BIOMOLECULAR SCIENCE (BMS-UY)

BMS-UY 471X Guided Studies in Biomolecular Science (1-4 Credits)
Typically offered Fall, Spring, and Summer terms
As arranged special project (experimental, theoretical, computational or literature search)
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 1001 Introduction to Cell and Molecular Biology Laboratory (1 Credit)
Typically offered Fall, Spring, and Summer terms
This laboratory accompanies the lecture course BMS-UY 1003 Introduction to Cell and Molecular Biology. This laboratory course is required for BMS and CBE majors taking BMS-UY 1003, but is optional for other majors. | Co-requisite: BMS-UY 1003
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Corequisites: BMS-UY 1003.

BMS-UY 1003 Introduction to Cell and Molecular Biology (3 Credits)
Typically offered Fall, Spring, and Summer terms
The course covers the fundamentals of biology with emphasis on cell and molecular biology. The course material includes introduction to biomolecules and bioenergetics, basic organization and functioning of living cells and general principles of genetics and reproduction.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No

BMS-UY 1032 Introduction to Biomolecular Science (2 Credits)
Typically offered Spring
This is a one-semester overview course in chemistry, providing examples of important discoveries and important chemical innovators, with a strong emphasis on cutting-edge research. Field opportunities are developed to allow students to contribute to the discipline. | Prerequisite: Only first-year students are permitted to enroll in this introductory level course.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: Only first-year students are permitted to enroll in this introductory level course.

BMS-UY 2001 Introduction to Physiology Laboratory (1 Credit)
Typically offered Fall, Spring, and Summer terms
This laboratory accompanies the lecture course BMS-UY 2003 Introduction to Physiology. This laboratory course is required for BMS majors taking BMS-UY 2003, but is optional for other majors. | Prerequisite: BMS-UY 1003 or BMS-UY 1004. Co-requisite: BMS-UY 2003
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 1003 and BMS-UY 1001.
Corequisites: BMS-UY 2003.

BMS-UY 2003 Introduction to Physiology (3 Credits)
Typically offered Fall, Spring, and Summer terms
The course covers the fundamentals of animal physiology with emphasis on the mammal. The course will focus on the origin, development, and evolution of the vertebrates and their organ systems, including Nervous and Endocrine systems, Muscles, Cardiovascular, Respiratory, Renal and Digestive systems. | Prerequisite: BMS-UY 1003 or instructor's permission.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 1003 or instructor's permission.

BMS-UY 2612 Stem Cells and Development (2 Credits)
Typically offered Fall
This course follows the traditional approach to developmental biology. Starting with mechanisms of developmental organization and patterning, cell-cell communication and stem cells biology we will review the development in several model organisms, including Drosophila, amphibians, and birds. However, the main focus will be on mammalian development with detailed discussion of processes such as fertilization, gastrulation, neurulation, somitogenesis, development of the respiratory and digestive systems, and limb development. Special sections will be dedicated to birth defects, interplay between the environment and development and regeneration across species. | Prerequisites: BMS-UY 1004 or BIOL-UA 11 or instructor's/advisor's permission
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 1004 or BIOL-UA 11 or instructor's/advisor's permission.

BMS-UY 2713 Biostatistics (3 Credits)
Typically offered Spring
The course will cover both classical and modern computer-intensive statistical methods. Applications to the analysis of laboratory data will include problems commonly encountered in bioinformatics, genomics, molecular biology, systems biology and medicine. Data sets will be analyzed in the context of hypotheses underlying the experiments in which they were generated. No previous background in statistics is required. | Prerequisites: MA-UY 1124 and (CS-UY 1133 or CS-UY 1113 or CS-UY 1114) or Instructor's/Advisor's permission
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: MA-UY 1124 and (CS-UY 1133 or CS-UY 1113 or CS-UY 1114) or Instructor's/Advisor's permission.

