The research programs in the department provide excellent opportunities for graduate training in fundamentals of modern investigative microbiology, immunology, and pathobiology. An emphasis is placed on a multi-disciplinary approach to research problems. Areas of research strength in the department include bacteriology, immunology, mycobacterial diseases, prion biology, vector borne infectious diseases, and virology. Please visit the Department of Microbiology (https://vetmedbiosci.colostate.edu/mip/) for more information.

### Master's Programs
- Master of Science in Microbiology, Plan A*
- Master of Science in Microbiology, Plan B (http://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/microbiology-immunology-pathology/plan-b-ms-microbiology/)

### Ph.D.
- Ph.D. in Microbiology*
- Ph.D. in Pathology*

* Please see department for program of study.

### Courses

#### Microbiology, Immunology, and Pathology (MIP)

- **MIP 101  Introduction to Human Disease (GT-SC2)**  Credits: 3 (3-0-0)
  - **Course Description:** Survey of human systems and diseases.
  - **Prerequisite:** None.
  - **Term Offered:** Spring.
  - **Grade Mode:** Traditional.
  - **Special Course Fee:** No.

- **MIP 149  The Microbial World**  Credits: 3 (3-0-0)
  - **Course Description:** Importance of microbiology in daily life, with emphasis on positive and negative roles of microbes, infectious disease, and current microbiology issues.
  - **Prerequisite:** None.
  - **Term Offered:** Fall.
  - **Grade Mode:** Traditional.
  - **Special Course Fee:** No.

- **MIP 150  Introduction to Research Methods**  Credits: 3 (0-6-0)
  - **Course Description:** Undergraduate research experience highlighting fundamental skills of laboratory research while working towards the goal of novel microbial discovery.
  - **Prerequisite:** None.
  - **Terms Offered:** Fall, Spring.
  - **Grade Mode:** Traditional.
  - **Special Course Fee:** No.

- **MIP 192  Microbiology First-Year Seminar**  Credits: 2 (0-0-2)
  - **Course Description:** Introduction to microbiology major and faculty, academic and career planning, information sources in biomedical sciences.
  - **Prerequisite:** None.
  - **Term Offered:** Fall.
  - **Grade Mode:** Traditional.
  - **Special Course Fee:** No.
MIP 250  Eukaryotic Microbiology  Credits: 3 (3-0-0)
Course Description: Cell biology topics with emphasis on eukaryotic 
microbes. Topics include the central dogma of molecular biology, 
cell structure and function, and cell membranes as they relate to the 
importance of the host cell as well as parasites. Spotlight microbes 
will be studied that depict many eukaryotic processes important in cell 
biology, human health, and scientific models. 
Prerequisite: CHEM 111, may be taken concurrently and LIFE 102. 
Term Offered: Fall. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 260 The World of Parasites  Credits: 3 (3-0-0)
Course Description: Introduction to parasitology; evolution, ecology, 
epidemiology, physiology, and morphology of representative parasites of 
every group. 
Prerequisite: BZ 110 or LIFE 102. 
Term Offered: Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 275 Microcomputing Applications in Microbiology  Credits: 2 (1-0-1)
Course Description: Network software on MS-DOS microcomputers will 
be used to acquire and analyze data and information that are commonly 
encountered in microbiology. 
Prerequisite: None. 
Registration Information: Must register for lecture and recitation. 
Term Offered: Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 298 Introductory Research  Credits: Var[1-3] (0-0-0)
Course Description: Freshman/sophomore research experience in a 
working research environment. 
Prerequisite: None. 
Registration Information: Written consent of instructor required. 
Terms Offered: Fall, Spring, Summer. 
Grade Mode: Instructor Option. 
Special Course Fee: No. 

