Animal Science (MR)

Master of Animal Science Degree Requirements

Code	Title	Hours	Counts towards
Core Courses [1]		**5**	
ANS 601	Animal Science Seminar		
ANS 600	Professional Development for Graduate Students		
ST 511	Statistical Methods For Researchers I		
Animal Science Discipline Core		**9**	
Select one course from the following sections: Genetics, Nutrition, and Physiology			
Genetics Courses			
ANS 540	Animal Genetic Improvement		
ANS 553	Physiology and Genetics of Growth and Development		
ANS 591	Special Topics in Animal Science through AG Idea (Genetics or Animal Selection Course)		
ANS 713	Quantitative Genetics and Breeding		
ANS 726	Advanced Topics In Quantitative Genetics and Breeding		
Nutrition Courses			
ANS 550	Applied Ruminant Nutrition		
ANS/BCH 571	Regulation of Metabolism		
ANS 561	Equine Nutrition		
ANS 565	Advanced Canine and Feline Nutrition		
ANS 710	Advanced Swine Nutrition and Management		
Physiology Courses			
ANS 552	Comparative Reproductive Physiology and Biotechnology		
ANS 535	Stress Physiology in Animals		
ANS 539	Comparative Animal Exercise Physiology		
ANS Elective Course (p. 1)		**6**	
Elective Course (p. 2) [2]		**16**	
Total Hours		**36**	

[1] No more than three (3) credit hours of a seminar to be included in the 36 credit hour total

[2] Electives must differ from required coursework; only 6 hours can come from 400-level courses

ANS Elective Courses

Code	Title	Hours	Counts towards
ANS Elective Course		**6**	
Select two courses below			
ANS 515	Comparative Nutrition		
ANS 525	Feed Manufacturing Technology		
ANS 537	Precision Livestock Farming Systems		
ANS 539	Comparative Animal Exercise Physiology		
ANS 540	Animal Genetic Improvement		
ANS 550	Applied Ruminant Nutrition		
ANS 552	Comparative Reproductive Physiology and Biotechnology		
ANS 553	Physiology and Genetics of Growth and Development		
ANS 554	Lactation, Milk and Nutrition		
ANS 561	Equine Nutrition		
ANS 565	Advanced Canine and Feline Nutrition		
ANS/BCH 571	Regulation of Metabolism		

ANS 590	Topical Problems in Animal Science (Can be repeated)	
ANS 591	Special Topics in Animal Science through AG Idea	
ANS 603	Reproductive Physiology Seminar	
ANS 604	Animal Breeding and Genetics Seminar	
ANS 701	Protein and Amino Acid Metabolism	
ANS 713	Quantitative Genetics and Breeding	
ANS 726	Advanced Topics In Quantitative Genetics and Breeding	
ANS 790	Advanced Special Topics in Animal Science - Biology of Reproduction (Reproductive Mammalian Physiology I)	
ANS 790	Advanced Special Topics in Animal Science - Biology of Reproduction	
Total Hours		**6**

Elective Courses

Code	Title	Hours	Counts towards
Elective Courses		**16**	
Select at least 5 of the following courses			
Agriculture and Extension Education			
AEE 426	Methods of Teaching Agriculture	3	
AEE 478	Advanced Issues in Extension Education	3	
AEE 503	Youth Program Management	3	
AEE 500	Agricultural Education, Schools and Society	3	
AEE 501	Foundations Of Agricultural and Extension Education	3	
AEE 505	Trends and Issues in Agricultural Education and Human Sciences	3	
AEE 507	Comparative Agricultural and Extension Education	3	
AEE 521	Program Planning in Agricultural Extension and Human Sciences	3	
AEE 522	Occupational Experience in Agriculture	3	
AEE 523	Adult Education in Agriculture	3	
AEE 524	Coordinating the High School Agricultural Education Program	3	
AEE 526	Information Technologies in Agricultural and Extension Education	3	
AEE 529	Curriculum Development in Agricultural and Extension Education	3	
AEE 530	Priority Management in Agricultural and Extension Education	3	
AEE 533	Leadership and Management of Volunteers in Agricultural and Extension Education	3	
AEE 535	Teaching Agriculture in Secondary Schools	3	
AEE 545	Methods of Change in Agricultural and Human Sciences	3	
AEE 550	Leadership Theory	3	

