

MOLECULAR, CELLULAR, BIOMEDICAL SCIENCES

The Department of Molecular, Cellular and Biomedical Sciences provides a profession-ready education with extensive and diverse course offerings and opportunities to conduct cutting-edge research in the biomedical and molecular/cellular life sciences.

For undergraduates, we offer the bachelor of science (B.S.) in:

- Biochemistry, Molecular & Cellular Biology
- Biomedical Science
- Genetics

<https://colsa.unh.edu/molecular-cellular-biomedical-sciences>

Programs

- [Biochemistry, Molecular and Cellular Biology \(BMCB\)](#)
- [Biomedical Science \(BMS\)](#)
- [Genetics \(GEN\)](#)

Courses

Biochemistry, Molecular and Cellular Biology (BMCB)

BMCB 501 - Biological Chemistry

Credits: 4

Survey of the molecular basis of life with a focus on the mechanisms of biochemical reactions in metabolic pathways, beginning with an overview of functional groups and organic reactions relevant for living organisms. Bioenergetics of carbohydrate, lipid, and nitrogen metabolic pathways.

Prerequisite(s): (CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D- or CHEM 404H with a minimum grade of D-)) or CHEM 411 with a minimum grade of D-.

Mutual Exclusion: No credit for students who have taken BMCB 658, BMCB 751, BMCB 752.

Grade Mode: Letter Grading

BMCB 605 - Principles of Cell Biology

Credits: 4

Cell and developmental biology of multicellular eukaryotic organisms. Structure and function of major cellular compartments; mechanisms of cellular communication and dynamics; embryonic development.

Special topics: subcellular organization and function; membrane biogenesis; signal transduction; mitogenesis; apoptosis; autophagy; tumor suppressors and cell cycle regulation; cytokinesis; cytoskeletal dynamics; cellular shape and motility; stem cell biology; organogenesis; morphogenesis and patterning.

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-) and CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D- or CHEM 404H with a minimum grade of D-).

Equivalent(s): BIOL 605, BSCI 735

Grade Mode: Letter Grading

BMCB 658 - General Biochemistry

Credits: 3

Comprehensive, introductory course emphasizing the cellular metabolism and the structure and function of proteins, nucleic acids, carbohydrates, and lipids.

Co-requisite: BMCB 659

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or BMS 507 with a minimum grade of D-) and ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)).

Equivalent(s): BMCB 658A

Mutual Exclusion: No credit for students who have taken BMCB 501.

Grade Mode: Letter Grading

BMCB 658A - General Biochemistry

Credits: 3

Comprehensive, introductory course emphasizing the cellular metabolism and the structure and function of proteins, nucleic acids, carbohydrates, and lipids. This course is intended for programs that do not require a biochemistry laboratory.

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or BMS 507 with a minimum grade of D-) and ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)).

Equivalent(s): BMCB 658

Mutual Exclusion: No credit for students who have taken BMCB 501.

Grade Mode: Letter Grading

BMCB 659 - General Biochemistry Lab

Credits: 2

Structured laboratory experiments that provide training in analytical and preparative techniques fundamental to modern biochemistry and molecular biology.

Co-requisite: BMCB 658

Equivalent(s): BCHM 659, BMCB 659W

Grade Mode: Letter Grading

Special Fee: Yes

BMCB 659W - General Biochemistry Lab

Credits: 2

Structured laboratory experiments that provide training in analytical and preparative techniques fundamental to modern biochemistry and molecular biology.

Co-requisite: BMCB 658

Attributes: Writing Intensive Course

Equivalent(s): BCHM 659, BMCB 659

Grade Mode: Letter Grading

Special Fee: Yes

BMCB #750 - Physical Biochemistry**Credits:** 3

Structure, interactions, and physical-chemical properties of biomolecules. Thermodynamic, kinetic, and spectroscopic methods for the study of proteins and nucleic acids.

Prerequisite(s): ((CHEM 545 with a minimum grade of D- and CHEM 546 with a minimum grade of D-) or (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-)) and (MATH 424B with a minimum grade of D- or MATH 425 with a minimum grade of D-).

Equivalent(s): BCHM 750**Grade Mode:** Letter Grading**BMCB 751 - Principles of Biochemistry I****Credits:** 4

In-depth survey of biochemistry: macromolecular structure; structure and function of proteins, nucleic acids, carbohydrates, and lipids; introduction to metabolic pathways.

Prerequisite(s): (CHEM 547 with a minimum grade of D- and CHEM 548 with a minimum grade of D-) or (CHEM 651 with a minimum grade of D- and CHEM 652 with a minimum grade of D-).

Equivalent(s): BCHM 751**Mutual Exclusion:** No credit for students who have taken BMCB 501.**Grade Mode:** Letter Grading**BMCB 752 - Principles of Biochemistry II****Credits:** 4

In-depth survey of biochemistry: metabolism of amino acids, nucleotides, carbohydrates and lipids; synthesis and regulation of macromolecules; molecular biology of the eukaryotic cell.

Prerequisite(s): BMCB 751 with a minimum grade of D-.

Equivalent(s): BCHM 752**Mutual Exclusion:** No credit for students who have taken BMCB 501.**Grade Mode:** Letter Grading**BMCB 753 - Cell Culture****Credits:** 5

Principles and technical skills fundamental to the culture of animal and plant cells, tissues, and organs. Introduction to the techniques of sub-culturing, establishing primary cultures, karyotyping, serum testing, cloning, growth curves, cryopreservation, hybridoma formation and monoclonal antibody production, and organ cultures. Application of cell culture to contemporary research in the biological sciences. Lab.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): ANSC 751, MICR 751, PBIO 751**Grade Mode:** Letter Grading**Special Fee:** Yes**BMCB 754 - Molecular Biology Research Methods****Credits:** 5

Theory and application of current technologies to manipulate DNA. Hands-on research experience that includes DNA isolation and quantitation methods, cloning, PCR, DNA sequencing, and analysis of gene products. Lab.