MIP 300  General Microbiology  Credits: 3 (3-0-0)
Course Description: Structure, function, development, physiology, and 
molecular biology of microorganisms emphasizing bacteria. 
Prerequisite: (BZ 110 or BZ 120 or LIFE 102) and (CHEM 245, may 
be taken concurrently or CHEM 341, may be taken concurrently or 
CHEM 345, may be taken concurrently). 
Registration Information: Sections may be offered: Online. 
Terms Offered: Fall, Spring, Summer. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 302  General Microbiology Laboratory  Credits: 2 (0-4-0)
Course Description: Laboratory skills and techniques for isolating, 
characterizing, and identifying bacteria. 
Prerequisite: MIP 300, may be taken concurrently. 
Terms Offered: Fall, Spring, Summer. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 303  General Microbiology--Honors Recitation  Credits: 2 (0-0-2)
Course Description: Research and present topics related to the material 
presented in MIP 300. 
Prerequisite: None. 
Registration Information: Participation in the Honors Program required. 
Must have concurrent registration in MIP 300. Sections may be offered: 
Online. 
Terms Offered: Fall, Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 315 Pathology of Human and Animal Disease  Credits: 3 (3-0-0)
Course Description: Biological systems critical to mammalian physiology 
and how each is affected by metabolic, genetic, environmental, and 
infected agents. 
Prerequisite: BZ 110 or LIFE 102. 
Term Offered: Fall, Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 334 Food Microbiology  Credits: 3 (3-0-0)
Course Description: Microorganisms in the spoilage of foods. Methods of 
control of microorganisms in food and the major food-borne diseases. 
Prerequisite: LIFE 205 or MIP 300. 
Term Offered: Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 335 Food Microbiology Laboratory  Credits: 2 (0-4-0)
Course Description: Laboratory skills and techniques related to the 
presence of microorganisms in food, production, and preservation. 
Prerequisite: (LIFE 206 or MIP 302) and (MIP 334, may be taken 
concurrently). 
Term Offered: Spring (odd years). 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 342 Immunology  Credits: 4 (3-0-1)
Course Description: Principles of immunology: components of the 
immune system, interactions of humoral and cellular elements, and 
clinical applications of basic concepts. 
Prerequisite: (BZ 310 or BZ 350 or LIFE 201B or LIFE 210 or MIP 250) 
and (CHEM 245, may be taken concurrently or CHEM 341, may be taken 
concurrently or CHEM 345, may be taken concurrently) and (MIP 300). 
Registration Information: Must register for lecture and recitation. 
Terms Offered: Fall, Spring, Summer. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 343 Immunology Laboratory  Credits: 2 (0-4-0)
Course Description: Techniques used in research and clinical 
immunology, including diagnostic problem solving and data analysis. 
Prerequisite: MIP 302 and MIP 342, may be taken concurrently. 
Term Offered: Spring. 
Grade Mode: Traditional. 
Special Course Fee: No. 

