

# Course Bulletin

<b>001188</b>	<b>Pathology Mentor</b>
Subject: VET	Catalog Nbr: 1188

<b>133789</b>	<b>Animals and Society I</b>
Subject: APP	Catalog Nbr: 501
2018 FALL	Primary
Emily McCobb	emily.mccobb@tufts.edu
<p>Animals in Society uses lectures, discussions and assignments to survey contemporary issues regarding animals and how those issues play out in public policy and community practices toward animals. This is done through a series of modules that examine the historical, social, ethical, political, legal, legislative and economic aspects of society's relationship to recognized categories of animals. The first module of Animals &amp; Society I comprises an introduction to ethics, law, science, social marketing, and policy-making; this year, the second module focuses on wildlife and wildlife policy.</p>	

<b>133807</b>	<b>Animals and Society II</b>
Subject: APP	Catalog Nbr: 502
2018 SPRG	Primary
Allen Rutberg	allen.rutberg@tufts.edu
2018 SPRG	Primary
Emily McCobb	emily.mccobb@tufts.edu
2018 SPRG	Primary
David Lee-Parritz	david.lee-parritz@tufts.edu
<p>Animals in Society II is centered around modules on farm animals, companion animals and the use of animals in research. Additional context is provided in the form of class sessions on humane education and the role of animals in literature and art.</p>	

<b>133997</b>	<b>Public Policy Analysis</b>
Subject: APP	Catalog Nbr: 509
2018 SPRG	Primary
Allen Rutberg	allen.rutberg@tufts.edu
<p>This course focuses on the theories, analytical approaches and techniques of public policy analysis and provides students with an opportunity to critically examine theoretical frameworks in the context of animal policy. The course will explore policy process, elements of policy design, and the relationship between social movements and political institutions. Through in-depth research in animal policy areas of interest to them, students will gain skills in policy analysis and familiarity with research resources, including laws, regulations, legislation, lobbying reports, and campaign finance records. For the course, students will write a policy analysis case study and policy memos among other assignments.</p>	

<b>134234</b>	<b>Elective</b>
Subject:	Catalog Nbr:

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VET	521
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**134248****Elective**

Subject:	Catalog Nbr:
VET	522

**134328****Intro to Lab Anml Med**

Subject:	Catalog Nbr:
LAM	551

This course is an introduction to the use of animals in biomedical research and the role of the laboratory animal veterinarian. In the first half of the course, presentations from experts in the field cover regulatory control of research animal use, the role of the Institutional Animal Care and Use Committee (IACUC), animal models in biomedical research, and ethical use of animals. A laboratory animal anatomy module includes three dissection labs devoted to anatomy of rodents, lagomorphs, hamsters, ferrets, and gerbils. The second half of the course is focused on care of research animals and design of research animal facilities. The class tours a barrier rodent housing facility, a rodent facility using robotic technology, and a primate facility.

Students are expected to attend all classes, labs, and tours. They are required to write one analysis paper on research animal ethical cases and to work in groups to create a design for a multi-species research animal facility. The class holds a mock Animal Care and Use Committee meeting. Two written assignments are required. Same basic PhD course as VET 657.

**134376****Surgery & Anesthesiology In Research Facilities**

Subject:	Catalog Nbr:
LAM	556

2018 FALL

Primary

David Lee-Parritz

david.lee-parritz@tufts.edu

This course is designed to provide the students with additional training in anesthesia and surgery methods relevant to the laboratory animal setting. The first portion of the course focuses on principles of anesthesia in laboratory animals with special emphasis on rodents and non-traditional species that are not typically covered in the veterinary curriculum. Pain assessment; analgesic management; determination of humane endpoints and methods of euthanasia are also covered. A rodent anesthesia laboratory is conducted allowing students to gain experience with the following: injectable and inhalant anesthetic agents, various methods of inhalant drug delivery (chamber, mask, and manifold systems), intubation techniques and monitoring techniques. The second half of the class focuses on the principles of aseptic surgery in research facilities including sterilization methods, surgical pack preparation and issues specific to rodents, USDA covered species, amphibians and reptiles. Minimally invasive surgical techniques, microsurgical techniques, and pre and post-operative care and support are also discussed. There are also practical handling laboratories involving rodents, rabbits and fish. These laboratories provide an opportunity for the students to learn appropriate restraint and handling techniques as well as practice common procedures such as injections, oral administration of compounds,

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catheter placement and blood collection. There are laboratories designed to provide anesthesia experience for rodents and swine.

<b>134393</b>	<b>Specialized Research Environments</b>			
Subject: LAM	Catalog Nbr: 557			
2018 SPRG	Primary	Angeline Warner	angie.warner@tufts.edu	
<p>This course provides advanced instruction in topics relating to specialized environments which are of particular concern to the laboratory animal veterinarian. The course is primarily composed of didactic sessions presented by specialists in the field and addresses a variety of broad topics. Biosafety in the laboratory animal facility is discussed with emphasis on zoonotic diseases, occupational health and safety programs, and biocontainment facility design and operation. Other subject matter includes: animal model development with emphasis placed on mouse genetics and nomenclature; behavioral studies including rodent and primate methodologies; statistics and experimental design; and imaging technologies such as ultrasound, magnetic resonance imaging (MRI) and computed tomography (CT). The course consists of didactic lectures, case studies, and facility tours which are designed to integrate the material discussed in lectures.</p>				

<b>134409</b>	<b>Applied Learning Experience: Animal Facility Experience</b>			
Subject: LAM	Catalog Nbr: 558			
2018 SUMR	Primary	Angeline Warner	angie.warner@tufts.edu	
2018 SUMR	Primary	David Lee-Parritz	david.lee-parritz@tufts.edu	
<p>Charles River Labs, Wyeth Laboratories, TMC, U. of Massachusetts Medical Center, Genzyme, and Massachusetts General Hospital and New England Primate Research Center agreed to accept students in their facilities during summers for either Animal Facility or Research Experiences, as well as their clinical electives. Options are available at other facilities as well.</p> <p>ALE: Animal Facility Experience</p> <p>The summer Animal Facility Experience consists of two 4-week in-depth training experiences at industry or academic laboratory animal facilities during the first or second summer after matriculation into the program. Students can apply to take the laboratory animal experience part of the program at any institution with an AAALAC- accredited laboratory animal program. New sites must be approved by the Laboratory Animal Medicine Graduate Program Committee. A student can arrange the two 4-week programs at one or two separate institutions the first summer.</p> <p>During the summer, students work closely with veterinary staff and animal care staff for hands on experience with the animal care, enrichment and veterinary programs and are required to write a paper on ethical use of animals in research or environmental enrichment programs based on their didactic training and summer experience. Students are evaluated by the veterinary staff at the training institutions.</p>				

<b>134470</b>	<b>Research: Planning and Techniques (mentor)</b>
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Subject:      Catalog Nbr:  
CBS            561

Students spend the majority of their training time working in the laboratory, conducting research studies relevant to their research project. Data is analyzed and interpreted in light of the test hypotheses. One objective of the research is to have students present their findings at scientific meetings and prepare their studies for publication

<b>134488</b>	<b>Fundamentals of Animal Research-Biostatistics</b>
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Subject:      Catalog Nbr:  
CBS            570

This is an elementary course in statistics, designed to give an overview of the basics of statistical analyses, including probability theory, distributions, and hypothesis testing. It is a core course in the graduate curriculum, and as such the prerequisites are those for entry into the graduate program. Topics to be covered include probability and sampling theory, frequency distributions, and hypothesis testing. Some hands-on exercises using statistical software are also offered, but it is anticipated that more advanced applications will require additional instruction. It is the instructor's objective to familiarize students with central concepts and to save in depth discussion of methodologies for advanced courses, however when it is practical, students are encouraged to suggest topics for discussion and review.

<b>134520</b>	<b>Fundamentals of Animal Research II: Research Ethics</b>
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Subject:      Catalog Nbr:  
CBS            571

The aim of the course is to discuss acceptable, unacceptable and controversial aspects of research ethics and responsibilities of a researcher. Students enrolled in the course participate in the discussions of topics using a case-based approach. The course topics include: (1) Experimental techniques and the treatment of data, (2) Conflict of interest, (3) Publication policies and openness in research, (4) Allocation of credits and authorship practices, (5) Error and negligence in science, (6) Misconduct in science, and (7) Responding to violations of ethical standards. The course meets weekly for 2 hours during November-December.

<b>134537</b>	<b>Journal Club/Seminars</b>
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Subject:      Catalog Nbr:  
CBS            572

The emphasis is on critical analysis, identifying the reasons that the research is significant, and understanding how the findings extend current knowledge. Students take this course both semesters of the MS program and give presentations each semester. In addition, students are required to attend department seminar series. These seminars take place throughout the year and are part of the training experience, providing an opportunity to develop communication skills and present ideas.

<b>134568</b>	<b>Lab Meetings</b>
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Subject:      Catalog Nbr:

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CBS 573

All students will attend and participate in weekly laboratory meetings scheduled by their mentor or research groups. Students are expected to present plans or results of projects to laboratory members at these meetings.

**134584**

## Readings In Special Topics

Subject: Catalog Nbr:  
CBS 574

This course focuses on important topics within the field of research study. Each student meets weekly with their mentor to discuss relevant research papers in their area of study.

**134599**

## Research

Subject: Catalog Nbr:  
CBS 575

Students spend the majority of their training time working in the laboratory, conducting research studies relevant to their research project. Data is analyzed and interpreted in light of the test hypotheses. One objective of the research is to have students present their findings at scientific meetings and prepare their studies for publication.