Attributes: Writing Intensive Course

Prerequisite(s): GEN 604 with a minimum grade of D-.

Equivalent(s): BCHM 754, BSCI 765, GEN 754, PBIO 754**Grade Mode:** Letter Grading**Special Fee:** Yes**BMCB 755 - Protein Biochemistry Laboratory****Credits:** 5

Application of modern approaches to the characterization and purification of proteins. Emphasis on recombinant protein production and purification, analytical techniques for characterization of proteins, enzyme kinetics, and molecular visualization of protein structure.

Attributes: Writing Intensive Course

Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-.

Grade Mode: Letter Grading**Special Fee:** Yes**BMCB 760 - Pharmacology****Credits:** 4

Introduction to the basic principles and fundamental concepts of pharmacology, with a focus on molecular mechanisms and pathological basis of therapeutics and their curative effects. Topics include: foundations of pharmacology including pharmacodynamics and pharmacogenomics; drugs affecting other systems; chemotherapeutic drugs.

Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-.

Mutual Exclusion: No credit for students who have taken BSCI 680.**Grade Mode:** Letter Grading**BMCB 763 - Biochemistry of Cancer****Credits:** 4

Evaluation of the hallmarks of cancer, including molecular mechanisms of carcinogenesis, roles of oncogenes and dysregulated cell development, function and metabolism, tumor immunology, and the biological basis of cancer therapy.

Prerequisite(s): (BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-) and BMCB 605 with a minimum grade of D-.

Equivalent(s): BCHM 763**Grade Mode:** Letter Grading**BMCB 790 - Undergraduate Teaching Experience****Credits:** 1-4

Provide academic support to graduate teaching assistants or faculty in preparing, presenting, and executing Biochemistry, Molecular and Cellular Biology lectures or labs.

Repeat Rule: May be repeated for a maximum of 4 credits.**Grade Mode:** Letter Grading**BMCB 794 - Protein Structure and Function****Credits:** 4

Analysis of how the three-dimensional architecture of soluble and membrane proteins contributes to their biochemical function; methods for determining the structure of proteins; protein folding; protein targeting; mechanisms of enzyme catalysis. Computer resources used for protein modeling and structural prediction.

Prerequisite(s): BMCB 658 with a minimum grade of D- or BMCB 751 with a minimum grade of D-.

Equivalent(s): BCHM 794**Grade Mode:** Letter Grading**BMCB 795 - Investigations in Molecular and Cellular Biology****Credits:** 1-4

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.

Repeat Rule: May be repeated for a maximum of 8 credits.**Equivalent(s):** BCHM 795, BCHM 795W, BMCB 795W**Grade Mode:** Letter Grading

BMCB 795W - Investigations in Molecular and Cellular Biology**Credits:** 1-4

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.

Attributes: Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Equivalent(s):** BCHM 795, BCHM 795W, BMCB 795**Grade Mode:** Letter Grading**BMCB 799 - Senior Thesis****Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in biochemistry, molecular and cellular biology. Final product is a written thesis. One or two semesters.

Attributes: Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Equivalent(s):** BCHM 699, BCHM 799, BCHM 799H, BMCB 799H**Grade Mode:** Letter Grading**BMCB 799H - Honors Senior Thesis****Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in biochemistry, molecular and cellular biology and in the Honors Program. Final product is a written thesis. One or two semesters.

Attributes: Honors course; Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Equivalent(s):** BCHM 799, BCHM 799H, BMCB 799**Grade Mode:** Letter Grading**Biomedical Science (BMS)****BMS #405 - In Sickness and in Health: Understanding Why Bodies Fail****Credits:** 4

This course describes the basic structure and function of various organs and systems, then discuss many common diseases and conditions that impact humans, such as meningitis, Alzheimer's, diabetes, HIV/AIDS, asthma, and schizophrenia. Primary focus is on the physical process of disease but the course will also examine the emotional and social impact of certain diseases.

Attributes: Biological Science(Discovery)**Grade Mode:** Letter Grading**BMS 407 - Germs 101****Credits:** 4

Societal and technological impact of the invisible microbial world on our lives and on the planet. Weekly extra-class activities enable students to use the scientific method of inquiry to explore topics like bacteria that use sunlight to live or use of bacteria in genetic engineering. Presents germs from different perspectives: as living organisms, as human enemies or friends, and as represented in newspapers or on TV. Especially useful for people with microphobia. No credit for BMS or Biology majors.

Attributes: Biological Science(Discovery)**Equivalent(s):** BIOL 407, BMS 408, MICR 407**Grade Mode:** Letter Grading**BMS 501 - Microbes in Human Disease****Credits:** 4

Identification, pathogenesis, epidemiology, treatment, and prevention of medically important microorganisms. The biology of clinically relevant bacteria, viruses, fungi, and parasites is presented in relation to disease progress and host defense mechanisms. Clinical correlations that indicate microbes are causative agents of disease are emphasized. The laboratory introduces techniques for identification of pathogenic microorganisms to reinforce and expand the theoretical content. Lab.

Attributes: Biological Science(Discovery); Discovery Lab Course**Equivalent(s):** BMS 501H, MICR 501, MICR 501H, MICR 502**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 503 - General Microbiology****Credits:** 3

Principles of microbiology; morphology, physiology, genetics, culture, and classification of bacteria and other microorganisms; relationships of microbes to agriculture, environment, industry, sanitation, and infectious diseases.

Co-requisite: BMS 504

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BMS 507 with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and ((CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D-) or CHEM 404H with a minimum grade of D-) or CHEM 405 with a minimum grade of D-).

