DEPARTMENT OF CELL AND MOLECULAR BIOLOGY

Programs

Undergraduate

Major

- Cell and Molecular Biology Major (https://catalog.tulane.edu/science-engineering/cell-molecular-biology/cell-molecular-biology-major/)

Minor

- Cell and Molecular Biology Minor (https://catalog.tulane.edu/science-engineering/cell-molecular-biology/cell-molecular-biology-minor/)

Graduate

- Cell and Molecular Biology, MS (https://catalog.tulane.edu/science-engineering/cell-molecular-biology/cell-molecular-biology-ms/)
- Cell and Molecular Biology, PhD (https://catalog.tulane.edu/science-engineering/cell-molecular-biology/cell-molecular-biology-phd/)

Courses

Cell and Molecular Biology (CELL)

CELL 1010 Intro to Cell & Molec Biology (3)
This course is an introduction to the fundamental concepts that apply to all living systems. Major topics include the chemistry of life, primarily cellular respiration and photosynthesis; cell biology and organization; and an introduction to genetics.

CELL 1030 Heredity and Society (3)
Biology course for non-majors focusing on genetics. The explosive growth in information and knowledge established from the studies on molecular genetics has profound implications for science, medicine, law, economy, and our society itself. This course provides fundamental concepts of genetics to understand the ramifications of biology. Does not count toward CMB major.

CELL 1035 Heredity & Society Lab (1)
This introductory biology lab course provides hands-on lab experiences to reinforce concepts discussed in CELL 1030. Students will learn basic laboratory skills, including microscopy and molecular biological techniques. For non-majors. Prerequisite(s): CELL 1010 or 1030*. * May be taken concurrently. Prerequisite(s): CELL 1010 or 1030*. * May be taken concurrently.

Prerequisite(s): CELL 1010 or 1030*.
* May be taken concurrently.

CELL 1040 Forensic Biology (3)
Lectures, readings, and discussion of the literature in the fields of forensic biology. For non-majors.

CELL 1050 Introduction to Human Metabolism (3)
This course is designed to introduce you to human metabolism from a biochemical perspective. We will explore the composition of human bodies, how our cells utilize various fuel sources, and the relative nutritional value of different types of foods through discussions of scientific literature, laboratory experiments and environmental explorations. Open to high school students only.

CELL 1500 Biology Lecture (3)

CELL 1505 Biology Lab (1)

CELL 1890 Service Learning (0-1)
Students complete a service activity in the community in conjunction with the content of a three-credit co-requisite course. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 1940 Transfer Coursework (0-20)
Transfer Coursework at the 1000 level. Departmental approval may be required.

Maximum Hours: 99

CELL 1945 Transfer Coursework (0-20)
Course Limit: 99

CELL 2050 Genetics (3)
The principles of genetic analysis and the nature of genes. Discussion of DNA, chromosomes, and molecular mechanism of replication, mutation, expression, and transmission of heritable characteristics. Prerequisite(s): CELL 1010.

Prerequisite(s): CELL 1010.

CELL 2115 General Biology Lab (1)
Laboratory exercises emphasizing concepts in cell, molecular, and developmental biology. Designed for majors in the biological sciences. Prerequisite(s): CELL 1010, CHEM 1080 and 1085*. (* May be taken concurrently.)

Prerequisite(s): CELL 1010, CHEM 1080 and 1085*.
* May be taken concurrently.

CELL 2220 Careers in Cell & Molec Biol (1)
This course will examine different careers in medicine, the distribution of hours spent in practice each week, and some of the disease processes and treatments seen by physicians. It will be taught from a practical, clinical point of view and is intended to help students identify their areas of interest in medicine or medical research. Does not count toward the requirements for a major or minor in cell and molecular biology.

CELL 2660 Special Topics (0-4)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department.

CELL 2665 Special Topics Lab (0-4)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 2890 Service Learning (0-1)
Students complete a service activity in the community in conjunction with the content of a three-credit co-requisite course. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 2940 Transfer Coursework (0-20)
Transfer Coursework at the 2000 level. Department approval may be required.