**134612**

## Thesis Preparation

Subject: Catalog Nbr:  
CBS 576

Students in the DVM/MS-CBS program must complete a thesis and write their thesis during June and July and defend it orally by August 15. Students in the DVM/MS-CBS program must complete a thesis. The thesis must contain a title page that includes the project title, the student's name, the names of the mentor, and members of the advisory committee, a statement that the thesis is submitted in partial fulfillment of the requirement for a Master of Science in Comparative Biomedical Sciences, and the month and year of submission. The thesis itself must consist of an abstract of the project (one page), a general introduction to the research problem within the field of study (current and pertinent references should be included in this section), and a body of the thesis that consists of specific experiments, methods, results, a general discussion that relates the experimental finding to existing literature and the state of the field, references, and acknowledgement. Submitted or published work can be included as a component of the body of the thesis.

The thesis should be submitted in final form to the thesis examination committee a minimum of 2 weeks prior to the thesis defense. The Thesis Examination Committee consists of the student's SAC plus one outside examiner (Tufts program faculty or faculty from another academic institution). The name of the outside examiner is submitted to the program director for approval at least one month prior to the scheduled thesis defense. The thesis defense should occur in July or early August in time to permit any final revisions. The Thesis Examination Committee can approve the thesis as is, approve it with revisions, or reject the thesis. It must then be approved by the Advanced Education Committee (AEC). Two copies of the final version of the

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approved thesis are submitted to the program director by August 15.

<b>134641</b>	<b>Thesis Preparation (mentor)</b>			
Subject:	Catalog Nbr:			
CBS	579			
<p>The resident trainees will have an extended period in which to complete and defend their theses. Specifically, during the first year of training, the residents will complete all required course work as required in this MS program except that the research credits and participation will be reduced to a single credit commensurate with the trainee's efforts. At the end of the first year, residents will participate in a research planning and techniques seminar (1 credit) offered by the mentor and related faculty. Research will be conducted for a total of 8 months during the first and second year of residency to fulfill the thesis research requirements, VET 560 and VET 561. The candidate is expected to devote two months during year 1 defining their research project and acquiring relevant laboratory techniques needed for the proposed research. During year 2 the candidate would conduct full-time research from January through June.</p>				

<b>134656</b>	<b>Ecology &amp; Conservation Biology</b>			
Subject:	Catalog Nbr:			
MCM	580			
2018 FALL	Primary	Alison Robbins	alison.robbins@tufts.edu	
<p>The concept that the health of the environment influences the health of humans and animals means that all practitioners of conservation medicine must understand fundamental principles of ecology and conservation biology. This course will ensure all students possess foundational knowledge, including: an understanding of ecosystems, community, population ecology, demography, population genetics, population viability and conservation of biodiversity.</p>				

<b>134669</b>	<b>Health, Disease and Environment</b>			
Subject:	Catalog Nbr:			
MCM	581			
2017 FALL	Primary	Julie Ellis	Julie.Ellis@tufts.edu	
2018 FALL	Primary	Christopher Whittier	chris.whittier@tufts.edu	
<p>In this course, students will acquire a basic understanding of disease mechanisms, host defenses against disease, the role of vectors in spreading and maintaining disease, and basic principles of disease ecology. This class will also review the diseases of major concern for conservation medicine and ecosystem health. Emphasis will be placed on the integration of animal, human, and environmental health, and the environmental, economic, and anthropogenic factors promoting the emergence or persistence of infectious diseases and other major health threats.</p>				

<b>134683</b>	<b>Research Skills I - Systematic Review and Analysis</b>			
Subject:	Catalog Nbr:			
MCM	582			

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Research Skills I will guide students through the process of conducting and writing a thorough and rigorous critical literature review of an interdisciplinary conservation medicine topic of interest to them. Students will learn how to access, organize, analyze, interpret, critique, and communicate data and findings from existing sources of published research. The course's second half will focus on using literature reviews to inform research question and hypothesis development, study designs, and data collection methods. While this course will be unable to explore the multitude of available research methodologies in-depth, it is intended to provide you with an understanding of the breadth of methods available. Since you are expected to be identifying and reading research papers relevant to your selected interdisciplinary conservation medicine problem each week, required course readings will be limited. You may be called upon in class to provide informal updates on your literature search and review in discussions and group activities. Assignments are intended to aid you in beginning to conceptualize and research your case study topic. Each week will include up to six hours of contact time involving didactic presentations, critiques of published research, in-class group activities, individual assignments, and presentations.

<b>134695</b>	<b>Field and Laboratory Techniques</b>			
Subject:	Catalog Nbr:			
MCM	583			
2018 FALL	Primary	Alison Robbins		alison.robbsins@tufts.edu
<p>Conservation medicine requires empirical health assessments of individuals and populations. Through this course students will become familiar with commonly used field and laboratory methods. This hands-on course covers methods for estimating the size of populations, sample collection and handling, field capture, restraint and anesthesia (including animal welfare considerations). In addition, student will participate in practical session on laboratory diagnostics and commonly used laboratory research techniques (including PCR, ELISA, microarrays and applications of molecular genetics).</p>				

<b>134710</b>	<b>Journal Club</b>			
Subject:	Catalog Nbr:			
MCM	584			
2019 SPRG	Primary	Alison Robbins		alison.robbsins@tufts.edu
2019 SPRG	Primary	Christopher Whittier		chris.whittier@tufts.edu
<p>Journal club will familiarize students with topical scientific papers relevant to conservation medicine, help students become conversant in the language of different contributing disciplines and enhance the skills of analytical reading and critique. Papers will be coordinated with course material. Students take Journal Club in both the Fall and Spring semesters.</p>				

<b>134723</b>	<b>Case Study</b>			
Subject:	Catalog Nbr:			
MCM	585			
2019 SPRG	Primary	Alison Robbins		alison.robbsins@tufts.edu
2019 SPRG	Primary	Christopher Whittier		chris.whittier@tufts.edu
<p>The case study will provide a capstone exercise that builds on a student's knowledge and skills to produce a comprehensive conservation medicine analysis of a current health problem and recommend strategies to</p>				

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address identified challenges. Each student will identify an issue and will be charged with leading a collaborative team involving other students and appropriate faculty. Cases will undergo a peer-review evaluation through our network of conservation medicine partners. At the end of the year, case studies will be compiled and submitted for publication. Students register for the Case Study during the fall and spring semesters, and are expected to complete their Case Study during the summer

<b>134736</b>	<b>Human Dimensions of Conservation Medicine</b>			
Subject: MCM	Catalog Nbr: 586			
2019 SPRG	Primary	Janetrix Amuguni	Janetrix.Amuguni@tufts.edu	
2019 SPRG	Primary	Felicia Nutter	Felicia.Nutter@tufts.edu	
Human political, economic, and cultural considerations help create the conditions that govern animal, human, and environmental health, and establish the context in which conservation medicine solutions are implemented. This course will examine the roles of economics, local, national and international governmental regulations, treaties and policies. It will also explore the influences that communities and local culture have on agriculture, trade, conservation, environment, land use, and public health.				

<b>134750</b>	<b>Engineered Solutions</b>			
Subject: MCM	Catalog Nbr: 587			
2019 SPRG	Primary	David Gute	david.gute@tufts.edu	
2019 SPRG	Primary	Stephen Levine	stephen.levine@tufts.edu	
Innovation and applied technology will play an increasingly significant role in developing sustainable solutions for many conservation medicine issues. Conservation professionals need to understand the options and potential of engineered solutions in both natural and built environments. In this course students will work within the context of systems engineering as a basis for problem solving. Applied topics will include: ecological engineering, hydrology, remote sensing (satellite, biological and chemical), engineered natural systems and environmental impact assessment methodologies.				

<b>134762</b>	<b>Research Skills II - Surveillance Methods and Techniques</b>			
Subject: MCM	Catalog Nbr: 588			
2018 SPRG	Primary	Julie Ellis	Julie.Ellis@tufts.edu	
2018 SPRG	Primary	Christopher Whittier	chris.whittier@tufts.edu	
This course will familiarize students with methods for collecting data on health events, disease incidence and prevalence, including participatory methodologies. Students will be introduced to modeling of disease dynamics and processes and disease mapping using GIS technologies. Students will also acquire familiarity with the use of telemetry for monitoring wildlife populations, and the analysis of wildlife data using GPS and GIS and emerging web-based technologies such as Google Earth.				