Equivalent(s): MICR 503**Grade Mode:** Letter Grading**BMS 504 - General Microbiology Laboratory****Credits:** 2

Practical laboratory training in general microbiology. Topics include safe handling, visualization, and physiological identification of microorganisms with special attention given to aseptic technique.

Co-requisite: BMS 503**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 507 - Human Anatomy and Physiology I****Credits:** 0 or 4

Cellular and systematic aspects of the human body. Laboratory exercises utilize preserved specimens, dissectible models, living tissue and computer-aided instruction. Systems covered include: the cell, chemistry, tissues, integument, osseous tissue and the skeleton, muscular tissue and muscles, nerves, the brain, spinal cord, autonomic nervous system, and special senses. Lab.

Attributes: Biological Science(Discovery); Discovery Lab Course**Mutual Exclusion:** No credit for students who have taken ANSC 511.**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 508 - Human Anatomy and Physiology II****Credits:** 0 or 4

Cellular and systematic aspects of the human body. Laboratory exercises utilize preserved specimens, dissectible models, living tissue and computer-aided instruction. Systems covered include: endocrine, blood, cardiovascular, respiratory, immune, digestive and metabolism, urinary, acid-base and electrolyte balance, reproductive.

Attributes: Biological Science(Discovery); Discovery Lab Course

Prerequisite(s): BIOL 411 with a minimum grade of D- or BMS 507 with a minimum grade of D- or BIOL 413 with a minimum grade of D-.

Mutual Exclusion: No credit for students who have taken ANSC 512.**Grade Mode:** Letter Grading**Special Fee:** Yes

BMS 560 - Body Fluids**Credits:** 3

The study of diseases and disorders through the analysis of extra-vascular body fluids. Emphasizes renal anatomy and physiology, and diseases and metabolic disorders affecting renal function.

Equivalent(s): BMS 660, MEDT 665, MLS 660, MLS 665**Grade Mode:** Letter Grading**BMS 561 - Body Fluids Laboratory****Credits:** 1

Practical experience in the performance and clinical correlation of urinalysis and selected body fluid procedures.

Co-requisite: BMS 560**Equivalent(s):** BMS 661, MEDT 665, MLS 661, MLS 665**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 600 - Field Experience****Credits:** 1-4

Supervised experience providing the opportunity to apply academic experience in settings associated with future professional employment and/or related graduate opportunities. Must be approved by a faculty advisor selected by the student. Only 4 credits can be used toward the major.

Repeat Rule: May be repeated for a maximum of 8 credits.**Equivalent(s):** BMS 600W, MICR 600, MICR 600W**Grade Mode:** Credit/Fail Grading**BMS 602 - Pathogenic Microbiology****Credits:** 3

An introduction to microbial disease, with a focus on bacterial and viral diseases in humans and animals. This course examines the clinical presentation, laboratory diagnosis, and treatment of specific microbial pathogens. Molecular aspects of both microbial infection and host immune response are discussed. Case studies based on real clinical and research microbiology problems are presented.

Prerequisite(s): BMS 501 with a minimum grade of D- or (BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-).**Equivalent(s):** MICR 602, MICR 700**Grade Mode:** Letter Grading**BMS 603 - Pathogenic Microbiology Laboratory****Credits:** 2

An introduction to morphologic, cultural, biochemical and pathogenic characteristics of microorganisms causing human and animal diseases. Laboratory exercises focus on both classical and modern laboratory diagnostic testing.

Co-requisite: BMS 602**Prerequisite(s):** BMS 501 with a minimum grade of D- or (BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-).**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 610 - Biomedical Lab Management****Credits:** 4

Overview of biomedical laboratory management, including lab operation, compliance, financial management, personnel management, information systems, and leadership.

Attributes: Writing Intensive Course**Equivalent(s):** MEDT 610, MLS 610**Grade Mode:** Letter Grading**BMS 623 - Histology: Microscopic Cellular Structure and Function****Credits:** 4

Cellular structure, function, and physiology, as well as the interactions between cells in different organ systems, are examined at the microscopic level. Digital microscopic images are utilized to examine the cellular structure of all organ systems and the interactions between cells in these organs. Hybrid course with online lab.

Prerequisite(s): (ANSC 511 with a minimum grade of D- and ANSC 512 with a minimum grade of D-) or ((BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BMS 507 with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and BMS 508 with a minimum grade of D-).**Grade Mode:** Letter Grading**BMS 635 - Preceptorial in Prehospital Care****Credits:** 2

Practice and evaluation of prehospital care. Understand the roles of different provider levels in a healthcare setting. Students participate in ambulance activities, then discuss assessment and treatment of patients in the prehospital setting. Licensure by the New Hampshire Bureau of EMS required before course start date.

Prerequisite(s): KIN 684 with a minimum grade of D- and KIN 685 with a minimum grade of D-.**Repeat Rule:** May be repeated for a maximum of 4 credits.**Grade Mode:** Credit/Fail Grading**BMS 640 - Phlebotomy Theory****Credits:** 2

Theory and demonstration of procedures involved in blood collection with an emphasis on safety and professionalism. Hands-on practice of selected techniques.

Equivalent(s): MLS 640, MLS 650A**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 641 - Phlebotomy Clinical Internship****Credits:** 1-2

Students obtain experience and proficiency in routine blood collection techniques at a health care facility (80 to 120 hours).

Prerequisite(s): BMS 640 with a minimum grade of D-.**Equivalent(s):** MLS 641, MLS 650B**Grade Mode:** Credit/Fail Grading**Special Fee:** Yes**BMS 642 - Clinical Immunology and Serology****Credits:** 2

Innate and specific immunity in the context of chemical and cellular responses to antigenic challenge. Also introduces the immunologic basis of autoimmunity, immune proliferation and deficiency, and hypersensitivity. Current clinical analytical methodologies and diagnostic criteria used to identify, differentiate and/or monitor these responses and conditions included.

