology	4
FS 201	Introduction to Food Science	3
FS 290	Careers in Food and Bioprocessing Sciences	1
FS 322	Muscle Foods and Eggs	3
FS 324	Milk and Dairy Products	3
FS 330	Science of Food Preparation	3
FS 352	Introduction to Microbiological Food Safety Hazards	3
FS 354	Food Sanitation	3
FS 416	Quality Control in Food and Bioprocessing	3
FS 421	Food Preservation	3
FS 426	Upstream Biomanufacturing Laboratory	2
FS 435	Food Safety Management Systems	3

FS 453	Food Laws and Regulations	3	FW 560	International Wildlife Management and Conservation	3
FS 462	Postharvest Physiology	3	FW 565	African Ecology and Conservation	4
FS 475	Problems and Design in Food and Bioprocessing Science	3	GPH 201	Fundamentals of Global Public Health	3
FS 516	Quality Control in Food and Bioprocessing	3	HS 432	Introduction to Permaculture	3
FS 521	Food Preservation	3	HS 462	Postharvest Physiology	3
FS 526	Upstream Biomanufacturing Laboratory	2	HS 532	Introduction to Permaculture	3
FS 535	Food Safety Management Systems	3	HS 562	Postharvest Physiology	3
FS 553	Food Laws and Regulations	3	IDS 303	Humans and the Environment	3
FS 562	Postharvest Physiology	3	NR 303	Humans and the Environment	3
FW 221	Conservation of Natural Resources	3	NR 350	International Sustainable Resource Use	4
FW 311	Piedmont Wildlife Ecology and Management	3	NR 406	Conservation of Biological Diversity	3
FW 312	Fisheries Techniques and Management	1	NR 420	Watershed and Wetlands Hydrology	4
FW 313	Mountain Wildlife Ecology and Management	1	NR 460	Renewable Natural Resource Management and Policy	3
FW 314	Coastal Ecology and Management	1	NR 520	Watershed and Wetlands Hydrology	4
FW 353	Wildlife Management	3	NR 560	Renewable Natural Resource Management and Policy	3
FW 403	Urban Wildlife Management	3	NTR 425	Feed Manufacturing Technology	3
FW 411	Human Dimensions of Wildlife and Fisheries	3	NTR 525	Feed Manufacturing Technology	3
FW 453	Principles of Wildlife Science	4	PO 322	Muscle Foods and Eggs	3
FW 460	International Wildlife Management and Conservation	3	PO 424	Poultry Meat Production	3
FW 465	African Ecology and Conservation	4	PO 425	Feed Manufacturing Technology	3
FW 511	Human Dimensions of Wildlife and Fisheries	3	PO 435	Poultry Incubation & Breeding	4

PO 525	Feed Manufacturing Technology	3	BME 298	Biomedical Engineering Design and Manufacturing I	2
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
<b>Group C - Applied Sci &amp; Tech</b>			FOR 520	Watershed and Wetlands Hydrology	4
AEC 419	Freshwater Ecology	4	FS 322	Muscle Foods and Eggs	3
AEC 423	Introduction to Fisheries Sciences Laboratory	1	FS 435	Food Safety Management Systems	3
AEC 519	Freshwater Ecology	4	FS 462	Postharvest Physiology	3
ANS 322	Muscle Foods and Eggs	3	FS 535	Food Safety Management Systems	3
ANS 425	Feed Manufacturing Technology	3	FS 562	Postharvest Physiology	3
ANS 525	Feed Manufacturing Technology	3	FW 221	Conservation of Natural Resources	3
BAET 323	Water Management	3	FW 404	Wildlife Habitat Management	3
BIO 227	Understanding Structural Diversity through Biological Illustration	3	FW 460	International Wildlife Management and Conservation	3
BME 204		3	FW 560	International Wildlife Management and Conservation	3
BME 217	Biomedical Electronics Laboratory	1	HS 200	Home Horticulture	3

