BIOMEDICAL SCIENCE MAJOR: MEDICAL AND VETERINARY SCIENCES OPTION (B.S.)

https://colsa.unh.edu/molecular-cellular-biomedical-sciences/program/bs/biomedical-science-major-medical-veterinary

Description

The **Biomedical Science: Medical and Veterinary Sciences (BMS:MVS)** program is founded on the principles of the One Health Initiative, which unites human and veterinary medicine. This rigorous academic program meets requirements for entry into veterinary school, medical school, and graduate school in the area of biomedical science or for a career as a research scientist in either the biotechnology/pharmaceutical sector or government and academic research labs.

You will select elective courses from three major areas of study:

- biomedical systems
- pathobiology and disease
- public health and environmental issues

As a BMS:MVS major, you have many opportunities for career-relevant learning experiences including:

- NH Veterinary Diagnostic Laboratory located on the UNH campus
- UNH Agricultural Experiment Station farm facilities
- independent research in laboratories of UNH biomedical science faculty
- experience in local hospitals
- internships in biotechnology and pharmaceutical companies in the Greater Boston area

BMS:MVS graduates are prepared for post-baccalaureate education in:

- **professional health programs**
  - veterinary school
  - medical school
  - allied health programs (physician assistant or pathologist's assistant)
- **graduate programs**
  - biomedical science
  - pathology
  - public health
  - nursing

Careers of previous Medical & Veterinary Sciences graduates include:

- **research scientists/laboratory technicians**
  - biotechnology and pharmaceutical companies
  - academic biomedical research programs
  - forensic laboratories
  - hospitals/health clinics
- **state and federal government employment**
  - public health laboratories
  - health inspector (e.g., Food and Drug Administration)

Requirements

Students in the Medical and Veterinary Sciences (MVS) option take eight Foundation courses, six Bioscience Core courses, three BMS-MVS Core courses, and six BMS-MVS Major Elective courses. One capstone experience, supervised and approved within the major, is required of all seniors. In addition, all other university academic requirements must be completed, including those for the Discovery Program and the University Writing Requirement.

A grade of C-minus or above is required in all courses within the major, which includes Foundation courses, Bioscience Core, BMS-MVS Core and BMS-MVS Major Electives.

Students applying to health profession schools need a full year of English. ENGL 415C, ENGL 419, ENGL 501, ENGL 502 or ENGL 503 should be taken in addition to ENGL 401. For further details, visit the Pre-Professional Health Program Advising Office on-line or in person (Rudman Hall, Room G02).

Foundation Courses

Code	Title	Credits
CHEM 403	General Chemistry I [1]	4
CHEM 404	General Chemistry II	4
CHEM 651 & CHEM 653	Organic Chemistry I and Organic Chemistry Laboratory	5
CHEM 652 & CHEM 654	Organic Chemistry II and Organic Chemistry Laboratory	5
MATH 424B	Calculus for Life Sciences [2]	4
BIOL 528	Applied Biostatistics I	4
PHYS 401	Introduction to Physics I	4
PHYS 402	Introduction to Physics II	4

1 CHEM 403 fulfills the Physical Science Discovery requirement

2 MATH 424B fulfills the Quantitative Reasoning Discovery requirement

Bioscience Core Courses

Code	Title	Credits
BIOL 411	Introductory Biology: Molecular and Cellular [3]	4
BIOL 412	Introductory Biology: Evolution, Biodiversity and Ecology	4
BMS 503 & BMS 504	General Microbiology and General Microbiology Laboratory	5
GEN 604	Principles of Genetics	4
BMCB 605	Principles of Cell Biology	4
BMCB 658 & BMCB 659	General Biochemistry and General Biochemistry Lab	5

3 BIOL 411 fulfills the Biological Science Discovery requirement, Discovery Laboratory requirement, and the Discovery Inquiry requirement.

BMS-MVS Core Courses

Code	Title	Credits
BMS 401	Professional Perspectives in Biomedical Sciences	1
BMS 507	Human Anatomy and Physiology I	4
or ANSC 511	Anatomy and Physiology	
BMS 508	Human Anatomy and Physiology II	4
or ANSC 512	Anatomy and Physiology	

BMS-MVS Major Elective Courses

A total of six **unique** major elective courses are required. Two courses must be taken in each of the following subject areas: biomedical systems, pathobiology and disease, and health and environmental issues.