Prerequisite(s): ((BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D-) and (BIOL 412 with a minimum grade of D-) or BIOL 412H with a minimum grade of D-) or (BMS 507 with a minimum grade of D- and BMS 508 with a minimum grade of D-) or (ANSC 511 with a minimum grade of D- and ANSC 512 with a minimum grade of D-).**Equivalent(s):** MEDT 651, MLS 642, MLS 651**Grade Mode:** Letter Grading

BMS 643 - Clinical Serology Laboratory**Credits:** 2

Performance, interpretation and application of serological techniques for the diagnosis of immune system disorders.

Co-requisite: BMS 642**Equivalent(s):** MEDT 651, MLS 643, MLS 651**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 644 - Clinical Hematology****Credits:** 3

Human blood cell physiology in both health and disease. Includes benign and malignant conditions of red blood cells and white blood cells.

Equivalent(s): MLS 644, MLS 652**Grade Mode:** Letter Grading**BMS 645 - Clinical Hematology Laboratory****Credits:** 2

Analysis of whole blood for cellular components with special emphasis on differentiating benign from malignant processes, as well as cellular identification by morphologic characteristics and cytochemical staining.

Co-requisite: BMS 644**Equivalent(s):** MLS 645, MLS 652L**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 646 - Clinical Hemostasis****Credits:** 1

Introduction to hemostasis through evaluation of platelets, blood vessels, coagulation factors and fibrinolysis, including dysfunction and disease states.

Prerequisite(s): BMS 644 (may be taken concurrently) with a minimum grade of D-.**Grade Mode:** Letter Grading**BMS 650 - Molecular Diagnostics****Credits:** 4

Fundamental principles of molecular technology and techniques used in clinical laboratories such as nucleic acid extraction, DNA amplification, sequencing and hybridization, gel electrophoresis, and chromosome analysis. Prediction and detection of human disease (infectious disease, cancer, and other inherited disease), identity testing, molecular epidemiology, pharmacogenetics, and ethical issues. Previous knowledge of genetics and biochemistry lab techniques is highly recommended.

Attributes: Environment, TechSociety(Disc)**Equivalent(s):** BMS 755, BSCI 765, MLS 755**Grade Mode:** Letter Grading**BMS 655 - Human and Animal Parasites****Credits:** 3

Introduction to the parasitic process in humans and different animals indigenous to domestic and foreign areas of the world. Topics include epidemiology, infection, control, genetics, and immunology, as well as global economic consequences.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.**Grade Mode:** Letter Grading**BMS 656 - Immunohematology****Credits:** 3

The immunology of blood, including blood group systems and the critical role they play in safe transfusion medicine. Additional topics include blood collection, component use, transfusion reactions, and transfusion-transmitted infections.

Equivalent(s): MEDT 653, MLS 653, MLS 656**Grade Mode:** Letter Grading**BMS 657 - Blood Banking Laboratory****Credits:** 1

Hands-on experience in clinical blood banking practices including blood typing, antibody screening and identification, cross matching, and confirmatory testing.

Co-requisite: BMS 656**Equivalent(s):** MEDT 653, MLS 653, MLS 657**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 658 - Medical Biochemistry****Credits:** 3

Use of body fluids to assess specific disease states including the pathophysiology of the disease, pre-analytical issues, analytical methodologies, and instrumentation. Topics include the biochemistry of analytes (amino acids, proteins, enzymes, tumor markers, non-protein nitrogen metabolites, carbohydrates, lipids, electrolytes, blood gases, etc.), clinical endocrinology, toxicology and therapeutic drug monitoring.

Prerequisite(s): BMCB 658 with a minimum grade of D- and BMCB 659 with a minimum grade of D- and (BIOL 528 with a minimum grade of D- or PSYC 402 with a minimum grade of D- or SOC 402 with a minimum grade of D- or MATH 439 with a minimum grade of D-).**Equivalent(s):** MEDT 654, MLS 654, MLS 658**Grade Mode:** Letter Grading**BMS 659 - Clinical Chemistry Laboratory****Credits:** 2

Measurement of blood analytes such as proteins, glucose, electrolytes, and cholesterol, etc. Screening for drugs in urine and evaluation of clinical significance in human specimens. Principles of spectrometry, immunoassay, point-of-care testing, chromatography, mass spectrometry, electrophoresis, automation, and ion selective electrodes, with emphasis on instrumentation, quality control, and pre-analytical and analytical issues.

Co-requisite: BMS 658**Equivalent(s):** MLS 654L, MLS 659**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 702 - Endocrinology****Credits:** 4

Structure and function of vertebrate endocrine systems through the lens of physiology, biochemistry, and cell and molecular biology, with special reference to mammals. Current investigations of the body's major endocrine glands, such as the brain, thyroid, pancreas, adrenals and gonads, as regulators and integrators of biological systems. Principles of Cell Biology recommended prior to taking this course.

Equivalent(s): ANSC 702, BCHM 702**Grade Mode:** Letter Grading

BMS 703 - Infectious Disease and Health**Credits:** 4

Principles underlying the nature of infectious disease agents, including representative parasites, fungi, bacteria, viruses, and prions. Established pathogens and emerging human and animal disease agents highlighting zoonotic diseases. Epidemiology, pathogenesis, host immune response, disease transmission, treatment, and control. Weekly review and discussion of current world disease events.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): MICR 702

Grade Mode: Letter Grading

BMS 704 - Pathologic Basis of Disease**Credits:** 4

Principles and mechanisms of disease at the cellular and tissue levels, including responses to cell injury, death and adaptation, inflammation, circulatory disturbances, disorders of the immune system, and neoplasia. ANSC 511 and ANSC 512, or BMS 507 and BMS 508 recommended.