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<b>134777</b>	<b>Project Management And Communication</b>			
Subject:	Catalog Nbr:			
MCM	589			
2019 SPRG	Primary	Alison Robbins		alison.robbs@tufts.edu
<p>This course will cover important communication skills that will enhance collaboration and dissemination of information to stakeholders (scientific community, public and government agencies) as well as the practical skills needed to initiate, fund, and manage research projects. Style and strategies for publication in scientific and lay journals, delivery of legislative briefings, and use of other media will be explored. Project development topics will include team building, seeking funders, grant writing, project development and management, and program and policy evaluation. Sessions on collaborative writing, data visualization, team management and leadership will be included.</p>				

<b>134789</b>	<b>Journal Club/Seminar</b>			
Subject:	Catalog Nbr:			
LAM	592			
2017 FALL	Primary	Angeline Warner		angie.warner@tufts.edu
2018 FALL	Primary	David Lee-Parritz		david.lee-parritz@tufts.edu
<p>Students, along with faculty members, participate in a monthly journal club for discussion of current literature in the field. The emphasis is on critical analysis, identifying significance of the research, and understanding how the findings extend current knowledge.</p>				

<b>134829</b>	<b>Research</b>			
Subject:	Catalog Nbr:			
BMS	603			
2017 FALL	Primary	Patrick Skelly		Patrick.Skelly@tufts.edu
2018 FALL	Primary	Saul Tzipori		saul.tzipori@tufts.edu
<p>Guided research on a topic suitable for a doctoral dissertation.</p>				

<b>134842</b>	<b>Research</b>			
Subject:	Catalog Nbr:			
BMS	604			
2018 FALL	Primary	Saul Tzipori		saul.tzipori@tufts.edu
<p>Guided research on a topic suitable for a doctoral dissertation.</p>				

<b>134869</b>	<b>Research</b>			
Subject:	Catalog Nbr:			
BMS	605			
<p>Guided research on a topic suitable for a doctoral dissertation.</p>				

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<b>134897</b>	<b>Journal Club and Seminar Series</b>			
Subject:	Catalog Nbr:			
BMS	607			
2019 SPRG	Primary	Charles Shoemaker	Charles.Shoemaker@tufts.edu	
<p>Students, post-doctoral fellows, scientific staff, and faculty members participate in a weekly Journal Club and regular seminars. The emphasis in Journal Club is on critical analysis of the data and how the research extends current knowledge. Seminars include both campus Work-in-Progress presentations and research presentations given by scientists from the campus or invited from outside. Students take this course throughout their PhD program and are required to regularly attend both Journal Club and seminars. In addition students lead Journal Club twice per year and present one Work-in-Progress seminar per year beginning in the second year.</p>				

<b>134912</b>	<b>Research</b>			
Subject:	Catalog Nbr:			
BMS	608			
Guided research on a topic suitable for a doctoral Dissertation.				

<b>134940</b>	<b>Research</b>			
Subject:	Catalog Nbr:			
VET	616			

<b>134982</b>	<b>Parasite Biology</b>			
Subject:	Catalog Nbr:			
BMS	652			
2018 SPRG	Primary	Patrick Skelly	Patrick.Skelly@tufts.edu	
<p>Parasites are extraordinarily pervasive. This graduate course explores globally important parasites including hookworms, tapeworms, blood flukes, and those that cause malaria, sleeping sickness, and Chagas' disease. Students examine the morphology, development, and distribution of these pathogens and consider the mechanisms they use to infect their hosts and survive within. Topics include the mechanisms of infection and immunity, intracellular survival strategies, vector biology, drug resistance, vaccines, and the economics and public health impact of parasitic disease. Each class centers on interactive discussions and an examination of the primary scientific literature. Course offered every other year.</p>				

<b>134998</b>	<b>Fundamentals of Animal Research I: Biostatistics</b>			
Subject:	Catalog Nbr:			
BMS	653			
<p>Basic statistics will be taught using an active approach, emphasizing practical applications of statistical concepts such as hypothesis testing, sampling and, statistical inference. Students will gain experience in</p>				

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analyzing data sets and presenting data. In addition, students will become familiar with using Excel for basic statistical analyses and more specialized programs for more advanced statistics. It is the instructor's objective to familiarize students with central concepts and to save in depth discussion of methodologies for advanced courses, however when it is practical, students are encouraged to suggest topics for discussion and review. Laptop computers are required.

<b>135016</b>	<b>Fundamental Of Animal Research II: Ethics</b>			
Subject:	Catalog Nbr:			
BMS	654			
2018 FALL	Primary	Robert Bridges		robert.bridges@tufts.edu
<p>The aim of the course is to discuss acceptable, unacceptable and controversial aspects of research ethics and responsibilities of a researcher. Students enrolled in the course participate in the discussions of topics using a case-based approach. The course topics include: (1) Experimental techniques and the treatment of data; (2) Conflict of interest; (3) Publication and openness; (4) Allocation of credit and authorship practices; (5) Error and negligence in science; (6) Misconduct in science; (7) Use of animals in research; and (8) Responding to violations of ethical standards. The course meets weekly for 2 hours during November-December.</p>				

<b>135033</b>	<b>Epidemiology of Zoonotic Infections</b>			
Subject:	Catalog Nbr:			
BMS	655			
<p>This course seeks to provide health professionals with the basis for evaluating risks and formulating prevention and intervention strategies for outbreaks or endemic transmission of zoonotic infections. Each session is structured with a "vertical" component comprising general principles, and a "horizontal" component comprising a case study of a specific agent that illustrates the general principles. Course offered every other year</p>				

<b>135049</b>	<b>Advanced Molecular Biology</b>			
Subject:	Catalog Nbr:			
BMS	656			
<p>This course introduces students to molecular biology of both prokaryotes and eukaryotes including (1) DNA replication, repair, and recombination; (2) Bacterial genetics; (3) Chromosome structure and function; (4) Protein biosynthesis and transportation; and (5) Phages and viruses. Course offered every other year.</p>				

<b>135081</b>	<b>Introduction to Lab Animal Medicine</b>			
Subject:	Catalog Nbr:			
BMS	657			
<p>This course is an introduction to the use of animals in biomedical research and the role of the laboratory animal veterinarian. In the first half of the course, presentations from experts in the field cover regulatory control of research animal use, the role of the Institutional Animal Care and Use Committee (IACUC), animal</p>				

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models in biomedical research, and ethical use of animals. A laboratory animal anatomy module includes three dissection labs devoted to anatomy of rodents, lagomorphs, hamsters, ferrets, and gerbils. The second half of the course is focused on care of research animals and design of research animal facilities. The class will tour a barrier rodent housing facility, a rodent facility using robotic technology, and a primate facility. Students are expected to attend all classes, labs, and tours. They will be required to write one analysis paper on research animal ethical cases and to work in groups to create a design for a multi-species research animal facility. The class holds a mock IACUC meeting. Same basic course as MS-LAM course 551

<b>135123</b>	<b>Principles of Biodefense</b>
Subject: BMS	Catalog Nbr: 659
<p>The recent increase in terrorist attacks in many parts of the world has focused attention on the possibility that pathogens and toxins may be used as weapons targeting humans or economically important animals and plants. The issues surrounding bioterrorism and its critical complement, biodefense, are complex and require an understanding of sociopolitical factors as well as those of biology. This course seeks to provide the basis for (1) evaluating the risks associated with bioterrorism and (2) developing strategies for defending against as well as responding to the illegitimate use of biological agents. Each of the sessions are structured into a didactic introductory, "horizontal" hour designed to explore general concepts, with the second hour dedicated to a "vertical" participatory discussion: specific case studies or literature review of the biology and other issues related to specific agents that illustrate important aspects of the horizontal topics. The grade for the course is determined by class participation and a term paper. Course offered every other year</p>	

<b>135181</b>	<b>Molecular &amp; Cellular Biology-Umass Bbs-821</b>
Subject: VET	Catalog Nbr: 698

<b>138644</b>	<b>Transfer Credit</b>
Subject: TRAN	Catalog Nbr: 9999

<b>138660</b>	<b>Toxicological Pathology</b>
Subject: BMS	Catalog Nbr: 609
<p>Focuses on toxicant/drug-induced pathophysiology and histopathological responses of the cardiovascular, pulmonary, gastrointestinal, renal, neurological, musculoskeletal, immune, endocrine and reproductive systems in animals. The course integrates into each organ system studied a review of standard techniques used in toxicity studies including principles of Good Laboratory Practices (GLP), the use of animal necropsy, histology/pathology, various tissue molecular biological techniques, methods in evaluating or testing lesions,</p>	

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genetics of rodent strains, and transgenic mice. Special emphasis is placed on mechanisms of action, defining histopathologic changes of significance compared to common background/incidental lesions, and the use of nomenclature, data bases and statistical analysis in overall interpretation of histopathology studies. (Course offered every other year.)

<b>138661</b>	<b>Externship</b>			
Subject:	Catalog Nbr:			
MCM	590			
2019 SPRG	Primary	Alison Robbins	alison.robbins@tufts.edu	
2019 SPRG	Primary	Christopher Whittier	chris.whittier@tufts.edu	
<p>Students will have the opportunity to immerse themselves in conservation medicine work in a wide variety of settings for four weeks during the program year. The preceptorship will provide students with insight into how conservation medicine issues are addressed and how interdisciplinary approaches can be applied in a real world setting. Students will be able to select from field experiences, clinical experiences, analytical experiences, laboratory-focused experiences, and project management or policy experiences. The preceptorship will be completed either during the winter break or summer semester, depending upon the opportunity.</p>				

<b>138669</b>	<b>Preventive Medicine in Research Animal Facilities</b>			
Subject:	Catalog Nbr:			
LAM	553			
2018 FALL	Primary	Angeline Warner	angie.warner@tufts.edu	
<p>This course is designed to complement the second year of the veterinary curriculum which is mainly concerned with the pathophysiology of disease. This course focuses on viral, bacterial and parasitic pathogens of concern in the laboratory animal and research settings. Pathogens of importance to traditional laboratory animal species are covered with special emphasis on rodent diseases. In addition, diseases of concern to nontraditional laboratory animals such as swine, small ruminants, fish, amphibians, reptiles and birds are also discussed. The course also provides instruction in the diagnosis, treatment, control and prevention of disease in the laboratory animal facility. The development and implementation of health surveillance and preventative health programs in a laboratory animal setting is discussed including the use of sentinels for routine health monitoring of colonies. This course consists of didactic lectures and tutorial sessions with assigned readings, case studies and interactive discussions.</p>				

<b>138670</b>	<b>Laboratory Animal Medicine and Pathology</b>			
Subject:	Catalog Nbr:			
LAM	555			
2018 SPRG	Primary	David Lee-Parritz	david.lee-parritz@tufts.edu	
<p>This course is designed to complement the third year of the veterinary curriculum which integrates the pathophysiological aspects of disease with a comprehensive discussion of the presenting clinical signs, diagnostic criteria, and the treatment of these entities. The lectures provided in this course are designed to provide students with a sound basis in clinical laboratory animal medicine with emphasis on diagnosis, prognosis, and management. A rodent surgery laboratory is offered at Charles River Labs in which students</p>				

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gain practical experience in rodent surgical methods by performing common procedures such as splenectomy, adrenalectomy, ovariectomy, embryo transfer, ovarian transplant and jugular vein cannulation.

