

# VETERINARY MEDICAL SCIENCES

## Program Information

*Chair:* C. Risco

*Graduate Coordinator (Large Animals):* I. Larkin

*Graduate Coordinator (Small Animals):* D. Lewis

Complete faculty listing by department: Follow this link (<https://gradschool.ufl.edu/GimsPublic/Acalog/Faculty.aspx>).

The College of Veterinary Medicine offers graduate study leading to the Master of Science and Doctor of Philosophy degrees in veterinary medical sciences. The College also offers certification and a non-thesis concentration in forensic toxicology via web-based distance education. Minimum requirements for the Master of Science and Doctor of Philosophy degrees are described in the *Graduate Degrees* section of this catalog.

The program provides extensive training in basic and applied research for qualified students with a baccalaureate degree or a D.V.M. or equivalent degree. Applicants are expected to have a background in the biological sciences, mathematics, chemistry, and physics. Particular attention is paid to the advanced education of veterinarians, those interested solely in research, and those interested in combining their graduate study with residency training in a clinical specialty. The College offers three areas of specialization within the veterinary medical sciences program:

**Large and Small Animal Clinical Sciences:** Physiology, endocrinology, aquatic animal health, fish diseases, gastroenterology, immunology, vision sciences, perinatology, reproductive biology, pharmacokinetics, veterinary sports medicine, and wildlife and zoological medicine (I. Larkin and D. Lewis Graduate Coordinators).

**Physiological Sciences:** Comparative anatomy, physiology, pharmacology, biochemistry, neurobiology, nutrition, reproductive biology, and toxicology (R. Johnson, Graduate Coordinator).

**Infectious Diseases and Experimental Pathology:** Bacteriology, parasitology, virology, immunopathology, molecular mechanisms of disease and host defense, epidemiology, and veterinary public health (M.T. Long, Graduate Coordinator).

The College participates in the interdisciplinary specialization in toxicology, in cooperation with other departments and colleges in both the Health Science Center and the Institute of Food and Agricultural Sciences and with the Center for Environmental and Human Toxicology (see the Toxicology description under *Interdisciplinary Graduate Studies*).

The following courses in related areas are acceptable for graduate major credit in veterinary medical sciences:

Code	Title	Credits
<b>Physiological Sciences</b>		
ANS 6704	Mammalian Endocrinology	2
ANS 6751	Physiology of Reproduction	3
BCH 5413	Mammalian Molecular Biology and Genetics	3
BCH 6206	Advanced Metabolism	3
BCH 6415	Advanced Molecular and Cell Biology	3
BCH 6740	Physical Biochemistry/Structural Biology	3
BMS 6510		

GMS 6400C	Principles of Physiology	6
GMS 6735		
GMS 7706C		
GMS 7743		
<b>Infectious Disease and Experimental Pathology</b>		
BCH 5413	Mammalian Molecular Biology and Genetics	3
BCH 6415	Advanced Molecular and Cell Biology	3
BMS 603		
GMS 5304C		
GMS 6140	Principles of Immunology	4
GMS 6152		
GMS 6330		
GMS 6332		
GMS 6333		
GMS 6381		
GMS 6382	Special Topics in Immunology	1-3
GMS 6421	Cell Biology	4
STA 6208	Basic Design and Analysis of Experiments	3
STA 6166	Statistical Methods in Research I	3
STA 6176		
<b>Large and Small Animal Clinical Sciences</b>		
All of the above		

## Degrees Offered

### Degrees Offered with a Major in Veterinary Medical Sciences

- Doctor of Philosophy
  - without a concentration
  - concentration in Animal Molecular and Cellular Biology
  - concentration in Clinical and Translational Science
  - concentration in Toxicology
- Master of Science
  - without a concentration
  - concentration in Forensic Toxicology
  - concentration in Shelter Medicine
  - concentration in Veterinary Forensic Sciences

Requirements for these degrees are given in the Graduate Degrees (<http://gradcatalog.ufl.edu/graduate/degrees/>) section of this catalog.