BMS-UY 3214 Microbiology (4 Credits)
Typically offered Spring
The course studies microbial organisms, especially bacteria and viruses. Topics: Microbial relationship to disease, infections and immunological processes. Mutation, transformation, transduction, induction and bioenergetic processes. Laboratory work includes experimental analysis of microbial structure and physiology by biochemical and cytochemical means. Also studied: Influence of environment on nutrition, enzymes and metabolism of representative microbial species. Lab fee required. | Prerequisites: BMS-UY 2004 or an approved equivalent, and CM-UY 1014 or instructor's permission.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 2004 or an approved equivalent, and CM-UY 1014 or instructor's permission.

BMS-UY 3611 Advanced Molecular Biology Laboratory (1 Credit)
Typically offered Fall
This laboratory accompanies the lecture course BMS-UY 3613 Advanced Molecular Biology. It is required for BMS majors. | Prerequisites: BMS-UY 1003 and BMS-UY 1001; Co-requisites: BMS-UY 3613
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 1003 and BMS-UY 1001; Co-requisites: BMS-UY 3613.

BMS-UY 3613 Advanced Molecular Biology (3 Credits)
Typically offered Fall
This course is focused on the structure and function of genes, including DNA replication, repair and packaging in chromosomes, the regulation of gene expression, transcription and translation. In addition to all major topics in molecular biology, we will discuss the molecular bases of organism development, the function of the immune system, and the biology of stem cells. The course will also focus on key methods in modern molecular biology/genetic engineering and their research and clinical applications, for example, for studying diseases such as cancer. | Prerequisites: BMS-UY 1001, BMS-UY 1003 and CM-UY 2213 or instructor's/advisor's permission.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 1001, 1003 and CM-UY 2213 or instructor's/advisor's permission.

BMS-UY 3711 Advanced Cell Biology Laboratory (1 Credit)
Typically offered Spring
This laboratory accompanies the lecture course BMS-UY 3713 Advanced Cell Biology. It is required for BMS majors. | Prerequisites: BMS-UY 3613 and BMS-UY 3611; Co-requisites: BMS-UY 3713
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3613 and BMS-UY 3611; Co-requisites: BMS-UY 3713.

BMS-UY 3713 Advanced Cell Biology (3 Credits)
Typically offered Spring
This course focuses on the cell as the basic structural and functional unit of life. We will cover (i) structure and function of cellular membranes and organelles, including transport of biomolecules and intracellular traffic; (ii) fundamental processes underlying cells growth, movement and communications; (iii) Cell division, growth, death and regulation of these vital biological processes. The role of the latter in diseases such as e.g. cancer will be briefly discussed too. | Prerequisites: BMS-UY 3613 and BMS-UY 3611 or instructor's/advisor's permission
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3613 and BMS-UY 3611 or instructor's/advisor's permission.

BMS-UY 3812 Epigenetics in Health and Disease (2 Credits)
Typically offered Spring
Epigenetic ("above genetic") processes shape virtually every facet of biology, from development to tissue homeostasis and disease. Starting with an overview of historical perspectives and definitions of epigenetics, the course will discuss the major types of epigenetic modification of DNA and histones, and the role of epigenetic regulation in normal and disease states. The lectures will include discussions of carcinogenesis, inflammation and neurodegeneration, the effect of early life stress on gene expression, and epigenetic contributions to other chronic conditions, such as asthma, allergies, cardiovascular disease, and eating disorders. | Prerequisites: BMS-UY 3613 or instructor's/advisor's permission
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3613 or instructor's/advisor's permission.

BMS-UY 4111 Genetics and Genomics Laboratory (1 Credit)
Typically offered Fall
This laboratory accompanies the lecture course BMS-UY 3114 Genetics. It is required for BMS majors. | Prerequisites: BMS-UY 3713 and BMS-UY 3711; Co-requisites: BMS-UY 4113
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3713 and BMS-UY 3711; Co-requisites: BMS-UY 4113.