AEE 560	Organizational Behavior and Administrative Leadership in Agricultural & Human Science	3
AEE 565	Community Leadership	3
AEE 577	Evaluation in Agricultural and Human Sciences	3
AEE 578	Scientific Inquiry in Agricultural and Extension Education	3
AEE 579	Research Proposal Development in Agricultural Education and Human Sciences	3
AEE 595	Special Topics in Agricultural and Extension Education	1-6
AEE 735	Effective Teaching in Agriculture and Life Sciences	3
AEE 705	International Agricultural Development	3
Animal Science		
ANS 515	Comparative Nutrition	3
ANS 525	Feed Manufacturing Technology	3
ANS 535	Stress Physiology in Animals	3
ANS 537	Precision Livestock Farming Systems	3
ANS 539	Comparative Animal Exercise Physiology	3
ANS 540	Animal Genetic Improvement	3
ANS 550	Applied Ruminant 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
ANS 561	Equine Nutrition	3
ANS 565	Advanced Canine and Feline Nutrition	3
ANS 571	Regulation of Metabolism	3
ANS 590	Topical Problems in Animal Science	1-3
ANS 591	Special Topics in Animal Science through AG Idea	1-3
ANS 601	Animal Science Seminar	1
ANS 600	Professional Development for Graduate Students	1
ANS 603	Reproductive Physiology Seminar	1
ANS 604	Animal Breeding and Genetics Seminar	1
ANS 610	Topical Problems in Animal Science	1-6
ANS 641	Practicum in Animal Science	1-3
ANS 685	Master's Supervised Teaching	1-3
ANS 690	Master's Exam	1-9
ANS 693	Master's Supervised Research	1-9
ANS 695	Master's Thesis Research	1-9
ANS 696	Summer Thesis Research	1
ANS 699	Master's Thesis Preparation	1-9
ANS 701	Protein and Amino Acid Metabolism	3
ANS 702	Reproductive Physiology of Mammals	3
ANS 710	Advanced Swine Nutrition and Management	3

ANS 790	Advanced Special Topics in Animal Science - Biology of Reproduction	4
ANS 713	Quantitative Genetics and Breeding	3
ANS 726	Advanced Topics In Quantitative Genetics and Breeding	3
Agricultural Resource Economics		
ARE 404	Advanced Agribusiness Management	3
ARE 412	Advanced Agribusiness Marketing	3
ARE 413	Applied Agribusiness Marketing	3
ARE 433	U.S. Agricultural Policy	3
Biology		
BIO 405	Functional Histology	3
BIO 424	Endocrinology	3
BIO 434	Hormones and Behavior	3
BIO 444	The Biology of Love and Sex	3
BIO 488	Neurobiology	3
Biological and Agricultural Engineering		
BAE 435	Precision Agriculture Technology	3
BAE 472	Irrigation and Drainage	3
BAE 501	Sensors and Controls	3
BAE 535	Precision Agriculture Technology	3
BAE 525	Industrial Microbiology and Bioprocessing	3
BAE 572	Irrigation and Drainage	3
BAE 573	Introduction to Hydrologic and Water Quality Modeling	3
BAE 578	Circular Approach to Manure Management	3
Business Administration		
MBA 515	Enterprise Resource Planning Systems	3
MBA 520	Financial Management of Corporations	2
MBA 570	Opportunity Evaluation and Value Creation	3
MBA 576	Technology Entrepreneurship and Commercializatior I	3
MBA 577	Technology Entrepreneurship and Commercialization II	3
MBA 580	Creating Value in Organizations	3
MBA 585	Current Topics in BioSciences Management	3
MBA 586	Legal, Regulatory and Ethical Issues in Life Science Industries	3
Business Management		
BUS 590	Special Topics In Business Management	1-6
Molecular and Structural 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 552	Experimental Biochemistry	3
BCH 553	Biochemistry of Gene Expression	3