<b>138673</b>	<b>Toxicological Pathology</b>
Subject: VET	Catalog Nbr: 609

<b>139123</b>	<b>Parasite Biology</b>
Subject: MCM	Catalog Nbr: 1001

<b>139212</b>	<b>Journal Club/Seminar</b>
Subject: VET	Catalog Nbr: 592
<p>Students, along with faculty members, participate in a monthly journal club for discussion of current literature in the field. The emphasis is on critical analysis, identifying significance of the research, and understanding how the findings extend current knowledge.</p>	

<b>139232</b>	<b>Animal Law</b>
Subject: APP	Catalog Nbr: 1001
2018 FALL	Primary
Allen Rutberg	allen.rutberg@tufts.edu
<p>Until recently, animals were treated as nothing more than property in courts of law. In this course, students explore how the changing status of animals is (or might be) reflected in case law, as well as the implications of specific state and federal laws (such as animal cruelty laws, the Animal Welfare Act, and the Endangered Species Act) for the legal status of animals.</p>	

<b>139235</b>	<b>Applied Learning Experience: Animal Facility</b>
Subject: VET	Catalog Nbr: 550

<b>139236</b>	<b>Laboratory Animal Medicine and Pathology</b>
Subject: LAM	Catalog Nbr: 555

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<b>139237</b>	<b>Applied Learning Experience-Research Facility</b>			
	Subject:	Catalog Nbr:		
	VET	554		

<b>139244</b>	<b>Research</b>			
	Subject:	Catalog Nbr:		
	BMS	616		
	2018 FALL	Primary	Saul Tzipori	saul.tzipori@tufts.edu
	2018 FALL	Primary	Patrick Skelly	Patrick.Skelly@tufts.edu
Guided research on a topic suitable for a doctoral Dissertation.				

<b>139245</b>	<b>Applied Learning Experience: Research Experience</b>			
	Subject:	Catalog Nbr:		
	LAM	559		
	2018 SUMR	Primary	Angeline Warner	angie.warner@tufts.edu
	2018 SUMR	Primary	David Lee-Parritz	david.lee-parritz@tufts.edu
<p>Charles River Labs, Wyeth Laboratories, TMC, U. of Massachusetts Medical Center, Genzyme, and Massachusetts General Hospital and New England Primate Research Center agreed to accept students in their facilities during summers for either Animal Facility or Research Experiences, as well as their clinical electives. Options are available at other facilities as well.</p> <p>The summer Research Experience consists of an 8-week research experience involving animals. This research experience must take place during the first or second summer of the program and be an 8-week in depth laboratory research experience, preferably an independent project, in an established research laboratory.</p> <p>Students are required to work with an established biomedical research investigator and write a research report on the summer project. They are evaluated by the principle investigator of the laboratory.</p>				

<b>139249</b>	<b>JAX-Mammalian Genetics</b>			
	Subject:	Catalog Nbr:		
	BMS	1001		
<p>In collaboration with Jackson Laboratories, TCSVM is offering a live video presentation of a series of topics on Mammalian Genetics. Faculty as well as graduate students have the opportunity to refresh/learn mammalian genetics.</p>				

<b>139261</b>	<b>UMass-Principles of Light &amp; Electron Microscopy</b>			
	Subject:	Catalog Nbr:		

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BMS	1003
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<b>139264</b>	<b>Understanding Human Psychopathology</b>
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Subject:	Catalog Nbr:
VET	514

<b>139265</b>	<b>Disruption of Cellular Architecture and Human disease</b>
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Subject:	Catalog Nbr:
CRUM	788

<b>139481</b>	<b>Shelter Visitations</b>
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Subject:	Catalog Nbr:
APP	1002

2018 FALL	Primary	Emily McCobb	emily.mccobb@tufts.edu
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This elective is designed for students with a special interest in shelter medicine. The sessions will be divided as follows:

Session 1: (2 hours) meet with Dr. McCobb to discuss semester goals and prepare list of locations to visit. The selected locations can be determined by the student's interests and by ease of travel. In addition, we will review a list of goals/questions to be answered by the student at each visit site.

Visits: students will visit 4 animal shelters in the New England area. For each shelter they will prepare a five page report summarizing the goals and questions that we discussed. Students should also write a conclusion report (of at least pages) summarizing comparisons between the different places that they visited.

Wrap up Session: (2 hours) the student will meet with Dr. McCobb again to discuss the shelter visits and what was learned.

<b>139482</b>	<b>Farm Animal Welfare</b>
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Subject:	Catalog Nbr:
APP	1003

<b>139483</b>	<b>Wildlife Rehabilitation</b>
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Subject:	Catalog Nbr:
APP	1004



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<b>139484</b>	<b>Community Cat Clinics</b>
Subject: APP	Catalog Nbr: 1005
<p>Students may receive elective credit for participating in a variety of community-service oriented activities, including animal shelter visitation, community cat clinics, support for the Tufts at Tech Community Veterinary Clinic, Tufts Paws for People, and the Tufts Pet Loss Hotline. Academic exercises matched to the service activities help illuminate the policy and practice context of the students' work.</p>	

<b>139601</b>	<b>GIS for Natural Resources and Conservation Application</b>
Subject: MCM	Catalog Nbr: 1002

<b>139857</b>	<b>Humanitarian Studies In The Field</b>
Subject: MCM	Catalog Nbr: 1003
<p>This course will offer a practical and in-depth analysis of the complex issues and skills needed to engage in humanitarian work in field settings. Through presentations offered by the faculty of the Humanitarian Studies Initiative and guest speakers who are experts in their topic areas, students will gain familiarity with the primary frameworks in the humanitarian field (human rights, livelihoods, Sphere standards, international humanitarian law) and will focus on practical issues that arise in the field, such as rapid public health assessments, field cluster sampling techniques, application of minimum standards for food security, and operational approaches to relations with the military in humanitarian settings.</p>	

<b>139893</b>	<b>Molecular and Cellular Immunology</b>
Subject: BMS	Catalog Nbr: 1004
<p>This course is offered through the University of Massachusetts Medical School.</p>	

<b>139894</b>	<b>Advanced Epidemiology and Research Methods</b>
Subject: BMS	Catalog Nbr: 1005
<p>This course is offered through the University of Massachusetts Medical School.</p>	

<b>139895</b>	<b>Cell and Molecular Genetics</b>
Subject: BMS	Catalog Nbr: 1006
<p>This course is offered through the University of Massachusetts Medical School.</p>	

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<b>139904</b>	<b>Introduction to Clinical Epidemiology</b>			
Subject:	Catalog Nbr:			
BMS	1007			
This course taken through the University of Massachusetts Medical School.				

<b>139964</b>	<b>Understanding Human Psychopathology</b>			
Subject:	Catalog Nbr:			
APP	1006			

<b>139965</b>	<b>Wildlife in Captivity</b>			
Subject:	Catalog Nbr:			
APP	1007			
2018 FALL	Primary	Allen Rutberg	allen.rutberg@tufts.edu	
<p>This lecture/discussion class examines the ethical, welfare, health, conservation, and policy issues surrounding the keeping of wildlife in captivity. Particular attention is paid to wildlife in zoos and aquariums, but wild animals in sanctuaries, backyards, research facilities, circuses, and other forms of entertainment also receive attention. The course features outside speakers, faculty- and student-run discussions, and weekend field trips to zoos and other facilities.</p>				

<b>139972</b>	<b>Introduction to Animal Welfare</b>			
Subject:	Catalog Nbr:			
APP	1008			
2018 SPRG	Primary	Alicia Karas	alicia.karas@tufts.edu	
2018 SPRG	Primary	Emily McCobb	emily.mccobb@tufts.edu	
<p>This course blends readings, lectures, practical experience, discussion, and student projects to develop student understanding of various perspectives and definitions of animal welfare, methods for scientific study and evaluation of animal welfare, the effect of policy and markets on shaping of practices, and current welfare issues in areas such as animal agriculture, sport, science, and education. Students will consider aspects of assessing welfare, including stress, physical health, mental states, and quality of life and will be introduced to methods of conducting welfare assessments.</p>				

<b>140030</b>	<b>Global Information Systems-Independent Study</b>			
Subject:	Catalog Nbr:			
MCM	1004			

<b>140065</b>	<b>JAX Medical and Experimental Mammalian Genetics</b>			
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Subject:	Catalog Nbr:
BMS	1008

<b>140096</b>	<b>Community Cat Clinics</b>
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Subject:	Catalog Nbr:
APP	1005

Students may receive elective credit for participating in a variety of community-service oriented activities, including animal shelter visitation, community cat clinics, support for the Tufts at Tech Community Veterinary Clinic, Tufts Paws for People, and the Tufts Pet Loss Hotline. Academic exercises matched to the service activities help illuminate the policy and practice context of the students' work.