## Courses

### Veterinary Medical Sciences PROGRAM Courses

Code	Title	Credits
GMS 6070	Sensory and Motor Systems	3
PHA 5270	Health Care and Patient Safety	3
PHA 5271	Health Care Risk Management	3
PHA 6116	In Vivo and In Vitro Stability of Drugs	3
PHA 6125	Introduction to Quantitative Pharmacology	3
PHA 6170C	Pharmaceutical Product Formulation	3
PHA 6183	Pharmaceutical Gene Delivery	3
PHA 6185	Life Cycle of a Drug	3
PHA 6227	Institutional Pharmacy Leadership I	3
PHA 6228	Institutional Pharmacy Leadership II	3
PHA 6250	Patient Responsibility in Health Care	3
PHA 6264	Pharmacoeconomics and Health Technology Assessment	3

PHA 6265	Introduction to Pharmaceutical Outcomes and Policy I	3	VME 6574	Aquatic Animal Pathology and Forensic Science	3
PHA 6266	Introduction to Pharmaceutical Outcomes and Policy II	2	VME 6575	Veterinary Forensic Medicine	3
PHA 6268	Pharmacoepidemiology and Patient Safety	3	VME 6576	Veterinary Forensic Pathology	3
PHA 6269	Pharmaceutical Products and Public Policy	3	VME 6577	Practicing Pathology	3
PHA 6274	Federal Regulations of Drugs and Pharmacy	3	VME 6578	Forensic Veterinary Osteology	3
PHA 6275	Federal Regulations of Controlled Substances	3	VME 6579	Veterinary Forensic Radiology and Imaging	3
PHA 6276	Pharmacy Benefit Design & Management	3	VME 6580	Cybercrime in Wildlife Investigations	3
PHA 6277	Ethics in Drug Development Production and Use	3	VME 6581	Working Dogs in Conservation and Forensic Science	3
PHA 6278	State Regulation of Drugs and Pharmacy	3	VME 6602	General Toxicology	3
PHA 6279	Pharmaceutical Outcomes and Policy Seminar	1	VME 6603	Advanced Toxicology	3
PHA 6286	Pharmaceutical Microeconomics	3	VME 6604	Literature Survey in Toxicology	1-2
PHA 6287	Pharmaceutical Health Economics	3	VME 6605	Toxic Substances	3
PHA 6288	Critical Review of Research Methods	3	VME 6607	Human Health Risk Assessment	4
PHA 6289	Regulating Clinical Research	3	VME 6613	Forensic Toxicology I	3
PHA 6416	Pharmaceutical Analysis I	3	VME 6614	Forensic Toxicology II	3
PHA 6417	Pharmaceutical Analysis II	3	VME 6615	Veterinary Forensic Toxicology	3
PHA 6427	Pharmacogenetics of Drug Metabolism	2	VME 6616	Veterinary Products and the Environment	3
PHA 6717	Measurement in Pharmaceutical Outcomes and Policy Research	3	VME 6617	Identifying and Preventing Environmental Risks of Veterinary Products	3
PHA 6793	Evidentiary Basis of Pharmaceutical Use	3	VME 6650	Principles of Mammalian Pharmacology	4
PHA 6796	Study Design in Pharmaceutical Outcomes & Policy Research	3	VME 6766	Laboratory Quality Assurance/Quality Control	3
PHA 6798	The Use and Abuse of Statistics in Drug Regulation	3	VME 6767	Issues in the Responsible Conduct of Research	1
PHA 6799	Medication Safety & Quality Program Evaluation	3	VME 6771	Veterinary Epidemiologic Research	3
PHA 6805	Applied Data Interpretation and Reporting of Findings in Pharmacy	3	VME 6800	Welfare and Wellness for Pets and People	1
PHA 6891	Introduction to Pharmacoepidemiology	3	VME 6810	Integrating Veterinary Medicine with Shelter Systems	3
PHA 6892	Practices and Procedures of the IRB	3	VME 6811	Shelter Animal Physical Health	3
PHA 6893	Research Ethics	3	VME 6812	Problem-Oriented Approach to Shelter Animal Behavior and Welfare	3
PHA 6894	Introduction to Graduate Studies	1	VME 6813	Behavioral Health for Shelter Dogs and Cats	3
PHA 6896	Preclinical Drug Evaluation	2	VME 6814	Teaching Clinical Skills in Animal Shelters	3
PHA 6937	Topics in Pharmaceutical Administration	2	VME 6815	Animal Shelter Population Management by the Metrics	3
VME 5244	Physiology: Organ Systems	4	VME 6816	The Role of the Animal Shelter in Protecting Community and Public Health	3
VME 6008	Care of Aquatic Megavertebrates	3	VME 6817	Humane Euthanasia Practices for Animal Shelters	3
VME 6010	Aquatic Animal Conservation Issues	3	VME 6818	High Quality High Volume Spay Neuter	3
VME 6011	Introduction to Aquatic Wildlife Health Issues	3	VME 6820	Introduction to Veterinary Disaster Response	1
VME 6017	Manatee Health & Conservation	3	VME 6905	Problems in Veterinary Medical Sciences	1-4
VME 6051	Cruelty to Animals and Interpersonal Violence	3	VME 6910	Supervised Research	1-5
VME 6052	Animal Crime Scene Processing	3	VME 6931	Seminar in Veterinary Medical Sciences	1
VME 6053	Skeletal Trauma Analysis in Animals	3	VME 6932	Seminar in Physiological Sciences	1
VME 6054	Scientific and Legal Principles of Forensic Evidence	3	VME 6933	Seminar in Infectious Diseases and Experimental Pathology	1
VME 6056	Animal Law	3	VME 6934	Topics in Veterinary Medical Sciences	1-4
VME 6140	Mucosal Immunology	1	VME 6936	Seminar in Pathophysiology	1
VME 6430C	Contemporary Issues in Small Animal Surgery	3	VME 6938	Topics in Aquatic Animal Health	1
VME 6464	Molecular Pathogenesis	3	VME 6939	Topics in International Shelter Medicine	3
VME 6505	Autoimmunity	1	VME 6940	Supervised Teaching	1-5
VME 6570	Wildlife Conservation and Forensic Science	3	VME 6950	Capstone Project Presentation	1-3
VME 6571	Forensic Applied Animal Behavior	3	VME 6951	Communicating Research About Shelter Medicine	1
VME 6572	Forensic Aspects of Agricultural Animal Welfare	3	VME 6971	Research for Master's Thesis	1-15
VME 6573	Applications of DNA for Companion Animal and Wildlife Cases	3	VME 7979	Advanced Research	1-12
			VME 7980	Research for Doctoral Dissertation	1-15
			WIS 5562	Conservation Medicine	3
			WIS 6557	International Wildlife Conservation Law, Policy and Ethics	3