Equivalent(s): ANSC 704

Grade Mode: Letter Grading

BMS 705 - Immunology**Credits:** 3

An introduction to the fundamental mechanisms of immune function. Topics include the cells and organs of the immune system, humoral and cellular immune responses, the generation of immune cells, and how immune cells fight various infectious pathogens. Coreq: BMS 715 for BMS:MM majors only.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): MICR 705

Grade Mode: Letter Grading

BMS 706 - Virology**Credits:** 3

Principles of animal and selected plant and bacterial virology in relation to infection and disease. Emphasizes the molecular biology of viruses, viral replication, isolation, propagation, assay, pathogenesis, diagnosis, detection, epidemiology, and control. Coreq: BMS 708 for BMS:MM majors only.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): MICR 706

Grade Mode: Letter Grading

BMS 708 - Virology Laboratory**Credits:** 2

Principles and practices of animal, selected plants, and bacterial virological methods for the propagation, detection and enumeration of viruses.

Co-requisite: BMS 706

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): MICR 708

Grade Mode: Letter Grading

Special Fee: Yes

BMS #711 - Toxicology**Credits:** 4

Examination of mechanisms by which chemicals and other toxicants produce adverse effects in biological systems. Consideration of toxicant exposure and absorption, systemic and cellular distribution and metabolism, altered cellular mechanisms, and systemic and organ-specific effects of toxicity. Case-based discussions of toxicants affecting humans and other species in environmental and clinical contexts.

Prerequisite(s): BMB 658 with a minimum grade of D-.

Grade Mode: Letter Grading

BMS 712 - Experiences in Applied Veterinary Diagnostics**Credits:** 2

Students interact with different components of a working veterinary diagnostic laboratory. Through group reviews of New Hampshire Veterinary Diagnostic Lab cases, students learn about diseases using cases tailored to individual student interests. Pathologists and NHVDL staff provide information on disease processes, pathogenesis, and testing modalities. Students observe diagnostic techniques and archived gross and digital tissue specimens. Emphasis is on integrating knowledge of anatomy, physiology, microbiology, immunology, etc. within the context of molecular pathogenesis.

Prerequisite(s): (BMS 507 with a minimum grade of D- and BMS 508 with a minimum grade of D-) or (ANSC 511 with a minimum grade of D- and ANSC 512 with a minimum grade of D-).

Repeat Rule: May be repeated for a maximum of 4 credits. May be repeated up to 2 times.

Grade Mode: Letter Grading

BMS 715 - Immunology Laboratory**Credits:** 2

This applied immunology laboratory course highlights both historic and current methodologies important for elucidation and diagnosis of immune function. Techniques used to study phagocytosis, antibody production, immunodiffusion, and T-cell function will be introduced. Applications of the antibody technologies to other scientific disciplines (ELISA, immunofluorescence microscopy, immunoblotting, etc.) will also be covered.

Co-requisite: BMS 705

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Equivalent(s): MICR 715

Grade Mode: Letter Grading

Special Fee: Yes

BMS #715W - Immunology Laboratory**Credits:** 2

This applied immunology laboratory course highlights both historic and current methodologies important for elucidation and diagnosis of immune function. Techniques used to study phagocytosis, antibody production, immunodiffusion, and T-cell function will be introduced. Applications of the antibody technologies to other scientific disciplines (ELISA, immunofluorescence microscopy, immunoblotting, etc.) will also be covered.

Co-requisite: BMS 705

Attributes: Writing Intensive Course

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.

Grade Mode: Letter Grading

Special Fee: Yes

BMS 718 - Mammalian Physiology**Credits:** 4

Advanced study of the systems that control mammalian functions with emphasis on cellular and molecular mechanisms. Includes the nervous, muscular, cardiovascular, renal, gastrointestinal, and endocrine systems.

Attributes: Writing Intensive Course**Prerequisite(s):** BMS 507 with a minimum grade of D- or BMS 508 with a minimum grade of D- or ANSC 511 with a minimum grade of D- or ANSC 512 with a minimum grade of D-.**Equivalent(s):** ANSC 718**Grade Mode:** Letter Grading**BMS 719 - Host-Microbe Interactions****Credits:** 4

An examination of the way microorganisms interact with their hosts, with an emphasis on the pathogenic and commensal organisms of humans. Course material is introduced via reading, analysis and group presentations of primary scientific literature. Students are not only introduced to different types of host-microbe interactions, but different methods, systems and model organisms used to study these interactions.

Prerequisite(s): (BMS 501 with a minimum grade of D- or (BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-)) and GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**BMS 720 - Mycology, Parasitology, and Virology****Credits:** 3

Theoretical basis of the pathogenesis, epidemiology, and diagnosis of fungal, parasitic, and viral infections.

Prerequisite(s): BMS 602 with a minimum grade of D- and BMS 603 with a minimum grade of D-.**Equivalent(s):** MEDT 720, MLS 720**Grade Mode:** Letter Grading**BMS 721 - Mycology, Parasitology, and Virology Laboratory****Credits:** 2

Practical experience in medical mycology and parasitology diagnostic techniques. Isolation and identification of mycological and parasitological specimens. Principles and practices of proper specimen collections, analysis, and interpretation of results.

Co-requisite: BMS 720**Equivalent(s):** MLS 720L, MLS 721**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 725 - Cell Phenotyping and Tissue Engineering Laboratory****Credits:** 4

Introduction to culture and phenotyping of mammalian cells (cell line models), with applications to bioengineering and biomedical sciences. Skills, techniques, and knowledge covered include sterile technique, cell culture, cell line models, cell proliferation, cell survival, cell migration, cell adhesion, and drug response. Inquiry-based team projects investigate cell proliferation, cell death, transfection, flow cytometry, 3D scaffolds, or cell imaging.