<b>140216</b>	<b>International Environmental Law</b>
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Subject:	Catalog Nbr:
MCM	1005

This course addresses the nature, content, and structure of international environmental law. The course commences with an introduction to international environmental problems, together with basic principles of international law and environmental regulation. Specific topics include global warming, stratospheric ozone depletion, and exports of hazardous substances. Other topics may include marine pollution, transboundary pollution, trade and environment, and development and environment. The course evaluates the role of international and non-governmental organizations; the interrelationship between international legal process and domestic law; and the negotiation, conclusion, and implementation of international environmental agreements. Students take this course at The Fletcher School.

<b>140250</b>	<b>Immunology Seminar</b>
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Subject:	Catalog Nbr:
BMS	1009

<b>140255</b>	<b>Infection and Immune Response</b>
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Subject:	Catalog Nbr:
BMS	1010

<b>140256</b>	<b>Advanced Molecular Biology Seminar</b>
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Subject:	Catalog Nbr:
BMS	1011

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<b>140381</b>	<b>Graduate Biochemistry</b>		
Subject: BMS	Catalog Nbr: 1012		
This course provides a graduate-level discussion of the structure and function of biologically important molecules. Problems of protein and nucleic acid biochemistry are emphasized. This course is offered through Sackler School.			

<b>140382</b>	<b>Biostatistics II</b>		
Subject: BMS	Catalog Nbr: 1013		
This course surveys regression techniques for outcomes common in public health data, including continuous, binary, count and survival data. Emphasis is on developing a conceptual understanding of the application of these techniques to solving problems and to cogently summarize the results, rather than numerical details. This course offered through the Clinical and Translational Science department at Sackler School.			

<b>140385</b>	<b>Membranes and Trafficking</b>		
Subject: BMS	Catalog Nbr: 1014		
This course provides a thorough survey of major topics in cell biology, including membrane structure and function; transport systems, ion channels, and membrane excitability; protein trafficking, and organelle biogenesis. This course is offered through the Integrated Studies Program at Sackler School.			

<b>140386</b>	<b>Pet Loss Hotline</b>		
Subject: APP	Catalog Nbr: 1009		
Students may receive elective credit for participating in a variety of community-service oriented activities, including animal shelter visitation, community cat clinics, support for the Tufts at Tech Community Veterinary Clinic, Tufts Paws for People, and the Tufts Pet Loss Hotline. Academic exercises matched to the service activities help illuminate the policy and practice context of the students' work.			

<b>140387</b>	<b>Pet Loss Hotline</b>		
Subject: APP	Catalog Nbr: 1009		
2017 FALL	Primary	Emily McCobb	emily.mccobb@tufts.edu
2018 SPRG	Primary	Alicia Karas	alicia.karas@tufts.edu
Students may receive elective credit for participating in a variety of community-service oriented activities, including animal shelter visitation, community cat clinics, support for the Tufts at Tech Community Veterinary			

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Clinic, Tufts Paws for People, and the Tufts Pet Loss Hotline. Academic exercises matched to the service activities help illuminate the policy and practice context of the students' work.

<b>140445</b>	<b>Journal Club/Seminar</b>			
Subject:	Catalog Nbr:			
LAM	592			
2018 SPRG	Primary	Angeline Warner	angie.warner@tufts.edu	
2018 SPRG	Primary	David Lee-Parritz	david.lee-parritz@tufts.edu	
Students, along with faculty members, participate in a monthly journal club for discussion of current literature in the field. The emphasis is on critical analysis, identifying significance of the research, and understanding how the findings extend current knowledge.				

<b>140474</b>	<b>Veterinary Outreach Clinic</b>			
Subject:	Catalog Nbr:			
APP	1010			
2018 SPRG	Primary	Emily McCobb	emily.mccobb@tufts.edu	
This elective is for a student with a strong interest in Community Medicine. The interested student will develop an independent project in the area of providing medical care to underserved pet owners. The project may involve time in the clinic or could be independent study about the needs of underserved families, researching community demographics and helping to build community partnerships. Strong Spanish language skills are preferred.				

<b>140487</b>	<b>Generalized Linear Models</b>			
Subject:	Catalog Nbr:			
BMS	1015			
This course is offered at UMass Medical School, Graduate School of Biomedical Sciences.				

<b>140490</b>	<b>Principles of Animal Behavior and Human Activity</b>			
Subject:	Catalog Nbr:			
APP	1011			
2018 FALL	Primary	Seana Dowling-Guyer	Seana.Dowling_guyer@tufts.edu	
In this course, we will explore how human-directed activities have impacted animal behavior in both positive and negative ways. Core principles of animal behavior will be reviewed in light of anthropogenic effects on animal behavior, adaptations, evolution, and survivability. We will review scientific methods for studying animal behavior and critically examine scientific studies. Students will develop an ethogram for a species of their choice, explore the impact of anthropogenic activities in a sourced research paper, and design a research project to investigate some aspect of human-influenced animal behavior. This course is suitable for students new to the study of animal behavior as well as those who have taken prior coursework related to animal behavior. The course will feature outside speakers as well as faculty- and student-led discussions.				

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<b>140529</b>	<b>MCM Independent Study</b>			
Subject: MCM	Catalog Nbr: 1006			
2018 SUMR	Primary	Alison Robbins	alison.robbs@tufts.edu	
<p>MCM independent study – in this independent study students may work on a project that allows further in depth analysis of a topic of their choice or related to an ongoing course they are enrolled in. The study may be in the form of direct experience including, but not limited to observing group meetings or conferences with submission of a written analysis, or academic work including writing a research paper on a topic. The work may not substantially overlap with the student’s year-long case study project. Students are expected to prepare an outline of the proposed work and have it approved by the MCM program director and faculty before beginning the work. The work will be graded as outlined by the faculty mentor for the independent study.</p>				

<b>140571</b>	<b>Epidemiology of Zoonotic Infections</b>			
Subject: MCM	Catalog Nbr: 1007			
2019 SPRG	Primary	Sam Telford III	Sam.Telford@tufts.edu	
<p>This course seeks to provide health professionals with the basis for evaluating risks and formulating prevention and intervention strategies for outbreaks or endemic transmission of zoonotic infections. Each session is structured with a “vertical” component comprising general principles, and a “horizontal” component comprising a case study of a specific agent that illustrates the general principles. Course offered every other year and is cross listed with BMS 655.</p>				

<b>140827</b>	<b>Infectious Diseases of Humans and Animals I</b>			
Subject: IDGH	Catalog Nbr: 540			
2018 FALL	Primary	Gillian Beamer	Gillian.Beamer@tufts.edu	
<p>Infectious Diseases of Humans and Animals I covers important infectious disease in humans and animals. Part I includes five topically-related Units: 1) Introduction; 2) Respiratory Tract Unit; 3) Gastrointestinal Tract Unit; 4) Urogenital Tract Unit; and 5) Disease Ecology Unit. For each body systems-focused unit, normal anatomy and physiology are first reviewed. Additional lectures focus on cellular and molecular targets of infection, host immune and inflammatory responses, and disease-related lesions. The Disease Ecology Unit focuses on species and population interactions and environmental aspects that influence the patterns of disease. Reading from texts, published research papers, homework, student presentations and projects round out the material.</p>				

<b>140829</b>	<b>Applied Immunology and Vaccinology</b>			
Subject: IDGH	Catalog Nbr: 541			
2018 FALL	Primary	Abhineet Sheoran	abhineet.sheoran@tufts.edu	
<p>This course will teach the principles of immunology and comparative immunology and then apply them to</p>				

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understand immune responses against intracellular and extracellular infectious agents, immunotherapies, immunodiagnostics, and immune reactions and disorders. In addition, the course will examine (a) how the immune system can be manipulated in order to benefit the animal, (b) how knowledge of the immune response against an infectious agent is applied to designing and developing effective vaccines, and (c) what are the challenges for developing and other aspects of vaccine development. Problem-based sessions are incorporated for discussing and understanding of basic and applied aspects of immunology, and enhancing group collaboration and communication.

<b>140830</b>	<b>Research Training with Lab Rotation</b>			
Subject: IDGH	Catalog Nbr: 542			
Students will spend time in each laboratory in the DIDGH to have a deeper understanding of various infectious disease research projects and approaches used to answer research problems specific to each project. Interaction with faculty and scientist, and type of pathogen and problems studied and techniques used in each laboratory will help students identify a laboratory for their summer research work.				

<b>140831</b>	<b>Microbiology and Immunology Techniques</b>			
Subject: IDGH	Catalog Nbr: 543			
2018 FALL	Primary	Abhineet Sheoran	abhineet.sheoran@tufts.edu	
This course will provide students with a hands-on opportunity to learn both the theoretical basis and practical application of a variety of immunological and microbiological techniques commonly used in infectious disease research. Specifically, students will learn how to utilize antibodies to determine concentration of a target molecule in a biological sample, identify pathogens and their antigens, characterize lymphocyte subset responses, neutralize pathogens/toxins and purify pathogens and their virulence factors. Students will also learn to isolate, cultivate and identify bacteria, fungi, viruses and protozoa. In addition, students will learn sterile technique, including preparation of glassware and reagents, how to handle biomedical waste both within the laboratory and under field conditions and how to address a biological spill.				

<b>140832</b>	<b>Fundamentals of Biostatistics</b>			
Subject: IDGH	Catalog Nbr: 544			
Introductory statistics will be learned using an active approach, emphasizing practical applications of statistical concepts. Students will gain experience in analyzing data sets and presenting data. In addition, students will become familiar with using Excel for basic statistical analyses and more specialized programs for more advanced statistics, such as SPSS. Laptop computers are required.				