WIS 6559	Forensic Science for Conservation Biology	3
WIS 6561	Wildlife Crime Scene Processing	3

## VETERINARY MEDICAL SCIENCES

### Departmental COURSES

Code	Title	Credits
VME 5244	Physiology: Organ Systems	4
VME 6008	Care of Aquatic Megavertebrates	3
VME 6010	Aquatic Animal Conservation Issues	3
VME 6011	Introduction to Aquatic Wildlife Health Issues	3
VME 6017	Manatee Health & Conservation	3
VME 6051	Cruelty to Animals and Interpersonal Violence	3
VME 6052	Animal Crime Scene Processing	3
VME 6053	Skeletal Trauma Analysis in Animals	3
VME 6054	Scientific and Legal Principles of Forensic Evidence	3
VME 6056	Animal Law	3
VME 6070	Systematic Review and Meta-Analysis for Biomedical Research	2
VME 6140	Mucosal Immunology	1
VME 6195	Wildlife Virology: Emerging Wildlife Viruses of Veterinary and Zoonotic Importance	3
VME 6430C	Contemporary Issues in Small Animal Surgery	3
VME 6464	Molecular Pathogenesis	3
VME 6505	Autoimmunity	1
VME 6570	Wildlife Conservation and Forensic Science	3
VME 6571	Forensic Applied Animal Behavior	3
VME 6572	Forensic Aspects of Agricultural Animal Welfare	3
VME 6573	Applications of DNA for Companion Animal and Wildlife Cases	3
VME 6574	Aquatic Animal Pathology and Forensic Science	3
VME 6575	Veterinary Forensic Medicine	3
VME 6576	Veterinary Forensic Pathology	3
VME 6577	Practicing Pathology	3
VME 6578	Forensic Veterinary Osteology	3
VME 6579	Veterinary Forensic Radiology and Imaging	3
VME 6580	Cybercrime in Wildlife Investigations	3
VME 6581	Working Dogs in Conservation and Forensic Science	3
VME 6582	Introduction to Forensic Medicine 1	4
VME 6602	General Toxicology	3
VME 6603	Advanced Toxicology	3
VME 6604	Literature Survey in Toxicology	1-2
VME 6605	Toxic Substances	3
VME 6607	Human Health Risk Assessment	4
VME 6613	Forensic Toxicology I	3
VME 6614	Forensic Toxicology II	3
VME 6615	Veterinary Forensic Toxicology	3
VME 6616	Veterinary Products and the Environment	3
VME 6617	Identifying and Preventing Environmental Risks of Veterinary Products	3
VME 6620	The Practice of Regulatory Toxicology	3
VME 6650	Principles of Mammalian Pharmacology	4
VME 6651	Seminars in Veterinary Anesthesia and Analgesia	2
VME 6710C	Advanced Small Animal Airway and Thoracic Surgery	1
VME 6766	Laboratory Quality Assurance/Quality Control	3