MIP 351 Medical Bacteriology  Credits: 3 (3-0-0)
Course Description: Bacteria which cause human and veterinary 
diseases; host-parasite relationships, disease mechanisms, prevention, 
and therapy. 
Prerequisite: MIP 342. 
Term Offered: Spring. 
Grade Mode: Traditional. 
Special Course Fee: No.
MIP 352 Medical Bacteriology Laboratory Credits: 3 (0-6-0)
Course Description: Laboratory skills and techniques necessary for identifying medically important bacteria.
Prerequisite: MIP 302 and MIP 351, may be taken concurrently.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 384 Supervised College Teaching Credits: Var[1-5] (0-0-0)
Course Description:
Prerequisite: None.
Registration Information: Written consent of department required.
Maximum of 10 credits allowed in course. A maximum of 10 combined credits for all 384 and 484 courses are counted towards graduation requirements.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 400A Capstone in Microbiology: Medical Microbiology Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400B Capstone in Microbiology: Biotechnology Credits: 2 (0-0-2)
Course Description:
Prerequisite: (BC 351 or BC 401) and (MIP 300).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400C Capstone in Microbiology: Immunology Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400D Capstone in Microbiology: Microbial Diversity/Ecology Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400E Capstone in Microbiology: Microbial Genetics Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400F Capstone in Microbiology: Virology Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400G Capstone in Microbiology: Service Learning Credits: 2 (2-0-0)
Course Description:
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Written consent of department required.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400H Capstone in Microbiology: Prion Biology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing. Written consent of instructor.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400I Capstone in Microbiology: Mycobacterial Biology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400J Capstone in Microbiology: Big Data Sets in Microbiology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400K Capstone in Microbiology: Parasitology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 260 and MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 400L Capstone in Microbiology: Microbiome Biology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400M Capstone in Microbiology: Vector Biology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342 and MIP 462) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400N Capstone in Microbiology: Environmental Sustainability & Health Science Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400O Capstone in Microbiology: Pathology of Infectious Disease Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 315 and MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400P Capstone in Microbiology: Veterinary Microbiology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400Q Capstone in Microbiology: One Health Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400R Capstone in Microbiology: Food Microbiology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 400S Capstone in Microbiology: Biofilm Biology Credits: 2 (2-0-0)
Course Description: Discussion of literature on a topic of importance to the research community in the discipline.
Prerequisite: (MIP 342) and (MIP 351, may be taken concurrently or MIP 420, may be taken concurrently).
Registration Information: Junior standing.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 401 Laboratory Research Methods in Microbiology Credits: 4 (0-6-1)
Course Description: Hands-on experience in laboratory research methods for students working individually on a project which stems from a larger research project of a faculty member's laboratory. All students will work in the same facility equipped with appropriate equipment and supplies to conduct the student research project.
Prerequisite: MIP 150 and MIP 300 and MIP 302.
Restriction: Must be a: Undergraduate.
Registration Information: Biomedical sciences majors and Microbiology and Infectious Disease Concentration students only. Must register for laboratory and recitation.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 420 Medical and Molecular Virology Credits: 4 (4-0-0)
Course Description: Principles of animal virology: structure, classification, assay, diagnosis, control, replication, genetics, host-parasite relationships.
Prerequisite: (MIP 342) and (BC 351, may be taken concurrently or BC 401, may be taken concurrently).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 425 Virology and Cell Culture Laboratory Credits: 2 (0-6-1)
Course Description: Isolation and characterization of viruses. Viral diagnostic and cell culture techniques.
Prerequisite: MIP 302 and MIP 420, may be taken concurrently.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 432  Microbial Ecology  Credits: 3 (2-0-1)
Also Offered As: ESS 432.
Course Description: Principles of microorganism interactions with their living and non-living environments; implications for the environment, plants, and animals.
Prerequisite: MIP 300.
Registration Information: Must register for lecture and recitation. Credit not allowed for both ESS 432 and MIP 432.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 433  Microbial Ecology Laboratory  Credit: 1 (0-3-0)
Also Offered As: ESS 433.
Course Description: Experimental microbial ecology; the design, conduct and interpretation of experiments that illustrate basic principles of microbial ecology.
Prerequisite: MIP 300.
Registration Information: Must be taken concurrently with ESS 432 or MIP 432. Credit not allowed for both ESS 433 and MIP 433.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 443  Microbial Physiology  Credits: 4 (3-0-1)
Course Description: Structure, function of bacterial constituents; comparison with other organisms. Bacterial growth, energy production, biosynthesis.
Prerequisite: (MIP 300) and (BC 351 or BC 401).
Registration Information: Must register for lecture and laboratory.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 450  Microbial Genetics  Credits: 3 (3-0-0)