<b>140833</b>	<b>Research Ethics</b>			
Subject: IDGH	Catalog Nbr: 545			

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2018 FALL	Primary	Robert Bridges	robert.bridges@tufts.edu
2018 FALL	Primary	Mohammed Anwer	sawkat.anwer@tufts.edu
<p>This course will introduce ethics, science and society and address key issues affecting the responsible conduct of scientific research, including (1) animal use (ethical treatment of laboratory animals, laboratory animal care training, and IACUC); (2) human subjects (informed consent, IRB, training requirements and resources, clinical research and trials, regulations governing clinical investigation, cultural issues, and research/trials in developing countries); (3) laboratory safety and compliance (basic safety, biohazards, recombinant DNA, hazardous chemicals, transfer of etiologic agents, radioactivity); (4) dealing with scientific misconduct (where to report, whom to turn to for support and advice); (5) scientific communication i.e. presentations and publications (seminars and publications, citing the work of others, plagiarism, authorship, order of authors); (6) results of research and note keeping (verification, repetition, data ownership and legal ramifications); (7) conflict of interest and conflict of commitment; intellectual property (protection and rights). This course will also utilize case studies and ethics training through various online web portals to enforce deeper understanding of ethical issues in scientific research.</p>			

<b>140834</b>	<b>Journal Club</b>		
Subject: IDGH	Catalog Nbr: 546		
2018 FALL	Primary	Akram Da'darah	Akram.Da_darah@tufts.edu
<p>Students will present scientific papers relevant to infectious disease. All students will be required to thoroughly study the article before the Journal Club. Papers will cover diverse aspects of infectious diseases and be chosen via consultation with students' individual faculty mentors and the Course Director. The presentations will be powerpoint-based (40-50 min), which will be followed by extensive group discussion (20-30 min). The sessions will help students to enhance the skills of analytical reading and critique. The presentations will focus on critical analysis of the results/data, evaluation of the scientific merit of the paper, stimulating class-discussion of the paper and related literature, and developing presentation skills. Students will take Journal Club in both the Fall and Spring semesters. The journal club will be open to everyone and advertised campus-wide. Visiting and resident faculty will be strongly encouraged to attend as well as veterinary students, other graduate students and members of the Tufts community.</p>			

<b>140835</b>	<b>Infectious Diseases of Humans and Animals II</b>		
Subject: IDGH	Catalog Nbr: 547		
<p>A systems-based approach will be utilized to present infectious agents that primarily infect the nervous system, skin, and blood (including the reticuloendothelial system). The introductory lecture of each unit will briefly describe the anatomical (including histological) and physiological features of the organs of that system, and list infectious agents that primarily infect that system and cause pathology and disease. Model bacterial, viral, fungal and parasitic pathogens that cause disease domestically and/or globally will be selected for in-depth discussion. The etiology, pathogenesis, immunology, epidemiology, diagnosis, prevention and control of these selected pathogens will be discussed in detail. Reading of pertinent primary scientific literature will be assigned to facilitate discussion and deeper understanding.</p>			



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<b>140836</b>	<b>Microbial Molecular Biology</b>
Subject: IDGH	Catalog Nbr: 548
<p>The first part of the course will cover basic topics of molecular biology relevant to the understanding of viral, bacterial and protozoal microorganisms. Following an overview of the structure and function of nucleic acids, prokaryotic and eukaryotic gene expression and regulation will be discussed. The second part of the course will be devoted to applied topics in molecular biology, including genetically modified organisms, genotyping methods, medical molecular biology, high-throughput sequencing and its application to genomics and the analysis of complex bacterial populations. An introduction into computational methods for analyzing complex sequence data and their application to studying host associated microbial populations and their impact on health and disease will complete the course.</p>	

<b>140837</b>	<b>Animal Models of Infectious Diseases</b>
Subject: IDGH	Catalog Nbr: 549
<p>Students will learn methods of handling, feeding and care of animals, oral inoculations and systemic injections, observing and recording clinical signs of the disease, humanely euthanizing the animals, collection of blood and organs for immunological, microbiological or histological analysis, and disposal of carcass. The students will process serum and other samples in-vitro, analyze results and write reports. Students will prepare powerpoint presentations on animal models of infectious diseases or toxins produced by infectious agents and present them to the class.</p>	

<b>140839</b>	<b>Food Safety</b>
Subject: IDGH	Catalog Nbr: 561
<p>Students will become familiar with the more common food-borne illnesses and the risks of transmission from meat, poultry, dairy, eggs, and other foods. They will learn the principles of the Hazard Analysis and Critical Control Points system (HACCP) and the common diagnostic techniques used to monitor food safety, including detecting microorganisms and chemicals. Students will also learn the use of antimicrobial in food producing animals and development of antibiotic resistance, and understand the roles of a variety of state, federal, and global regulatory agencies which recommend and implement food protection practices.</p>	

<b>140840</b>	<b>Applications of Biotechnology</b>
Subject: IDGH	Catalog Nbr: 562
<p>Biotechnology is “the application of biological organisms, systems, or processes by various industries to learning about the science of life and the improvement of the value of materials and organisms such as pharmaceuticals, crops, and livestock” (ACS). Classes will explore different biotechnology applications, particularly those technologies of relevance to infectious disease. Students will learn how the technologies were developed, how they are being applied to global health issues, and how they are likely to evolve in the future. As part of the course, students will be asked to select biotechnologies they feel will be important to</p>	

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their personal career objectives, investigate these in depth and present their findings and views to the class followed by general discussion.

<b>140841</b>	<b>Molecular Biology Techniques</b>
Subject: IDGH	Catalog Nbr: 563
<p>The goal of this course is to provide students with hands-on experience in molecular biology procedures. Having first established good laboratory technique (to encompass safety and regulatory issues), students will have the opportunity to learn a variety of molecular methods including DNA isolation, digestion and cloning, bacterial transformation, evaluation of recombinant clones and plasmid isolation. Students will engage in primer design, gel electrophoresis, PCR (including quantitative real time PCR), DNA barcoding and sequence annotation. Basic bioinformatic skills will be explored. Recombinant protein expression systems will be compared (eukaryotic versus prokaryotic) and various recombinant protein expression and purification techniques (e.g. column chromatography and affinity methods) will be tested. Science writing skills that focus upon clarity, precision and comprehension of experimental results and conclusions will be emphasized. Students will gain a firm understanding of how the molecular biology techniques employed in this class are used to diagnose, identify and study infectious diseases.</p>	

<b>140842</b>	<b>Ecology of Disease Transmission</b>
Subject: IDGH	Catalog Nbr: 564
<p>This course will teach how host behavior, ecology and habitat patterns impact pathogen invasion dynamics or the spatio-temporal patterns of infectious diseases. Students will acquire a basic understanding of the principles of disease ecology and disease emergence including the major drivers of emergence, the relationships with biodiversity, and the effects of climate change. Key diseases of concern for conservation medicine and ecosystem health will be reviewed as examples. Emphasis will be placed on the integration of animal, human, and environmental health, and the environmental, economic, and anthropogenic factors promoting the emergence or persistence of infectious diseases and other major health threats.</p>	

<b>140843</b>	<b>Global Health and Threat of Emerging Pandemics</b>
Subject: IDGH	Catalog Nbr: 565
<p>This course will focus on infectious diseases that threaten global health and insecurity, their relation to poverty and development and how economic level, inequity, and policies of nations determines the health of its citizens. Using the lens of infectious diseases covered in previous courses, we will underscore the historical milestones, actors, assumptions, context and theories driving selected infectious diseases and their global health priorities in policy, programs and research. A recurring theme throughout the course is that there are common global drivers of infectious disease emergence and re-emergence influencing the health of populations in high, middle and low-income countries, that cross-cutting issues of inequality and systems transcend settings. The course will also examine the outcomes resulting from the ways in which new global health policies change patterns of health practice and Infectious disease intervention globally. That students will come out with an understanding of major challenges and solutions to infectious diseases of global health</p>	

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significance, programs and policies and be able address global health issues from an inter-disciplinary perspective, examine strategies and solutions for combating emergence and re-emergence of pandemics and promoting Global Health threats. This course is a reminder that no one person, agency or organization holds absolute knowledge on how best to address Infectious disease and Global Health challenges and that it has to be a multidisciplinary effort.