BMS-UY 4113 Genetics and Genomics (3 Credits)
Typically offered Fall
This lecture course seeks to build upon foundational concepts in genetics introduced in freshman BMS-UY 1003 and molecular genetics covered in the junior BMS-UY 3613 and BMS 3713 Advanced Molecular and Cell Biology courses respectively, while demonstrating the contemporary application of classical genetics to various fields, including genomics, genetic testing, ancestry, epigenetics, reproductive healthcare, etc. A brief review of the birthing of genetics by Gregor Mendel will be provided, but the main focus of the course will be on new methods and technologies, such as for example, gene sequencing, CRISPR and lentiviral gene therapy, and their application in health care and beyond. | Prerequisite: BMS-UY 3613 and BMS-UY 3713 or instructor's/advisor's permission.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3613 and BMS-UY 3713 or instructor's/advisor's permission.

BMS-UY 4324 Advanced Cell and Molecular Biology II (4 Credits)
Typically offered Fall
This is the second semester of a year-long course that examines the molecular basis of cell function and current trends in molecular biology. The lab component is a year-long project to locate, characterize, clone and express a gene. Lab fee required. | Prerequisite: BMS-UY 3314.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: BMS-UY 3314 with a Minimum Grade of D.

BMS-UY 4424 Introduction to Tissue Engineering and Biomaterials (4 Credits)
Typically offered Spring
This course introduces students to principles of tissue engineering (TE) and applications of biomaterials in the field of regenerative medicine. The course begins by covering fundamentals of what constitutes a biological tissue, exploring its cellular and extracellular components. Students will learn the basics of mechanobiology and understand principles of cell-to-material interactions. Students then learn how concepts of engineering and material science can be applied to the fabrication of biomaterials that emulate the functional properties of biological tissues in vitro. This course will cover such important topics as tissue scaffold building, natural polymer modification for bioplastic synthesis and analysis of biomaterials and key principles of their interactions with cells. Students will explore various techniques and tools available for tissue engineering researchers and will be introduced to a survey of methods to assess mechanobiological and other aspects of cell-to-biomaterial interactions; from microscopy and mechanical tests of whole constructs to gene expression analyses and immunochemistry assays. The course introduces students to multiple ways how one can learn if their synthetic material indeed represents a natural equivalent or is useful and truly applicable for patients' needs. The course is finalized by studying various sterilization methods and TE applications outside of human body, like in vitro disease modeling. As a part of this course students will carry out a literature-based Design Project aimed at finding a novel tissue engineering solution for an existing medical problem. | Prerequisites: CM-UY 2211 and CM-UY 2213
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: CM-UY 2211 and CM-UY 2213.

BMS-UY 4811 Topics in Biology (1 Credit)
Typically offered occasionally
Advanced or specialized topics in biology. As arranged.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 4812 Topics in Biology (2 Credits)
Typically offered occasionally
Advanced or specialized topics in biology. As arranged.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 4813 Topics in Biology (3 Credits)
Typically offered occasionally
Advanced or specialized topics in biology. As arranged.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 4814 Topics in Biology (4 Credits)
Typically offered occasionally
Advanced or specialized topics in biology. As arranged.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 4844 Topics in Biology (4 Credits)
Typically offered occasionally
Advanced or specialized topics in biology. As arranged.
Grading: Ugrd Tandon Graded
Repeatable for additional credit: Yes

BMS-UY 4914 Undergraduate Research in Biomolecular Sciences (4 Credits)
Typically offered Fall, Spring, and Summer terms
The course investigates problems in biomolecular science under faculty supervision. Library research, experimental studies and written reports are required. | Prerequisites: CM-UY 4011 and senior status or adviser's approval,
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: CM-UY 4011 and senior status or adviser's approval,.

BMS-UY 4924 Undergraduate Research in Biomolecular Sciences (4 Credits)
Typically offered Fall, Spring, and Summer terms
The course investigates problems in biomolecular science under faculty supervision. Library research, experimental studies and written reports are required. | Prerequisites: CM-UY 4011 and senior status or adviser's approval
Grading: Ugrd Tandon Graded
Repeatable for additional credit: No
Prerequisites: CM-UY 4011 and senior status or adviser's approval.