BCH 555	Proteins and Molecular Mechanisms	3
BCH 571	Regulation of Metabolism	3
BCH 703	Macromolecular Synthesis and Regulation	3
BCH 705	Molecular Biology Of the Cell	3
BCH 751	Biophysical Chemistry	3
BCH 761	Advanced Molecular Biology Of the Cell	3
BCH 763	Biochemistry Of Hormone Action	3
BCH 768	Nucleic Acids: Structure and Function	3
Biotechnology		
BIT 410	Manipulation of Recombinant DNA	4
BIT 465	Real-time PCR Techniques	2
BIT 466	Animal Cell Culture Techniques	2
BIT 467	PCR and DNA Fingerprinting	2
BIT 501	Ethical Issues in Biotechnology	1
BIT 510	Core Technologies in Molecular and Cellular Biology	4
BIT 564	Protein Purification	2
BIT 565	Real-time PCR Techniques	2
BIT 566	Animal Cell Culture Techniques	2
Biological Sciences		
BIO 524	Comparative Endocrinology	3
BIO 578	The Physiology of Stress	3
BIO 588	Neurobiology	3
CBS 662	Professional Conduct in Biomedical Research	1
CBS 754	Epidemiology II	3
CBS 762	Principles of Pharmacology	3
CBS 770	Cell Biology	3
CBS 783	Advanced Immunology	3
CBS 787	Pharmacokinetics	3
Crop Science		
CS 411	Crop Ecology	3
CS 414	Weed Science	4
CS 415	Integrated Pest Management	3
CS 430	Advanced Agroecology	4
CS 717	Weed Management Systems	1
Economics		
EC 404	Money, Financial Markets, and the Economy	3
EC 410	Public Finance	3
EC 413	Industrial Organization	3
EC 431	Labor Economics	3
EC 449	International Finance	3
EC 451	Econometrics II	3
EC 474	Economics of Financial Institutions and Markets	3
ECG 515	Environmental and Resource Policy	3
ECG 537	Health Economics	3
ECG 540	Economic Development	3
ECG 700	Fundamentals of Microeconomics	3
ECG 703	Fundamentals of Macroeconomics	3
ECG 706	Industrial Organization	3
ECG 715	Environmental and Resource Economics	3
ECG 730	Labor Economics	3
ECG 741	Agricultural Production and Supply	3
ECG 742	Consumption, Demand and Market Interdependency	3
ECG 748	Theory Of International Trade	3

ECG 749	Monetary Aspects Of International Trade	3
Entomology		
ENT 425	General Entomology	3
ENT 503	Insect Morphology and Physiology	3
ENT 550	Fundamentals of Arthropod Management	3
ENT 582	Medical and Veterinary Entomology	3
ENT 726	Biological Control of Insects and Weeds	3
ENT 762	Insect Pest Management In Agricultural Crops	3
Food Science		
FS 402	Chemistry of Food and Bioprocessed Materials	4
FS 403	Analytical Techniques in Food & Bioprocessing Science	4
FS 405	Food Microbiology	3
FS 406	Food Microbiology Lab	1
FS 416	Quality Control in Food and Bioprocessing	3
FS 421	Food Preservation	3
FS 453	Food Laws and Regulations	3
FS 462	Postharvest Physiology	3
FS 520	Pre-Harvest Food Safety	3
FS 530	Post-Harvest Food Safety	3
FS 540	Food Safety and Public Health	3
FS 553	Food Laws and Regulations	3
FS 554	Lactation, Milk, and Nutrition	3
FS 555	Exercise Nutrition	3
FS 562	Postharvest Physiology	3
FS 567	Sensory Analysis of Foods	3
FS 580	Professional Development and Ethics in Food Safety	1
FS 725	Fermentation Microbiology	3
Fisheries and Wildlife Sciences		
FW 453	Principles of Wildlife Science	4
FW 515	Fish Physiology	3
FW 553	Principles of Wildlife Science	3
FW 560	International Wildlife Management and Conservation	3
Genetics		
GN 521	Molecular Genetics	3
GN 541	Human and Biomedical Genetics	3
GN 701	Molecular Genetics	3
GN 702	Cellular and Developmental Genetics	3
GN 703	Population and Quantitative Genetics	3
GN 713	Quantitative Genetics and Breeding	3
GN 721	Genetic Data Analysis	3
GN 735	Functional Genomics	3
GN 757	Quantitative Genetics Theory and Methods	3
GN 761	Advanced Molecular Biology Of the Cell	3
GN 768	Nucleic Acids: Structure and Function	3
Immunology		
IMM 751	Immunology	3
IMM 783	Advanced Immunology	3
Microbiology		