<b>140846</b>	<b>Principles of Laboratory Management and Biosafety</b>
Subject: IDGH	Catalog Nbr: 568
<p>The course will provide in-depth understanding of biosafety and regulatory compliance, and laboratory management. The course will cover biosafety considerations of the BSL-2 and BSL-3 laboratories, risk assessment and hazard identification of infectious agents, biosafety design criteria for facility design, regulations/guidelines and regulatory compliance with federal/state and local laws, biosafety audit of work practices and procedures, management principles and managing a laboratory, and many other aspects of biosafety and laboratory management.</p>	

<b>140847</b>	<b>Research Assignment</b>
Subject: IDGH	Catalog Nbr: 569
<p>Students will develop and write research proposals, with a focus on addressing specific, human and/or animal, local or global, serious infectious diseases, including emerging infections. Each student will investigate and understand in depth a particular research problem. The proposal will include long and short term goals, hypothesis, specific aims, comprehensive literature survey on the subject, approach to solutions, methodology, biostatistics, expected outcome. Students will get opportunity to work and think independently, read scientific literature, develop oral/written communication, identify techniques to answer a research problem, and appreciate research process. The project will be presented orally to the class and written up and submitted as a significant part of the final course evaluation. Mentors will be assigned to each student to provide guidance as needed.</p>	

<b>140848</b>	<b>Introduction to Human-Animal Interactions</b>
Subject: APP	Catalog Nbr: 531
<p>This interdisciplinary course explores human-animal relationships as a context for promoting health and well-being for humans, animals, and communities. The course focuses on integrative research and application in human-animal interaction, and will cover a range of topics such as the role of animals in promoting positive human development, animal-assisted therapy, animals in the family setting, and animals in educational and programmatic contexts. Additional context is provided in the form of class sessions on humane education and the role of animals in literature and art.</p>	

<b>140849</b>	<b>Research Methods I</b>
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Subject: APP	Catalog Nbr: 518			
2018 FALL	Primary	Megan Mueller	Megan.Mueller@tufts.edu	
2018 FALL	Primary	Seana Dowling-Guyer	Seana.Dowling_guyer@tufts.edu	

This discussion course will focus on critical reading of the quantitative and qualitative research literature on human-animal relationships. Students will read and present assigned papers, lead and participate in discussions, conduct literature searches, prepare a literature review, and write a research proposal in an area of interest.

<b>140850</b>	<b>Statistics I</b>			
Subject: APP	Catalog Nbr: 516			
2017 FALL	Primary	Phyllis Mann	phyllis.mann@tufts.edu	
2018 FALL	Primary	Allen Rutberg	allen.rutberg@tufts.edu	

This course introduces students to the basics of statistical methods and research design. Students learn to state hypotheses, evaluate sampling procedures, create and manage data sets, and carry out basic statistical testing. Examples are drawn from research in veterinary medicine, animal science, human-animal relationships, and animal ecology.

<b>140851</b>	<b>Communicating Policy Positions</b>			
Subject: APP	Catalog Nbr: 524			
2018 SPRG	Primary	Allen Rutberg	allen.rutberg@tufts.edu	

The course requires students to draft and revise documents targeted at diverse audiences, including letters to the editor, blogs, op-eds, fact sheets, legislative testimony, and formal comments on draft regulations and other proposals for government actions, and to develop skills in making presentations to the public, legislators, legislative hearings, and other forums.

<b>140852</b>	<b>Research Methods II</b>			
Subject: APP	Catalog Nbr: 519			
2018 SPRG	Primary	Seana Dowling-Guyer	Seana.Dowling_guyer@tufts.edu	

This course provides more in-depth exploration of survey design, content analysis, and qualitative techniques such as interviews, ethnography, and focus groups. All students will produce a research proposal, which for research track students will lead directly to their capstone research project.

<b>140853</b>	<b>Mentored Externship</b>			
Subject: APP	Catalog Nbr: 532			

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2018 SUMR	Primary	Allen Rutberg	allen.rutberg@tufts.edu
<p>Students in the applied track complete their program by working at a government agency, legislative office, non-profit organization, or other entity that influences, makes, or implements animal policy or advances human-animal relationships. The students will analyze and synthesize their experiences in a substantial research paper and an oral report to classmates and Center faculty.</p>			

<b>140854</b>	<b>Independent Research I</b>		
Subject: APP	Catalog Nbr: 526	2018 SUMR	Primary
	Allen Rutberg	allen.rutberg@tufts.edu	
<p>For their capstone activity, students in the research track work independently with individual mentors to complete their research projects, with the expected outcome being an article that is potentially publishable in a peer-reviewed journal, or other scholarly product the dissemination of which will advance and inform animal policy or practice.</p>			

<b>140855</b>	<b>Independent Research II</b>		
Subject: APP	Catalog Nbr: 527	2018 FALL	Primary
	Allen Rutberg	allen.rutberg@tufts.edu	
<p>For their capstone activity, students in the research track work independently with individual mentors to complete their research projects, with the expected outcome being an article that is potentially publishable in a peer-reviewed journal, or other scholarly product the dissemination of which will advance and inform animal policy or practice.</p>			

<b>140856</b>	<b>Statistics II: Intermediate</b>		
Subject: APP	Catalog Nbr: 517	2018 SPRG	Primary
	Seana Dowling-Guyer	Seana.Dowling_guyer@tufts.edu	
<p>Intended for advanced research track students and tailored to their interests, this course will focus on experimental design and analysis of survey data, exploring the use of analysis of variance (ANOVA) and regression models, factor analysis, and other advanced techniques using SPSS or an equivalent statistical package.</p>			

<b>140912</b>	<b>Introduction to Policy</b>		
Subject: APP	Catalog Nbr: 1012		
<p>This lecture-discussion class is a quick introduction to the mechanisms of government with an emphasis on animal and environmental policy. Also examined are how history, culture, ethics, and the media influence the making and implementation of animal and environmental policy.</p>			

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<b>140997</b>	<b>Participatory&amp;Community Approaches Epi Rsch, Disease Surveillance and Hlth Service</b>		
Subject: MCM	Catalog Nbr: 1008	2018 FALL	Primary
		Jeffrey Mariner	Jeffrey.Mariner@tufts.edu
<p>This course is designed to be a practical introduction to epidemiological and service delivery methodologies that stress participation and community ownership. The course will combine a minimal amount of introductory lecture with in-class participatory learning exercises and discussion. The course will first look at the underlying concepts of participation and community-based development. Thereafter, the sessions will focus on specific methods and students will be asked to complete a group project using these skills. The group projects will consist of participatory assessments conducted within the University community on a health related theme. The course will close with sessions on community-based health care and the policy and institutional frameworks required for sustainable community-based programs. At the end of the course, students should be adequately prepared to conduct a mentored summer research project in participatory epidemiology.</p>			

<b>141109</b>	<b>GIS for Conservation Medicine</b>		
Subject: MCM	Catalog Nbr: 1009		
<p>This course will introduce students to the fundamental concepts of the Geographic Information Systems (GIS) as it relates to the one health paradigm and veterinary health. This course is designed for novice GIS students with specific focus on mapping and spatial analysis for human, animal, and environmental health applications. Tutorials include vulnerability analyses of animal habitats, monitoring disease outbreaks for public health, calculating deforestation and land cover change, suitability analysis for Ebola treatment centers in Liberia, site analysis for alternative energy sources, and many more. Technical topics to be covered include GIS data discovery; GPS field data collection; data structure and management; principles of cartographic visualization and design; and basic spatial tools, analysis and modeling. Classes will consist of both a lecture segment and an in-class activity/demonstration. Students will complete weekly tutorials or project assignments and conclude the semester with a final mapping/analysis project of their choosing. This course is open to all students and faculty from the Veterinary School.</p>			

<b>141125</b>	<b>Immunohistochemistry &amp; Microscopy</b>		
Subject: BMS	Catalog Nbr: 1016		
Course taken at Woods Hole Institute.			

<b>141126</b>	<b>Introduction to Neuroscience</b>		
Subject: BMS	Catalog Nbr: 1017		
Course offered through UMass Medical School.			

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<b>141127</b>	<b>Bases of Brain Disease</b>
Subject: BMS	Catalog Nbr: 1018
Course offered through UMass Medical School.	

<b>141128</b>	<b>Genetic Basis of Behavior</b>
Subject: BMS	Catalog Nbr: 1019
Course offered through UMass Medical School.	

<b>141129</b>	<b>Current Topics in Aging</b>
Subject: BMS	Catalog Nbr: 1020
Course offered through UMass Medical School	

<b>141198</b>	<b>Principles of Biostatistics</b>
Subject: BMS	Catalog Nbr: 1021
<p>This course is offered through PHPD at Tufts Medical School, and provides an introduction to the basic principles and applications of statistics as they are applied to problems in clinical and public health settings. Topics include the description and presentation of data, random variables and distributions, descriptive statistics, introduction to probability, estimation, elements of hypothesis testing, and one- and two-sample tests, ANOVA (including repeated-measures), non-parametric tests, and an introduction to linear and logistic regression. Lectures, problem sets, and computer output are used to develop these and additional concepts. Graduate standing.</p>	

<b>141533</b>	<b>Paws for People</b>
Subject: APP	Catalog Nbr: 1013
<p>1) Delta Training (12 hours) Two 6 hour sessions or 6 weeks of 2 hr courses Class taught by Delta instructors on becoming a registered visitor; what the animal handler needs to know, following this class students will be eligible to apply to the Delta Society for registration as a trained visitor. There is a \$80 fee for students to take this Delta Course. This includes a book and paying the lecturers. However, the course director has agreed to waive the 80 fee if students are willing to use a borrowed workbook from Paws for People, rather than purchase their own book. There is also a fee payable to the Delta Society if the student chooses to become registered with them. Registration is voluntary and not required as part of the selective.</p>	

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## 2) Evaluations

After completing the training the student will help perform evaluations of volunteers and their dogs. The student will spend two days assisting with evaluations and will also observe two visits for a total of 20 hours.

## 3) Visitation Experiences

The last 8 hours of the selective will consist of visitation by the student and a short (20 minutes only) presentation to the Tufts Paws for People Advisory Board summarizing their experiences.

## 4) Research Assignment

The student will prepare a 10-15 page research paper on a topic related to animal assisted therapy (topic to be pre-approved). In addition the student will prepare a 15-20 minute presentation on their paper to be presented to the Paws for People Steering Committee.