Prerequisite(s): BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.**Equivalent(s):** BMS 620**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 730 - Ethical Issues in Biomedical Science****Credits:** 4

An examination of the importance of scientific integrity in the biomedical sciences. Students are introduced to the ethical issues that scientists must be familiar with when conducting research. Issues include scientific record keeping, authorship and peer review, conflicts of interest, use of animals and humans in research, and recombinant DNA technology. Class is discussion-based, encouraging both an appreciation of established guidelines and an opportunity to critically examine them.

Attributes: Writing Intensive Course**Prerequisite(s):** (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D-) and GEN 604 with a minimum grade of D- and BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.**Equivalent(s):** MICR 718**Grade Mode:** Letter Grading**BMS 735 - Molecular and Cellular Parasitology****Credits:** 4

Parasites continue to present a major challenge to public health. Despite their significant impact on human health, many aspects of the molecular and cellular biology of these diverse organisms remain unknown. This course explores the latest research on these fascinating organisms through analysis and discussion of original research papers focusing on three of the major human parasites.

Prerequisite(s): BMS 503 with a minimum grade of D- and GEN 604 with a minimum grade of D- and (BMS 655 with a minimum grade of D- or BMS 720 with a minimum grade of D-).**Grade Mode:** Letter Grading**BMS 740 - Human Microbiome****Credits:** 4

The human microbiome is a new, rapidly growing field of microbiology that has already made important contributions to the understanding of human health. This laboratory course utilizes current research methodology to investigate the microbiome of the human skin. Students gain hands-on experience in PCR, genomics, bioinformatics, and modern clinical identification techniques. They also generate primary data to make their own contribution to this important field of research. Lab.

Prerequisite(s): (BMS 501 with a minimum grade of D- or (BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-) and GEN 604 with a minimum grade of D-).**Grade Mode:** Letter Grading**Special Fee:** Yes**BMS 747 - Case Studies in Bloodbanking****Credits:** 1

Patient case studies are analyzed in immunohematology. Correlation of patient history with clinical presentation and interpretation of clinical laboratory results. Learn to interpret given information, recognize abnormal results and their clinical significance, generate etiologic possibilities, and determine the best diagnosis for the patient condition including appropriate treatment and recommended follow-up testing.

Prerequisite(s): BMS 656 with a minimum grade of D- and BMS 657 with a minimum grade of D-.**Grade Mode:** Letter Grading

BMS 748 - Case Studies in Medical Biochemistry**Credits:** 1

Patient case studies are analyzed in medical biochemistry. Correlation of patient history with clinical presentation and interpretation of clinical laboratory results. Learn to interpret given information, recognize abnormal results and their clinical significance, generate etiologic possibilities, and determine the best diagnosis for the patient condition including appropriate treatment and recommended follow-up testing.

Prerequisite(s): BMS 658 with a minimum grade of D- and BMS 659 with a minimum grade of D-.

Grade Mode: Letter Grading

BMS 749 - Case Studies in Hematology and Immunology**Credits:** 2

Patient case studies are analyzed in hematology and immunology. Correlation of patient history with clinical presentation and interpretation of clinical laboratory results. Learn to interpret given information, recognize abnormal results and their clinical significance, generate etiologic possibilities, and determine the best diagnosis for the patient condition including appropriate treatment and recommended follow-up testing.

Attributes: Writing Intensive Course

Prerequisite(s): BMS 642 with a minimum grade of D- and BMS 643 with a minimum grade of D- and BMS 644 with a minimum grade of D- and BMS 645 with a minimum grade of D-.

Grade Mode: Letter Grading

BMS 750 - Case Studies in Microbiology**Credits:** 2

Patient case studies are analyzed in microbiology. Correlation of patient history with clinical presentation and interpretation of clinical laboratory results. Learn to interpret given information, recognize abnormal results and their clinical significance, generate etiologic possibilities, and determine the best diagnosis for the patient condition including appropriate treatment and recommended follow-up testing.

Attributes: Writing Intensive Course

Prerequisite(s): BMS 602 with a minimum grade of D- and BMS 603 with a minimum grade of D- and BMS 720 with a minimum grade of D- and BMS 721 with a minimum grade of D-.

Grade Mode: Letter Grading

BMS 751 - Advanced Clinical Microbiology Internship**Credits:** 5

Instruction and clinical practice of microbiology-related techniques and their applications in the medical laboratory setting. Includes the principles and practices of proper specimen collection, clinical diagnosis testing, and interpretation of results.

Equivalent(s): BMS 751W, MEDT 751, MLS 751, MLS 751W

Grade Mode: Letter Grading

Special Fee: Yes

BMS 752 - Advanced Hematology Internship**Credits:** 5

Instruction and clinical practice of hematology-related techniques and their applications in the medical laboratory setting. Includes the principles and practices of special hematology procedures including diagnostic staining, advanced hemostasis studies, and evaluation of blood cells in disease states.

Equivalent(s): BMS 752W, MEDT 752, MLS 752, MLS 752W

Grade Mode: Letter Grading

BMS 753 - Advanced Immunohematology Internship**Credits:** 5

Introduction and clinical practice of immunohematology-related techniques and their applications in the medical laboratory setting. Includes the principles and practices of advanced blood-banking procedures, including antibody identification, and component therapy.

Equivalent(s): BMS 753W, MEDT 753, MLS 753, MLS 753W

Grade Mode: Letter Grading

BMS 754 - Advanced Clinical Chemistry Internship**Credits:** 5

Instruction and clinical practice of clinical chemistry-related techniques and their applications in the medical laboratory setting. Includes the principles and practices of advanced laboratory analysis of body fluid chemistries. Enzymology, isotopes, hormones, blood gases, and toxicology. Theory, operation, evaluation and maintenance of automated chemistry systems.