MB 405	Food Microbiology	3
MB 406	Food Microbiology Lab	1
MB 411	Medical Microbiology	3
MB 412	Medical Microbiology Laboratory	1
MB 414	Microbial Metabolic Regulation	3
MB 441	Immunology	3
MB 451	Microbial Diversity	3
MB 455	Microbial Biotechnology	3
MB 461	Molecular Virology	3
MB 714	Microbial Metabolic Regulation	3
MB 718	Introductory Virology	3
MB 725	Fermentation Microbiology	3
MB 751	Immunology	3
MB 758	Microbial Genetics & Genomics	3
MB 783	Advanced Immunology	3
Nutrition		
NTR 500	Principles of Human Nutrition	3
NTR 501	Advanced Nutrition and Metabolism	3
NTR 511	Public Health Perspectives in Infant Feeding	3
NTR 512	Clinical Concepts in Infant Feeding	3
NTR 515	Comparative Nutrition	3
NTR 550	Applied Ruminant Nutrition	3
NTR 554	Lactation, Milk, and Nutrition	3
NTR 555	Exercise Nutrition	3
NTR 701	Protein and Amino Acid Metabolism	3
NTR 557	Nutraceuticals and Functional Foods	3
NTR 558	Food Toxicology	3
NTR 706	Vitamin Metabolism	3
NTR 708	Energy Metabolism	3
NTR 764	Advances in Gastrointestinal Pathophysiology	3
NTR 775	Mineral Metabolism	3
Philosophy		
PHI 420	Global Justice	3
PHI 425	Introduction to Cognitive Science	3
PHI 440	The Scientific Method	3
PHI 475	Ethical Theory	3
PHI 520	Global Justice	3
PHI 540	The Scientific Method	3
PHI 575	Ethical Theory	3
PHI 816	Introduction to Research Ethics	1
Physiology		
PHY 503	General Physiology I	3
PHY 504	General Physiology II	3
PHY 505	Pathophysiology	2
PHY 524	Comparative Endocrinology	3
PHY 702	Reproductive Physiology of Mammals	3
PHY 764	Advances in Gastrointestinal Pathophysiology	3
Poultry Science		
PO 410	Production and Management of Game Birds in Confinement	3
PO 421	Commercial Egg Production	3
PO 424	Poultry Meat Production	3
PO 435	Poultry Incubation & Breeding	4
PO 524	Comparative Endocrinology	3
PO 566	Animal Cell Culture Techniques	2
PO 757	Comparative Immunology	3

PO 775	Mineral Metabolism	3
Soil Science		
SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	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 532	Soil Microbiology	4
SSC 541	Soil Fertility	3
SSC 545	Remote Sensing Applications in Soil Science and Agriculture	3
SSC 551	Soil Morphology, Genesis and Classification	3
SSC 562	Environmental Applications Of Soil Science	3
SSC 570	Wetland Soils	3
Statistics		
ST 430	Introduction to Regression Analysis	3
ST 431	Introduction to Experimental Design	3
ST 432	Introduction to Survey Sampling	3
ST 435	Statistical Methods for Quality and Productivity Improvement	3
ST 445	Introduction to Statistical Computing and Data Management	3
ST 505	Applied Nonparametric Statistics	3
ST 511	Statistical Methods For Researchers I	3
ST 512	Statistical Methods For Researchers II	3
ST 520	Statistical Principles of Clinical Trials	3
ST 546	Probability and Stochastic Processes I	3
ST 715	Theory Of Sampling Applied To Survey Design	3
ST 721	Genetic Data Analysis	3
ST 732	Longitudinal Data Analysis	3
ST 733	Spatial Statistics	3
ST 747	Probability and Stochastic Processes II	3
ST 748	Stochastic Differential Equations	3
ST 757	Quantitative Genetics Theory and Methods	3
ST 771	Biomathematics I	3
ST 772	Biomathematics II	3
Toxicology		
TOX 401	Principles of Toxicology	4
TOX 415	Ecotoxicology	4
TOX 501	Principles of Toxicology	4
TOX 701	Principles and Mechanisms of Molecular and Biochemical Toxicology, I	3
TOX 704	Chemical Risk Assessment	1
TOX 710	Molecular and Biochemical Toxicology	3
TOX 715	Environmental Toxicology	3
TOX 727	Pesticide Behavior and Fate In the Environment	2
Zoology		
ZO 544	Mammalogy	3
ZO 582	Medical and Veterinary Entomology	3