<b>141551</b>	<b>Applied Animal Behavior</b>			
Subject:	Catalog Nbr:			
APP	1014			
2018 SPRG	Primary	Seana Dowling-Guyer	Seana.Dowling_guyer@tufts.edu	
<p>This course will focus on applied behavior topics of common companion, farm, and zoo animals. We will discuss animal body language and typical behavior and compare that to people's perceptions of that behavior. Assessment of behavior and common problem behaviors will be reviewed along with effective management and modification techniques of those problems. Force-free handling and positive reinforcement training will be emphasized. We will examine abnormal behavior particularly as it relates to stress and poor welfare and design remediation, management, and modification programs to mitigate that behavior, with the goal of improving welfare. This course builds on topics covered in APP 1011 Principles of Animal Behavior and APP 1007 Wildlife in Captivity, and relates to APP 1008 Introduction to Animal Welfare but it is not necessary to have taken any of those courses nor is this a repeat of those courses. This course will be a mix of lecture, discussion, and hands-on work with animals. Students will design their own assessment and training programs, implement them, and record their progress and outcome. There will be several smaller research and writing assignments as well. Students will gain an understanding of the typical behavior of select animals, assessment techniques and indicators of poor welfare, and effective strategies for working with those animals in a variety of settings as well as appreciate the role of human companions and caretakers in the expression and perception of animal behavior.</p>				

<b>141632</b>	<b>GIS for Conservation Medicine</b>			
Subject:	Catalog Nbr:			
MCM	591			
2018 FALL	Primary	Carolyn Talmadge	Carolyn.Talmadge@tufts.edu	
<p>This course will introduce students to the fundamental concepts of the Geographic Information Systems (GIS) as it relates to the one health paradigm and veterinary health. This course is designed for novice GIS students with specific focus on mapping and spatial analysis for human, animal, and environmental health applications. Examples include vulnerability analyses of animal habitats, monitoring disease outbreaks for public health, calculating deforestation and land cover change, site analysis for alternative energy sources, and many more. Technical topics to be covered include GIS data discovery; GPS field data collection; data structure and management; principles of cartographic visualization and design; and basic overlay tools, analysis and</p>				



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modeling. Classes will consist of both a lecture segment and an in-class activity/demonstration. Students will complete weekly tutorials or project assignments and conclude the semester with a final mapping/analysis project of their choosing.

<b>141824</b>	<b>Principles of Epidemiology</b>			
	Subject:	Catalog Nbr:		
	IDGH	570		
<p>Epidemiology is the lynchpin science of public health. In combination with biostatistics, it is used to examine disease patterns and infer causes of diseases at population level, and many other types of issues such as whether a new drug is more effective than an old one, what the risk factors are for a given outcome, whether a new screening test is likely to be useful and, if so, in which population, what levels and types of air and water pollution should be of most concern, etc. To accomplish its varied objectives, epidemiology uses many different kinds of measures, study designs, and data analytic techniques. We will examine many of these in this course including: (1) Understand the basic structure of public health, its goals, and where epidemiology fits into the structure; (2) Know how to calculate and interpret important rates and measures used in epidemiology and public health and how to interpret confidence intervals around certain of these rates and measures; (3) Interpret basic epidemic curves; (4) Understand in general the design, strengths, weaknesses and ethical issues of the major types of epidemiologic studies; (5) Identify the three major causes of erroneous conclusions in epidemiologic research and how each one can be adjusted for or avoided; (6) Recognize effect modification (also called interaction) in data; (7) Learn how screening is employed in public health, including the basic measurements used to evaluate screening tests and the biases that can affect the accuracy of reported screening efficacy.</p>				

<b>141825</b>	<b>Bioterrorism: Risks and Defense Strategies</b>			
	Subject:	Catalog Nbr:		
	IDGH	571		
<p>Terrorist attacks in many parts of the world has focused attention on the possibility that pathogens and toxins may be used as weapons targeting humans or economically important animals and plants. The issues surrounding bioterrorism and its critical complement, biodefense, are complex and require an understanding of sociopolitical factors as well as those of biology. This course seeks to provide the basis for (1) critically evaluating the risks associated with bioterrorism and (2) developing strategies for defending against as well as responding to the illegitimate use of biological agents. Each of the sessions will be structured around a key reading or two designed to illustrate general concepts. Original, peer reviewed publications or policy papers will mainly serve as key readings.</p>				

<b>141841</b>	<b>Topics in Animal Ethics</b>			
	Subject:	Catalog Nbr:		
	APP	1015		
	2018 SPRG	Primary	Jennifer Maas	No Email on file.
	2018 SPRG	Secondary	Allen Rutberg	allen.rutberg@tufts.edu
<p>This course will use a series of student exercises, presentations, and discussions to explore the application of theories of ethics and cultural construction to issues surrounding human treatment of animals. Topics will</p>				

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include current theories of animal ethics, cross-cultural construction and categorization of animals, the ethics of pet-keeping, the relationship of animal mind to ethical standing, breeding and genetic manipulation of domestic animals, ethical paths toward humane treatment of wildlife, and others. Assignments will include essays, visual analyses, and student presentations.

<b>141842</b>	<b>Wildlife Module from Animals in Society II Course</b>		
Subject: APP	Catalog Nbr: 1016		
<p>This module of Animals &amp; Society II focuses on wildlife and wildlife policy. Evaluation is based on a series of written exercises, oral presentations, and class participation. The module meets for eleven 2-hour sessions (22 contact hours, and thus only 1.5 credits for the MCM program students). Students must get approval from Dr. Rutberg to take the module; familiarity with the basic structures of American government is strongly desired.</p>			

<b>142492</b>	<b>Research Methods</b>		
Subject: APP	Catalog Nbr: 1018		
<p>This course provides an exploration of survey design, content analysis, and qualitative techniques such as interviews, ethnography, and focus groups. Students in this elective course will complete design and preparation assignments and produce modified versions of the literature review and proposal.</p>			

<b>143489</b>	<b>Human-Animal Interactions</b>		
Subject: APP	Catalog Nbr: 1019		
2018 SPRG	Primary	Megan Mueller	Megan.Mueller@tufts.edu
<p>This interdisciplinary course explores human-animal relationships as a context for promoting health and well-being for humans, animals, and communities. The course focuses on integrative research and application in human-animal interaction, and will cover a range of topics such as the role of animals in promoting positive human development, animal-assisted therapy, animals in the family setting, and animals in educational and programmatic contexts. Additional context is provided in the form of class sessions on humane education and the role of animals in literature and art.</p>			

<b>143490</b>	<b>Introduction to Global Health</b>		
Subject: IDGH	Catalog Nbr: 572		
2018 FALL	Primary	Marieke Rosenbaum	Marieke.Rosenbaum@tufts.edu
<p>Global health as a field reflects the need for increasingly complex and multidisciplinary approaches to understanding health and disease in populations, brought on by an increasingly interconnected and changing world. Global health not only considers the epidemiological and transmission dynamics of disease, but the social and political dynamics as well. This course is designed to provide students with an overview of global</p>			

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health and equip them with the proper framework, context, and terminology to understand the social, political, and economic aspects of health and disease on a global scale.

<b>143491</b>	<b>Case Studies in Global Health</b>			
Subject: IDGH	Catalog Nbr: 573			
<p>This course will illuminate the complexity and multi-dimensionality of the evolving infectious disease pandemics, as illustration of the relationships between disease biology, society, and public policy. We will explore the history, changing trends, recent advances, and multidisciplinary strategies for addressing three independent and interacting infectious diseases: HIV, Ebola, and Tuberculosis. We will examine gender relations; poverty; stigma and discrimination; vulnerable populations; as well as global responses, from patient activism to 'global health' interventions. This course will build upon the introductory course in Global Health and course on Infectious Diseases in Global Health, but with a greater focus on social issues surrounding the pandemics, lived experiences of disease, the interactions between biology and social factors, and the political architectures of responses. The course will include lectures and documentaries, interactive classroom activities and discussions, and group projects and presentations.</p>				

<b>143494</b>	<b>Paws for People</b>			
Subject: APP	Catalog Nbr: 1020			
2017 FALL	Primary	Megan Mueller	Megan.Mueller@tufts.edu	
2018 SPRG	Primary	Alicia Karas	alicia.karas@tufts.edu	

<b>143495</b>	<b>Intermediate Statistics</b>			
Subject: APP	Catalog Nbr: 1021			
2018 SPRG	Primary	Seana Dowling-Guyar	Seana.Dowling_guyar@tufts.edu	

<b>143531</b>	<b>MAPP Independent Study</b>			
Subject: APP	Catalog Nbr: 1022			
2018 SUMR	Primary	Allen Rutberg	allen.rutberg@tufts.edu	

<b>143799</b>	<b>Fundamentals of Biostatistics</b>			
Subject: MCM	Catalog Nbr: 592			

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Introductory statistics will be learned using an active approach, emphasizing practical applications of statistical concepts. Students will gain experience in analyzing data sets and presenting data. In addition, students will become familiar with using Excel for basic statistical analyses and more specialized programs for more advanced statistics, such as SPSS. Laptop computers are required.

<b>143807</b>	<b>Case Study</b>
Subject: MCM	Catalog Nbr: 585
<p>The case study will provide a capstone exercise that builds on a student's knowledge and skills to produce a comprehensive conservation medicine analysis of a current health problem and recommend strategies to address identified challenges. Each student will identify an issue and will be charged with leading a collaborative team involving other students and appropriate faculty. Cases will undergo a peer-review evaluation through our network of conservation medicine partners. At the end of the year, case studies will be compiled and submitted for publication. Students register for the Case Study during the fall and spring semesters, and are expected to complete their Case Study during the summer</p>	