HS 201	The World of Horticulture: Principles and Practices	3	HS 521	Temperate-Zone Tree Fruits: Physiology and Culture	3
HS 203	Home Plant Propagation	3	HS 523		3
HS 242	Introduction to Small Scale Landscape Design	3	HS 423		3
HS 250	Home Landscape Design: Creating Garden Spaces	3	HS 562	Postharvest Physiology	3
HS 252	Landscape Graphic Communication	2	IDS 303	Humans and the Environment	3
HS 272	Landscape Design/Build	6	NR 300	Natural Resource Measurements	4
HS 290	Horticulture: Careers and Opportunities	1	NR 303	Humans and the Environment	3
HS 301	Plant Propagation	4	NR 400	Natural Resource Management	4
HS 302	Gardening with Herbaceous Perennials	3	NR 420	Watershed and Wetlands Hydrology	4
HS 303	Ornamental Plant Identification I	3	NR 421	Wetland Science and Management	3
HS 304	Ornamental Plant Identification II	3	NR 460	Renewable Natural Resource Management and Policy	3
HS 357	Landscape Grading and Drainage	4	NR 484	Environmental Impact Assessment	4
HS 400	Residential Landscaping	6	NR 500	Natural Resource Management	4
HS 411	Nursery Management	3	NR 520	Watershed and Wetlands Hydrology	4
HS 416	Planting Design	4	NR 521	Wetland Science and Management	3
HS 421	Temperate-Zone Tree Fruits: Physiology and Culture	3	NR 560	Renewable Natural Resource Management and Policy	3
HS 422	Small Fruit Production	3	NTR 420		3
HS 423		3	NTR 425	Feed Manufacturing Technology	3
HS 431	Vegetable Production	4	NTR 525	Feed Manufacturing Technology	3
HS 440	Greenhouse Management	3	PO 201	Poultry Science and Production	3
HS 442	Floriculture Crop Production	3	PO 201A	Poultry Science and Production	3
HS 462	Postharvest Physiology	3	PO 202	Poultry Science and Production Laboratory	1
HS 471	Landscape Ecosystem Management	4	PO 202A	Poultry Science and Production Laboratory	1
HS 516	Planting Design	4	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

Fall Semester		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 ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )		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 ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
GC 120	Foundations of Graphics	3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
BAE 100	Introduction to Biological and Agricultural Engineering and Technology	1

**Hours 15**

### Second Year

Fall Semester		Hours
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	Soil Science	3
SSC 201	Soil Science Laboratory	1

Free Elective		1
<b>Hours</b>		<b>14</b>
<b>Spring Semester</b>		
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )		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 ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
<b>Hours</b>		<b>14</b>
<b>Third Year</b>		
<b>Fall Semester</b>		
ST 350 Economics and Business Statistics		3
BAET 343 Agricultural Electrification		4
Agriculture and Resource Economics Elective (p. 2)		3
Restricted Electives (p. 3)		3
Communications Elective (p. 1)		3
<b>Hours</b>		<b>16</b>
<b>Spring Semester</b>		
BAET 332 Management of Animal Environments		4
BAET 323 Water Management		3
BAET 333 Processing Agricultural Products		4
BAET Electives (p. 2)		3
Agriculture and Resource Economics Elective (p. 2)		3
<b>Hours</b>		<b>17</b>
<b>Fourth Year</b>		
<b>Fall Semester</b>		
BAET 432 Agricultural and Environmental Safety and Health		3
BAET Elective (p. 2)		3
AEE 323 Leadership Development in Agriculture and Life Sciences		3
Restricted Electives (p. 3)		3
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
<b>Hours</b>		<b>15</b>
<b>Spring Semester</b>		
BAET 450 Biological and Agricultural Engineering Technology Capstone		3
BAET Elective (p. 2)		3
Restricted Electives (p. 3)		3
GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )		3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )		2
<b>Hours</b>		<b>14</b>
<b>Total Hours</b>		<b>120</b>

## 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.