Equivalent(s): BMS 754W, MEDT 754, MLS 754, MLS 754W

Grade Mode: Letter Grading

BMS #761 - Clinical Microbiology Internship**Credits:** 20

Advanced instruction in clinical bacteriology, mycology, parasitology, and virology at local hospital or reference laboratory. Isolation, identification, and antibiotic sensitivities for common pathogens are emphasized.

Equivalent(s): BMS 754W, MEDT 761, MLS 754W, MLS 761

Grade Mode: Letter Grading

Special Fee: Yes

BMS 790 - Undergraduate Teaching Experience**Credits:** 1-4

Provide academic support to graduate teaching assistants or faculty in preparing, presenting, and executing Biomedical Science lectures or labs.

Repeat Rule: May be repeated for a maximum of 4 credits.

Equivalent(s): MICR 790

Grade Mode: Letter Grading

BMS 795 - Investigations in Biomedical Science**Credits:** 1-8

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply knowledge and techniques of the major to a specific problem or question.

Repeat Rule: May be repeated for a maximum of 8 credits.

Equivalent(s): BMS 795W, MICR 795, MICR 795W

Grade Mode: Letter Grading

BMS 795W - Investigations in Biomedical Science**Credits:** 1-8

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply knowledge and techniques of the major to a specific problem or question.

Attributes: Writing Intensive Course

Repeat Rule: May be repeated for a maximum of 8 credits.

Equivalent(s): BMS 795, MICR 795W

Grade Mode: Letter Grading

BMS 799 - Senior Thesis**Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in biomedical sciences. Final product is a written thesis. One or two semesters.

Attributes: Writing Intensive Course

Repeat Rule: May be repeated for a maximum of 8 credits.

Equivalent(s): BMS 799H

Grade Mode: Letter Grading

BMS 799H - Senior Honors Thesis**Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in biomedical sciences and in the Honors Program. Final product is a written thesis. One or two semesters.

Attributes: Honors course; Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Equivalent(s):** BMS 799**Grade Mode:** Letter Grading**Genetics (GEN)****GEN 604 - Principles of Genetics****Credits:** 0 or 4

Chemical structure of genetic material, gene recombination, mutation, and chromosome mapping. Gene expression and regulation; recombinant DNA; evolutionary, quantitative, and population genetics. College math or statistics suggested.

Prerequisite(s): (((BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-)) or BMS 507 with a minimum grade of D-) and CHEM 403 with a minimum grade of D- and (CHEM 404 with a minimum grade of D- or CHEM 404H with a minimum grade of D-).

Equivalent(s): BIOL 604**Grade Mode:** Letter Grading**GEN 606 - Genetics Lab****Credits:** 4

Hands-on experience with some of the important model organisms used for research in genetics (fruit flies, bacteria, yeast, nematodes, and plants). Investigation of fundamental genetic concepts in the laboratory, experience with transmission and molecular genetic techniques, introduction to bioinformatics, analysis and interpretation of data.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**Special Fee:** Yes**GEN 704 - Genetics of Prokaryotic Microbes****Credits:** 5

Maintenance, exchange, and expression of genetic material in bacteria and their viruses. Historical overview of the role microbial genetics played in development of modern molecular biology. Contemporary perspective on methods used to understand the function of genes and their applications to basic science, biomedical research, and biotechnology. Lab.

Attributes: Writing Intensive Course**Prerequisite(s):** BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D- and GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**Special Fee:** Yes**GEN 705 - Population Genetics****Credits:** 3

Exploration of the forces (mutations, selection, random drift, inbreeding, assortative mating) affecting the frequency and distribution of genetic variation in natural populations. Quantifying the structure of populations. Methods of analysis for theoretical and practical applications.

Prerequisite(s): GEN 604 with a minimum grade of D- and BIOL 528 with a minimum grade of D-.**Equivalent(s):** PBIO 705, ZOOL 665, ZOOL 705**Mutual Exclusion:** No credit for students who have taken NR 664.**Grade Mode:** Letter Grading**GEN 706 - Human Genetics****Credits:** 4

Genetic basis of human traits and diseases including both traditional methods of diagnosis and contemporary molecular genetic approaches stemming from the human genome project. Case studies exemplify common practices in human genetic counseling and integrate the scientific basis of diagnosis with the special ethical implications of human genetic analysis.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Equivalent(s):** ANSC 706, BCHM 706**Grade Mode:** Letter Grading**GEN 711 - Genomics and Bioinformatics****Credits:** 0 or 4

Methods, applications, and implications of genomics—the analysis of whole genomes. Medical, ethical and legal implications of genomic data. Computer lab provides exposure and experience in a range of bioinformatics approaches used in genome analysis. Computer Lab.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Equivalent(s):** GEN 711W**Grade Mode:** Letter Grading**GEN 711W - Genomics and Bioinformatics****Credits:** 0 or 4

Methods, applications, and implications of genomics—the analysis of whole genomes. Microbial, plant and animal genomics are addressed, as well as medical, ethical and legal implications. The lab provides exposure and experience on a range of bioinformatics approaches—the computer applications used in genome analysis. Lab.

Attributes: Writing Intensive Course**Prerequisite(s):** GEN 604 with a minimum grade of D-.**Equivalent(s):** BCHM 711, BCHM 715, GEN 711, MICR 711, MICR 715**Grade Mode:** Letter Grading**GEN 712 - Programming for Bioinformatics****Credits:** 5

Development of programming skills that enable life science students to ask fundamental biological questions that require computers to automate repetitive tasks and handle query results efficiently. Topics include: computer values of important parameters of biological sequence data; pattern search and motif discovery scripts; accessing, querying, manipulating, retrieving, parsing, analyzing, and saving data from local and remote databases. Computer Lab.