Course Description: Principles of genetics at molecular level; mutation, recombination, complementation, suppression, control of gene expression, and recombinant DNA.
Prerequisite: (MIP 300) and (BC 351, may be taken concurrently or BC 401, may be taken concurrently).
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 462  Parasitology and Vector Biology  Credits: 5 (3-4-0)
Also Offered As: BSPM 462 and BZ 462.
Course Description: Protozoa, helminthes, and insects and related arthropods of medical importance; systematics, epidemiology, host damage and control.
Prerequisite: (BZ 110 or LIFE 103) and (MIP 302 or LIFE 206 or BZ 212).
Registration Information: Credit allowed for only one of the following: MIP 462, BSPM 462, BZ 462. Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 470  Graduate Fellowship Proposal Preparation  Credit: 1 (0-0-1)
Course Description: Guidance for the process of preparing a proposal for submission to the National Science Foundation.
Prerequisite: None.
Restriction: Must not be a: Freshman, Sophomore, Junior.
Registration Information: Senior standing. This is a partial semester course. Credit not allowed for both MIP 470 and MIP 481A2.
Term Offered: Fall.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MIP 492  Senior Professional Development Seminar  Credits: 2 (1-0-1)
Course Description:
Prerequisite: MIP 342.
Registration Information: Microbiology majors only. Must register for lecture and recitation.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 495  Independent Study  Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: MIP 300.
Registration Information: Written consent of department required.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 496  Group Study  Credits: Var[1-3] (0-0-0)
Course Description: Faculty-supervised investigation of areas of special interest in microbiology, virology, microbial physiology, or microbial genetics.
Prerequisite: None.
Registration Information: Written consent of instructor required.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 498  Research  Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: MIP 302.
Registration Information: Written consent of instructor required.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 520  Fundamentals of Prion Biology  Credit: 1 (1-0-0)
Course Description: Current state of prion research, future research directions, and the relationship of prion disease with other disease systems. Critical reading and synthesis of the literature, with an emphasis on writing skills.
Prerequisite: (BC 351 or MIP 342) and (MIP 300).
Registration Information: Junior standing. Credit not allowed for both MIP 520 and MIP 581A3.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 525 Flow Cytometry for Immunology Credit: 1 (1-0-0)
Course Description: Understand and interpret flow cytometry principles. Background of flow cytometry, experimental design, applications, and brief explanation of cell sorting.
Prerequisite: MIP 342 or MIP 651.
Registration Information: Senior standing. This is a partial semester course. Credit not allowed for both MIP 525 and MIP 581A4.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 530 Advanced Molecular Virology Credits: 4 (3-0-1)
Course Description: Virus-host interactions at the molecular and cellular level.
Prerequisite: (BC 351 or BC 401) and (BC 463 or MIP 450).
Registration Information: Must register for lecture and recitation.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 533 Epidemiology of Infectious Diseases/Zoonoses Credits: 3 (2-0-1)
Also Offered As: VS 533.
Course Description: Epidemiologic features of infectious and parasitic diseases that have a major impact on community medicine.
Prerequisite: MIP 300.
Registration Information: Credit not allowed for both MIP 533 and VS 533. Must register for lecture and recitation.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 535 Vector Collection and Identification Methods Credit: 1 (0-4-0)
Course Description: Training for the collection and morphological identification of mosquitoes and ticks.
Prerequisite: None.
Restriction: Must not be a: Freshman, Sophomore.
Registration Information: Written consent of instructor. This is a partial semester course. Required field trips. Credit not allowed for both MIP 535 and MIP 580A4.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 540 Biosafety in Research Laboratories Credits: 2 (2-0-0)
Course Description: Practical applications of biosafety principles, including lab practices and regulatory aspects of research involving infectious microorganisms and rDNA.
Prerequisite: MIP 300.
Restriction: Must be a: Graduate.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 543 RNA Biology Credits: 3 (3-0-0)
Course Description: Gene expression and regulation that occurs at the level of RNA (e.g., splicing, stability, export, translation, RNAi, etc.).
Prerequisite: BC 351, may be taken concurrently or BC 401, may be taken concurrently.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 545 Microbial Metagenomics/Genomics Data Analysis Credits: 2 (2-0-0)
Course Description: Microbiomes, microbes and their genetic material present in a host/environment, are linked to risk of disease in humans, animals, and plants. Metagenomics, including 16S rRNA community survey methods and shotgun metagenomics, use high throughput sequencing technology to provide insight into the composition and potential function of microbiomes. Hands-on experience with using bioinformatics and statistical tools necessary to process and analyze the resulting large datasets.
Prerequisite: (DSCI 510) and (STAR 511 or STAT 511A).
Registration Information: Senior standing. This is a partial semester course. Credit not allowed for both MIP 545 and MIP 581A2.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 550 Microbial and Molecular Genetics Laboratory Credits: 4 (2-6-0)
Course Description: Use of both in vivo genetics and in vitro molecular techniques to study gene structure, function, and regulation in bacteria.
Prerequisite: MIP 302 and MIP 450.
Registration Information: Written consent of department required. Must register for lecture and laboratory.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: Yes.