Additional Requirements

- No more than three (3) credit hours of a seminar to be included in the 36 credit hour total
- A minimum of one full academic year or its equivalent in residence as a graduate student at the university
- The non-thesis Master of Animal Science degree requires a minimum of 36 credit hours, of which a minimum of 12 credits are in Animal Science courses at the 500 or above level
- Non-thesis programs may include no more than three (3) hours of independent student study credits of special topics project (ANS 610) in the minimum 36-credit program
- Research credit is not permitted in non-thesis programs, except upon approval by an associate dean of the Graduate School in cases where the student was initially enrolled in a thesis program but later transferred to a non-thesis program
- 400-level ANS courses are not permitted in a graduate plan of work
- No more than six (6) hours of 400-level courses from outside departments may be counted toward the 36-credit hour requirement
- Non-Thesis Masters Examination (ANS 690) credits may not be used to satisfy the 36-credit hour requirement
- Non-Thesis Masters Continuous Registration (ANS 688 and ANS 689) credits may NOT be sure to satisfy the 36-credit hour requirement
- No more than three (3) credit hours of Masters supervised teaching (ANS 685) may be included in the minimum 36-credit hour program
- A graduate mentor (advisor) is required
- Mentor certification of a graduate plan of work and program completion
- Meet with the graduate mentor at last once per semester
- Complete the annual graduate student progress report
- Committee not required, oral examination not required
- The director of graduate programs (https://cals.ncsu.edu/animal-science/people/joan/) and the Graduate School (https://grad.ncsu.edu/) must approve the graduate plan of work

Accelerated Bachelor's/Master's Degree Requirements

The Accelerated Bachelors/Master's (ABM) degree program allows exceptional undergraduate students at NC State an opportunity to complete the requirements for both the Bachelor's and Master's degrees at an accelerated pace. These undergraduate students may double count up to 12 credits and obtain a non-thesis Master's degree in the same field within 12 months of completing the Bachelor's degree, or obtain a thesis-based Master's degree in the same field within 18 months of completing the Bachelor's degree.

This degree program also provides an opportunity for the Directors of Graduate Programs (DGPs) at NC State to recruit rising juniors in their major to their graduate programs. However, permission to pursue an ABM degree program does not guarantee admission to the Graduate School. Admission is contingent on meeting eligibility requirements at the time of entering the graduate program.

Faculty

Glen William Almond

Eduardo Beltranena

Joan Eisemann

Charlotte E. Farin

Vivek Fellner

William Lucas Flowers IV

Fikret Isik

Sung Woo Kim

Duane K. Larick

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Christian Maltecca

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Jeannette A. Moore

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Shannon Elizabeth Phillips

Jorge A. Piedrahita

Matt H. Poore

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Lin Xi

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Winston Murry Hagler

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Gerald B. Huntington

James R. Jones

Jean-Marie Luginbuhl

Roger Lee McCraw

William M. Morrow

Richard M. Myers

Robert M. Petters

Odis Wayne Robison

Frank D. Sargent

Jerry Wayne Spears

Steven Paul Washburn

Michael David Whitacre

Lon Weidner Whitlow

Charles Michael Williams

Todd Aaron Armstrong

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