Prerequisite(s): GEN 604 with a minimum grade of D- and GEN 711 with a minimum grade of D-.**Grade Mode:** Letter Grading**GEN 713 - Microbial Ecology and Evolution****Credits:** 4

Evolutionary and ecological forces that generate the tremendous diversity of microbial life on Earth with emphasis on viruses, archaea and bacteria. Functional roles of microorganisms, their population dynamics and interactions, and their mechanisms of evolutionary change in a variety of environmental settings, including natural communities and laboratory microcosms.

Attributes: Writing Intensive Course**Prerequisite(s):** GEN 604 with a minimum grade of D- and BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D-.**Equivalent(s):** MICR 713**Grade Mode:** Letter Grading

GEN 714 - Personal Genomics**Credits:** 4

Analysis and implications of personal genomic data is the focus of this course. Students understand and appreciate all aspects of the availability of personal genomic information and tools including scientific, medical, social, ethical and legal issues. Students have the opportunity to analyze their own individual genome to one of the publicly available genomes to learn about all various aspects of this emerging field. The course will be an entirely online format.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**GEN 715 - Molecular Evolution****Credits:** 4

Rates and patterns of evolutionary change in biomolecules. Forces affecting the size and structure of genomes. Molecular mechanisms of organismal evolution. Emphasizes integrating evidence from biochemistry, molecular genetics and organismal studies. Methods for reconstructing phylogeny from molecular sequences. Some knowledge of statistics recommended. Computer Lab.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Equivalent(s):** ZOOL 715**Grade Mode:** Letter Grading**GEN 717 - Molecular Microbiology****Credits:** 5

Fundamental physiological and metabolic processes of archaea, bacteria and fungi with a strong emphasis on prokaryotes. Literature-based course. Topics include regulation and coordination of microbial metabolism, bacterial cell cycle, global control of gene expression, signal transduction, and microbial cell differentiation. Lab.

Attributes: Writing Intensive Course**Prerequisite(s):** BMS 503 with a minimum grade of D- and BMS 504 with a minimum grade of D- and GEN 604 with a minimum grade of D-.**Equivalent(s):** MICR 717**Grade Mode:** Letter Grading**Special Fee:** Yes**GEN 721 - Comparative Genomics****Credits:** 4

Explores the central questions and themes in contemporary comparative genomics, including genome biology, phylogenomics, human origins, population genomics, and ecological genomics. Provides the conceptual framework required to evaluate new work in this fast-changing field.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**GEN 725 - Population Genetics Lab****Credits:** 2

Hands-on approach to exploration of evolutionary forces affecting the frequency and distribution of genetic variation in natural populations. Wet lab techniques include DNA extraction, restriction enzyme digestion, PCR, DNA fragment size-selection. Computational skills include high-throughput sequencing data control, identifying allelic variants, and generation of population genetic summary statistics.

Co-requisite: GEN 705**Prerequisite(s):** GEN 604 with a minimum grade of D- and BIOL 528 with a minimum grade of D-.**Grade Mode:** Letter Grading**GEN 771 - Molecular Genetics****Credits:** 4

Structure, organization, replication, dynamics, and expression of genetic information in eukaryotes. Focus on molecular genetic and epigenetic mechanisms of gene expression and its control; molecular genetic control of cell division and differentiation during development.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Grade Mode:** Letter Grading**GEN 772 - Evolutionary Genetics of Plants****Credits:** 4

Mechanisms of genetic change in plant evolution, both in nature and under human influence. Topics include neo-Darwinian theory; speciation and hybridization; origins and co-evolution of nuclear and organelle genomes; gene and genome evolution; transposable elements; chromosome rearrangements; polyploidy; genetic modification. Lab introduces methods in information gathering, bioinformatics, genome analysis, plant breeding, and genetic manipulation. Lab.

Attributes: Writing Intensive Course**Prerequisite(s):** GEN 604 with a minimum grade of D-.**Equivalent(s):** PBIO 772**Grade Mode:** Letter Grading**GEN #774 - Techniques in Plant Genetic Engineering and Biotechnology****Credits:** 4

Theory and hands-on experience with techniques used in plant genetic engineering, including cell and tissue culture, gene cloning, and analysis of foreign gene expression. Discussion of role of plant biotechnology in sustainable agriculture and climate change; modifying plants for better nutrition and stress response, environmental remediation, and production of pharmaceuticals; controversies associated with this technology. Lab.

Prerequisite(s): GEN 604 with a minimum grade of D-.**Equivalent(s):** PBIO 774, PBIO 775**Grade Mode:** Letter Grading**Special Fee:** Yes**GEN 790 - Undergraduate Teaching Experience****Credits:** 1-4

Provide academic support to graduate teaching assistants or faculty in preparing, presenting, and executing Genetics lectures or labs.

Repeat Rule: May be repeated for a maximum of 4 credits.**Equivalent(s):** MICR 790**Grade Mode:** Letter Grading**GEN 795 - Investigations in Genetics****Credits:** 1-4

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.

Repeat Rule: May be repeated for a maximum of 4 credits.**Equivalent(s):** GEN 795W**Grade Mode:** Letter Grading**GEN 795W - Investigations in Genetics****Credits:** 1-4

Advanced research or scholarly projects developed and conducted under the supervision of a faculty member. Provides the opportunity to apply advanced knowledge and techniques of the major to a specific problem or question.

Attributes: Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 4 credits.**Equivalent(s):** GEN 795**Grade Mode:** Letter Grading

GEN 799 - Senior Thesis**Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in genetics. Final product is a written thesis. One or two semesters.

Attributes: Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Grade Mode:** Letter Grading**GEN 799H - Honors Senior Thesis****Credits:** 1-4

Independent research project under the direction of a faculty sponsor for seniors in genetics and in the Honors Program. Final product is a written thesis. One or two semesters.

Attributes: Honors course; Writing Intensive Course**Repeat Rule:** May be repeated for a maximum of 8 credits.**Grade Mode:** Letter Grading

Faculty

Molecular, Cellular and Biomedical Sciences Department Faculty