MIP 555 Principles and Mechanisms of Disease Credits: 3 (3-0-0)
Course Description: Principles of disease processes; emphasis on reactivity of the diseased cell, tissue, organ, or organism.
Prerequisite: BMS 300.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 563 Biology of Disease Vectors Credits: 3 (3-0-0)
Course Description: Vector physiology and genomics, new strategies in vector control, and vector/host interactions.
Prerequisite: MIP 462 or BZ 565 or BZ 462.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 565 Next Generation Sequencing Platform/Libraries Credit: 1 (0-2-0)
Also Offered As: BZ 565.
Course Description: Theoretical and experimental aspects of next generation sequencing experiments with a focus on the Illumina platform. Students will create and sequence metagenomic and 16S rDNA libraries from soil samples and unknown bacterial cultures.
Prerequisite: None.
Restriction: Must be a: Graduate.
Registration Information: Graduate standing. This is a partial semester course. Credit allowed for only one of the following: BZ 565, CM 581A2, or MIP 565.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 570 Functional Genomics  Credits: 3 (2-2-0)
Course Description: State-of-the-art genomic tools with applications to studies of pathogenesis and pathophysiology of infectious diseases.
Prerequisite: MIP 300 and MIP 302 and MIP 443 and MIP 450.
Restriction: Must register for lecture and laboratory.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 576 Bioinformatics  Credits: 3 (3-0-0)
Also Offered As: BSPM 576.
Course Description: Technical computing across platforms using bioinformatics tools in molecular analysis.
Prerequisite: BC 463 or BZ 350 or CM 501 or CS 155 or ERHS 332 or MIP 275 or MIP 300 or MIP 450 or STAT 307.
Restriction: Credit not allowed for both MIP 576 and BSPM 576.
Term Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 577 Computer Analysis in Population Genetics  Credits: 2 (0-4-0)
Also Offered As: BZ 577.
Course Description: Computational and statistical techniques and practical exercises in discrete and quantitative genetics.
Prerequisite: MIP 578, may be taken concurrently or BZ 578.
Restriction: Credit not allowed for both MIP 577 and BZ 577.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 578 Genetics of Natural Populations  Credits: 4 (3-0-1)
Also Offered As: BZ 578.
Course Description: Theoretical and empirical aspects of the genetics of natural populations; current molecular techniques and statistical analysis.
Prerequisite: (BZ 350 or LIFE 201A or LIFE 201B or SOCR 330) and (STAT 201 or STAT 301 or STAT 307 or ERHS 307).
Restriction: Credit not allowed for both MIP 578 and BZ 578.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 611 Advanced Microbiological Research Methods  Credits: 4 (2-0-2)
Course Description: In-depth presentation of the ever-growing arsenal of techniques needed to be an effective experimental microbiologist/molecular biologist.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Restriction: Written consent of instructor. Sections may be offered: Online.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 612 Applied Immunology  Credits: 3 (3-0-0)
Course Description: Application of classic and modern principles in immunology currently being used in the medical, biotechnology and basic research fields.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 613 Applied Microbiology and Virology  Credits: 4 (4-0-0)
Course Description: Application of bacteria, fungi and viruses in translational research, from drug and vaccine development to the generation of clean energy.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 614 Medical Microbiology  Credits: 3 (3-0-0)
Course Description: In-depth examination of the pathogenic mechanisms of medically important bacteria, fungi, parasites and viruses.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 615 Ophthalmic Pathology  Credit: 1 (0-0-0)
Course Description: Background in normal ocular histology as well as pathologic changes in the eye, taught through a combination of lectures and class discussions.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 616 Modern Molecular Biology for Microbiologists  Credits: 4 (3-0-1)
Course Description: Develop a working knowledge in the theory and applications of modern molecular biology to applied and translational research uses in microbiology.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 617 Principles of Biodefense/Emerging Pathogens Credits: 3 (3-0-0)
Course Description: In-depth analysis of the physiology, biology and epidemiology of biodefense agents and emerging pathogens.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Admission to the MS in Microbiology, Immunology, and Pathology, Plan B program. Sections may be offered: Online.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 620 Advanced Prion Biology Credit: 1 (0-0-1)
Course Description: Foster the development of MIP master's students by improving communication skills and discussion of cutting edge research.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Admission to the MS in Microbiology, Immunology, and Pathology, Plan B program. Must register for lecture and recitation. May be taken twice for credit. Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 628 Immunity to Infection Credits: 3 (3-0-0)
Course Description: How microorganisms have evolved to counteract the immune system and how the immune system has evolved to resist microbes.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 630 Advances in Microbial Physiology Credits: 3 (3-0-0)