Biomedical Systems Electives

Recommended Courses

Code	Title	Credits
BMS 702	Endocrinology	4
BMS 718	Mammalian Physiology	4
BMCB 760	Pharmacology	4
GEN 717	Molecular Microbiology	5
NUTR 750	Nutritional Biochemistry	4

Other Appropriate Courses

Code	Title	Credits
BMS 623	Histology: Microscopic Cellular Structure and Function	4
BMS 740	Human Microbiome	4
ANSC 605	Poultry Production and Health Management	4
ANSC 609	Principles of Animal Nutrition	4
ANSC 612	Genetics of Domestic Animals	4
ANSC 698	Cooperative for Real Education in Agricultural Management (CREAM)	4
ANSC 701	Physiology of Reproduction	4
ANSC 708	Ruminant Nutritional Physiology	3
ANSC 710	Dairy Nutrition	4
ANSC 715	Physiology of Lactation	4
ANSC 724	Reproductive Management and Artificial Insemination	4
BMCB 753	Cell Culture	5
BMCB 754	Molecular Biology Research Methods	5
BMCB 794	Protein Structure and Function	4
CHE 762	Biomedical Engineering	4
GEN 704	Genetics of Prokaryotic Microbes	5
GEN 705	Population Genetics [4]	3
GEN 706	Human Genetics	4
GEN 711	Genomics and Bioinformatics	4
GEN 713	Microbial Ecology and Evolution	4
GEN 715	Molecular Evolution	4
GEN 721	Comparative Genomics	4
GEN 771	Molecular Genetics	4
KIN 684 & KIN 685	Emergency Medical Care: Emergency Medical Technician (EMT) and Emergency Medical Care: EMT Lab	5
ZOOL 613	Animal Behavior	5
ZOOL 777	Neuroethology (the Neural Basis of Animal Behavior)	4

4 Enrolling in GEN 725 concurrently is encouraged but not required

Pathobiology and Disease Electives

Recommended Courses

Code	Title	Credits
BMS 602	Pathogenic Microbiology	3
BMS 655	Human and Animal Parasites	3
BMS 704	Pathologic Basis of Disease	4
BMS 705	Immunology	3
BMS 711	Toxicology	4
BMS 719	Host-Microbe Interactions	4
BMCB 763	Biochemistry of Cancer	4

Other Appropriate Courses

Code	Title	Credits
BMS 644	Clinical Hematology	3
BMS 650	Molecular Diagnostics	4
BMS 656	Immunohematology	3
BMS 658	Medical Biochemistry	3
BMS 703	Infectious Disease and Health	4
BMS 706	Virology	3
BMS 720	Mycology, Parasitology, and Virology	3
NUTR 773	Clinical Nutrition	4

Health and Environmental Issues Electives

Recommended Courses

Code	Title	Credits
BMS 716	Public Health: Food- and Water-borne Diseases	4
BMS 730	Ethical Issues in Biomedical Science	4
ANSC 750	Collaborative Farm Design and Development	4
ANTH 610	Medical Anthropology: Illness and Healing	4
BIOL 541	Ecology	4
HMP 401	United States Health Care Systems [5]	4
HMP 501	Epidemiology and Community Medicine	4
NR 435	Contemporary Conservation Issues and Environmental Awareness [5]	4
SOC 635W	Medical Sociology	4

5 Only one 400-level course may be taken to fulfill a Major Elective requirement.

Other Appropriate Courses

Code	Title	Credits
ANTH 685	Gender, Sexuality and HIV/AIDS in Sub-Saharan Africa	4
CLAS 525	Greek and Latin Origins of Medical Terms	4
HMP 642	Health Economics	4
HMP 669	Human Behavior and the Public Health	4
NR 650	Principles of Conservation Biology	4
PSYC 531	Psychobiology	4
PSYC 737	Behavioral Medicine	4

BMS: MVS Capstone

The capstone explores areas of interest based on the integration of prior learning. The capstone requirement may be satisfied through a course, created work or product, or some form of experiential learning (e.g., honors thesis, mentored research project, or other special student activity). Students may take more than one capstone course. Capstone completion is never displayed on Degree Works; your advisor will certify capstone completion at the time of graduation. Students must have 90 credits or more when completing their capstone requirement. See your advisor for questions about capstones.