VME 6767	Issues in the Responsible Conduct of Research	1
VME 6771	Veterinary Epidemiologic Research	3
VME 6800	Welfare and Wellness for Pets and People	1
VME 6810	Integrating Veterinary Medicine with Shelter Systems	3
VME 6811	Shelter Animal Physical Health	3
VME 6812	Problem-Oriented Approach to Shelter Animal Behavior and Welfare	3
VME 6813	Behavioral Health for Shelter Dogs and Cats	3
VME 6814	Teaching Clinical Skills in Animal Shelters	3
VME 6815	Animal Shelter Population Management by the Metrics	3
VME 6816	The Role of the Animal Shelter in Protecting Community and Public Health	3
VME 6817	Humane Euthanasia Practices for Animal Shelters	3
VME 6818	High Quality High Volume Spay Neuter	3
VME 6819	Principles of Leadership in Animal Shelters	3
VME 6820	Introduction to Veterinary Disaster Response	1
VME 6905	Problems in Veterinary Medical Sciences	1-4
VME 6910	Supervised Research	1-5
VME 6931	Seminar in Veterinary Medical Sciences	1
VME 6932	Seminar in Physiological Sciences	1
VME 6933	Seminar in Infectious Diseases and Experimental Pathology	1
VME 6934	Topics in Veterinary Medical Sciences	1-4
VME 6936	Seminar in Pathophysiology	1
VME 6937L	VMS Graduate Seminar Series	1
VME 6938	Topics in Aquatic Animal Health	1
VME 6939	Topics in International Shelter Medicine	3
VME 6940	Supervised Teaching	1-5
VME 6950	Capstone Project Presentation	1-3
VME 6951	Communicating Research About Shelter Medicine	1
VME 6971	Research for Master's Thesis	1-15
VME 7979	Advanced Research	1-12
VME 7980	Research for Doctoral Dissertation	1-15

## Pharmacodynamics Courses

Code	Title	Credits
PHA 6472	Organic Synthesis of Drug Molecules	3
PHA 6476	Advanced Combinatorial Chemistry in Drug Discovery	3
PHA 6508	Systems Physiology and Pathophysiology I	5
PHA 6509	Systems Physiology and Pathophysiology II	5
PHA 6512L	Experiential Research Training in Pharmacodynamics	1-4
PHA 6521C	Research Techniques in Pharmacodynamics	1
PHA 7939	Journal Club in Pharmaceutical Sciences	1

## Pharmacology Courses

Code	Title	Credits
GMS 6563	Molecular Pharmacology	1-3
GMS 6590	Seminar in Pharmacology	1
GMS 6592	Ion Channels Journal Club: Pharmacology, Biophysics, and Neuroscience of Excitable Membranes	1

GMS 6847	Translational Research and Therapeutics: Bench, Bedside, Community, & Policy	3
GMS 7593	Topics in Pharmacology and Toxicology	1-3

Students write effectively in a manner appropriate to veterinary medical sciences

SLO 5 Professional Behavior

Students exhibit ethical and professional behavior during their studies and research

SLO 6 Professional Behavior

Students exercise the etiquette of constructive criticism and respond appropriately to criticism in a professional manner

## College of Pharmacy Courses

Code	Title	Credits
PHA 6356	Structure Determination of Complex Natural Products	3
PHA 6418	Model-Informed Drug Development	3
PHA 6471	Synthetic Medicinal Chemistry	3

## College of Veterinary Medicine Courses

Code	Title	Credits
VME 6934	Topics in Veterinary Medical Sciences	1-4
VME 6936	Seminar in Pathophysiology	1

### Student Learning Outcomes

## Veterinary medical sciences (phd)

SLO 1 Knowledge

Students identify, describe, explain and apply the literature, research, and practices relevant to their area of specialization.

SLO 2 Skills

Students analyze and critically evaluate new information and ideas contained in books and journal articles, as well as information and ideas presented at scientific meetings, seminars and/or informal discussions with other scientists.

SLO 3 Skills

Students apply speaking skills needed to communicate orally in formal and informal settings.

SLO 4 Skills

Students write effectively in a manner appropriate to veterinary medical sciences.

SLO 5 Professional Behavior

Students exhibit ethical and professional behavior throughout their studies and research.

## Veterinary Medical Sciences (MS)

SLO 1 Knowledge

1. For students in the programs that require a Master's thesis, successful completion of the thesis and thesis defense.

2. For students in the non-thesis programs, successful completion of a) the capstone project (Shelter Medicine)

b). the final comprehensive examination (Veterinary Forensic Science and Forensic Toxicology)

SLO 2 Skills

Students analyze and critically evaluate new information and ideas contained in books and journal articles, as well as information and ideas presented at scientific meetings, seminars and/or informal discussions with other scientists

SLO 3 Skills

Students apply speaking skills needed to communicate orally in formal and informal settings

SLO 4 Skills