Course Description: Contemporary developments in bacterial structure, function, metabolism, and genetics.
Prerequisite: MIP 443.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 636 Mechanisms of Viral Infection and Disease Credits: 4 (3-0-1)
Course Description: Cytopathic mechanisms, pathogenetic events in viral diseases; host response and antiviral immunity; cancer induction by DNA and RNA viruses.
Prerequisite: MIP 420 or MIP 530.
Restriction: Must be a: Graduate, Professional.
Registration Information: Must register for lecture and recitation.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 651 Immunobiology Credits: 3 (3-0-0)
Course Description: Structure, function, regulation of immunoglobulins and the immune system. Cellular immunity including transplantation and cancer.
Prerequisite: MIP 342.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 654 Research Policies and Regulations Credit: 1 (1-0-0)
Course Description: Reviews CSU and federal policies, rules, and regulations on integrity, use of humans and animals, authorship, data, genetics, etc., using case studies.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Sections may be offered: Online.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 666 Writing Scientific Manuscripts  Credits: 3 (0-0-3)
Course Description: Writing biological science manuscripts for publication.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of instructor.
Term Offered: Fall (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 670 Molecular Immunology and Immunogenetics  Credits: 3 (0-0-0)
Course Description: Molecular basis and genetics of immune response. Biochemistry of immunologically mediated diseases.
Prerequisite: MIP 651.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of instructor or DVM degree required.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 667 Advanced Bioanalytic Pathology  Credits: 2 (0-0-0)
Course Description: Laboratory medicine for post-graduate veterinarians and professional veterinary medical students.
Prerequisite: VM 724.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of instructor or DVM degree required.
Term Offered: Spring (odd years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 687 BioPharma Internship  Credit: 1 (0-0-3)
Course Description: Gain experience with a supervised mock project that encompasses the various biopharmaceutical areas while working with experienced staff leading the various units.
Prerequisite: MIP 540 and MIP 611.
Restriction: Must be a: Graduate, Professional.
Registration Information: Admission to the MS Microbiology Plan B program. Written consent of instructor. This is a partial semester course. Background check required. Credit not allowed for both MIP 681A3 and MIP 687.
Term Offered: Spring.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 698 Research Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Enrollment in an MIP graduate program.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 699 Thesis Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Enrollment in an MIP graduate program.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 700 Topics in Microbiology  Credit: 1 (1-0-0)
Course Description: Current literature in bacteriology, virology, genetics, and immunology.
Prerequisite: MIP 300.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 720 Methods of Carbohydrate Analysis  Credits: 2 (1-3-0)
Course Description: Structural analysis of complex carbohydrates using gas chromatography, mass spectrometry, and nuclear magnetic resonance.
Prerequisite: CHEM 346.
Restriction: Must be a: Graduate, Professional.
Registration Information: Must register for lecture and laboratory. This is a partial semester course. Credit not allowed for both ERHS 730 and MIP 730.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 740 Microbial and Molecular Genetics  Credits: 3 (2-0-1)
Course Description: Molecular biology and genetics of prokaryotic and eukaryotic cells and their viruses; strategies for genetic manipulation.
Prerequisite: MIP 450.
Restriction: Must be a: Graduate, Professional.
Registration Information: Must register for lecture and laboratory. This is a partial semester course. Credit not allowed for both ERHS 730 and MIP 730.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.
MIP 766 Cytopathology--Clinical Pathology Credits: 1 (0-0-1)
Course Description: Discussion of cytology cases that are diagnostically challenging, medically interesting, or classic case examples. Discussions and microscopic reviews of the cases will be led by a clinical pathologist.
Prerequisite: MIP 786A and MIP 786B and MIP 786C.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of instructor.
Term Offered: Spring.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MIP 767 Advanced General Pathology Credits: 3 (3-0-0)
Course Description: In-depth detailed study of general pathology and molecular mechanisms of disease. Help prepare students in the Anatomic and/or Clinical Pathology Residency prepare for the ACVP Board examination. Enhance the pathology knowledge and skills of Professional Veterinary Medicine students and graduate students in related disciplines.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Fall.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 768 Advanced Clinical Pathology Credits: 2 (2-0-0)
Course Description: In-depth clinical pathology (cytology, hematology, and biochemistry) for post-professional students in CVMBS residency and/or graduate degree programs.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Credit not allowed for both MIP 768 and MIP 781A2.
Term Offered: Spring.
Grade Mode: Traditional.
Special Course Fee: No.