Approved BMS:MVS Capstone Courses

Code	Title	Credits
BMS 635	Preceptorial in Prehospital Care (4-credit minimum)	2
BMS 702	Endocrinology	4
BMS 704	Pathologic Basis of Disease	4
BMS 711	Toxicology	4
BMS 718	Mammalian Physiology	4
BMS 719	Host-Microbe Interactions	4
BMS 740	Human Microbiome	4
BMS 795	Investigations in Biomedical Science (4-credit minimum)	1-8
BMS 795W	Investigations in Biomedical Science (4-credit minimum)	1-8
BMS 799	Senior Thesis (4-credit minimum)	1-4
BMS 799H	Senior Honors Thesis (4-credit minimum)	1-4
BMCB 763	Biochemistry of Cancer	4
ANSC 605	Poultry Production and Health Management	4
ANSC 698	Cooperative for Real Education in Agricultural Management (CREAM)	4
BMCB 753	Cell Culture	5
INCO 790	Advanced Research Experience (4-credit minimum)	1-4
NUTR 750	Nutritional Biochemistry	4
Other 795 Investigations course in the biological sciences (4-credit minimum)		

For a Capstone experience not listed above, such as an internship, submit a Capstone Experience Approval form **prior** to beginning the experience.

Degree Plan

SAMPLE Course Sequence for Medical and Veterinary Sciences. Several courses are flexible in order of completion, as indicated by footnotes.

Course	Title	Credits
First Year		
Fall		
BMS 401	Professional Perspectives in Biomedical Sciences	1
BIOL 411	Introductory Biology: Molecular and Cellular	4
CHEM 403	General Chemistry I	4
ENGL 401	First-Year Writing	4
Discovery Course		4
	Credits	**17**
Spring		
BIOL 412	Introductory Biology: Evolution, Biodiversity and Ecology	4
CHEM 404	General Chemistry II	4
MATH 424B	Calculus for Life Sciences	4
Discovery Course		4
	Credits	**16**
Second Year		
Fall		
BMS 507 or ANSC 511	Human Anatomy and Physiology I or Anatomy and Physiology	4
BMCB 605	Principles of Cell Biology [1]	4
CHEM 651 & CHEM 653	Organic Chemistry I and Organic Chemistry Laboratory	5
Discovery Course		4
	Credits	**17**
Spring		
BMS 508 or ANSC 512	Human Anatomy and Physiology II or Anatomy and Physiology	4
CHEM 652 & CHEM 654	Organic Chemistry II and Organic Chemistry Laboratory	5
BMS 503 & BMS 504	General Microbiology and General Microbiology Laboratory [1]	5
Discovery Course		4
	Credits	**18**
Third Year		
Fall		
BIOL 528	Applied Biostatistics I	4
BMCB 658 & BMCB 659	General Biochemistry and General Biochemistry Lab	5
PHYS 401	Introduction to Physics I	4
GEN 604	Principles of Genetics [1]	4
	Credits	**17**
Spring		
PHYS 402	Introduction to Physics II	4
Major Elective		4
Major Elective		4
Discovery Course		4
	Credits	**16**
Fourth Year		
Fall		
Major Elective (Capstone)		4
Major Elective		4
Discovery Course		4
Elective (any course)		4
	Credits	**16**
Spring		
Major Elective		4
Major Elective		4
Elective (any course)		4
	Credits	**12**
	Total Credits	**129**

[1] BMCB 605, BMS 503 & BMS 504, and GEN 604 and may be taken in other semesters, but all should be completed by the end of Fall semester in junior year.

Student Learning Outcomes

SLO: Core Knowledge in Biomedical Science with an emphasis on Medical and Veterinary Sciences.

- Students will be able to correlate patient history, symptoms and laboratory test results with the diagnosis and treatment of clinical disease states.
- Students will be able to interpret, analyze, and identify clinical laboratory results.
- Students will be able to define the mechanisms that give rise to human diseases and/or organ system dysfunction, including hypersensitivity, renal disease, acid-base disorders, etc.
- Students will be able to recognize risk factors for the development of disease.
- Students will be able to identify appropriate testing methodologies and assays for diagnosis of clinical diseases and organ system dysfunction and explain the underlying principle(s).

SLO: Quantitative Literacy, Inquiry & Analysis

- Students will be able to apply the scientific method to examine experimental evidence and draw informed conclusions.
- Students will be able to use graphs to represent scientific data.
- Students will be able to apply statistical methods to interpret scientific data.

SLO: Critical Thinking & Problem Solving

- Students will be able to use data to troubleshoot an unexpected outcome.
- Students will be able to apply core knowledge to critically interpret scientific data.

SLO: Written Communication

- Students will demonstrate written skills to communicate scientific knowledge and experimental data.

SLO: Oral Communication

- Students will be able to demonstrate oral presentation skills to communicate scientific knowledge and experimental data.