MIP 778 Pathobiology of Laboratory Animals Credits: 3 (3-0-0)
Course Description: Unique natural biology and diseases of laboratory animal species emphasizing clinical, diagnostic, morphologic and clinical pathologic features.
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 779 Laboratory Animal Pathology Rotation Credits: 1 (1-0-0)
Course Description: Using case material compiled from submissions to the Laboratory Animal Resources necropsy service, the VTH Diagnostic services, the Armed Forces Institute of Pathology, and other resources, analyze selected slides demonstrating histologic pathology in laboratory animals. Prepare a description of the slide, provide a diagnosis and a brief summary of the pathogenesis.
Prerequisite: MIP 778.
Restriction: Must be a: Graduate, Professional.
Registration Information: Credit not allowed for both MIP 779 and MIP 780A1.
Term Offered: Spring (even years).
Grade Mode: Traditional.
Special Course Fee: No.

MIP 784 Supervised College Teaching Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of department required.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 786A Practicum: Comparative Gross and Histologic Pathology Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Post-DVM graduate students only.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 786B Practicum: Surgical Pathology Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Post-DVM graduate students only.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 786C Practicum: Clinical Pathology Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Post-DVM graduate students only.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 786D Practicum: Comparative Medicine Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Post-DVM graduate students only.
Terms Offered: Fall, Spring, Summer.
Grade Mode: S/U Sat/Unsat Only.
Special Course Fee: No.

MIP 792A Seminar: Research/Graduate Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: M.S. and Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 792B Seminar: Research/Faculty Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: M.S. and Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.
MIP 792C Seminar: Microscopic and Bioanalytic Pathology Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: M.S. and Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 792D Seminar: Anatomic Pathology Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: M.S. and Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 792E Seminar: Clinical Pathology Credits: Var[1-3] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: M.S. and Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 795 Independent Study Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Written consent of department required.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 796 Group Study Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 798 Research Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.

MIP 799 Dissertation Credits: Var[1-18] (0-0-0)
Course Description:
Prerequisite: None.
Restriction: Must be a: Graduate, Professional.
Registration Information: Ph.D. candidates only. Maximum of 3 credits allowed per subtopic.
Terms Offered: Fall, Spring, Summer.
Grade Mode: Instructor Option.
Special Course Fee: No.