Maximum Hours: 99

CELL 2945 Transfer Credit (0-20)

Maximum Hours: 99

CELL 3030 Molecular Biology (3)
The course is designed to provide basic knowledge of molecular biology. Topics covered include DNA replication, gene structure and regulation, transcription, translation, and protein structure and regulation. Basic laboratory techniques and experimental design in molecular biology are emphasized. Pre-requisites: CELL 2050.

Prerequisite(s): CELL 2050.

CELL 3035 Molecular Biology Lab (1)
Laboratory experience in molecular biology techniques. Students will learn to analyze DNA via gel electrophoresis; isolate, detect, and quantitate RNA and/or protein; and use plasmids to clone and express a gene. Pre-requisite: CELL 2115, 3030*. (*May be taken concurrently.)

Prerequisite(s): CELL 2115 and 3030*.
* May be taken concurrently.

CELL 3050 Foundations of Pharmacology (3)
This course explains cellular mechanisms by which drugs act in the body. Specific topics include basic pharmacokinetics, drug receptor interactions, drug tolerance, toxicity and drug interactions. The course integrates biology and chemistry by using examples of drug action on the autonomic and central nervous systems, cardiovascular and endocrine systems as well as the treatment of infections. Concepts from cell biology, anatomy, biochemistry, neurochemistry and physiology are covered.

Prerequisite(s): CELL 1010 and (CHEM 2420 or 2440).

CELL 3210 Physiology (3)
This course is a survey of the organ systems of the human body. The cellular and molecular mechanisms of organ function are discussed. Emphasis is placed on clinical implications.

Prerequisite(s): CELL 1010.

CELL 3215 Physiology Lab (1)
This class includes a series of on-line laboratory simulations designed to demonstrate basic principles of Physiology. The course is meant to follow and reinforce material from Physiology, CELL 3210, taught in the Fall semester. Each class will start with a brief discussion of the material, how it relates to the physiology of the organism as a whole, and the clinical significance. Students will spend the rest of the class conducting the exercises for that day's lab. The results are saved as a PDF, printed and turned in to the instructor at the next class. Prerequisite(s): CELL 3210*. (* May be taken concurrently.)

Prerequisite(s): CELL 3210*.
* May be taken concurrently.

CELL 3230 Virology (3)
In the virology lecture course you will learn about the structural and reproductive cycles for the major classes of viruses. You will gain an understanding of the structural and genetic factors involved in the virus-host cell interaction. You will also learn about the techniques used to study viruses. You will be using all this knowledge to identify new viruses, solve case studies, hypothesize how specific features of viruses evolved, and propose experiments to study the virus life cycle.

Prerequisite(s): CELL 2050 or EBIO 2070.

CELL 3310 Cellular Neuroscience (3)
In-depth coverage of the basic principles of cellular neuroscience, including the biophysical basis of the membrane potential, action potential generation and propagation, and synaptic signaling. Students will be introduced to the synaptic organization of higher neural systems, such as the visual system and somatic sensory system. Prerequisite(s): CELL 1010.

Prerequisite(s): CELL 1010.

CELL 3315 Cellular Neuroscience Lab (1)
This is an interactive lab class giving students hands-on experience working with techniques used in the study of cellular neuroscience. Techniques include: behavioral testing using invertebrates, tissue staining, immunocytochemistry, and intracellular electrophysiological recordings. Prerequisite(s): CELL 3310 or NSCI 3310.

Prerequisite(s): CELL 3310 or NSCI 3310.

CELL 3320 Systems Neuroscience (3)
The subject of this course is the human nervous system, its anatomy, connectivity and function. Discusses the normal structure of the nervous system and the relationship of that structure to physiological function. The course is taught from a practical, clinical point of view and is intended to prepare students for further study in the neurosciences. Prerequisite(s): CELL 3310 or NSCI 3310.

Prerequisite(s): CELL 1010 and (CELL 3310 or NSCI 3310).

CELL 3400 Regenerative Biology (3)
This course provides the various cellular and molecular mechanisms of natural or injury-induced regeneration in vertebrates and the applications to development of therapies to restore tissues and organs damaged by injury or disease. Attribute: Capstone. Prerequisite(s): CELL 3750*. (* May be taken concurrently.)

Prerequisite(s): CELL 3750*.
* May be taken concurrently.

CELL 3560 Pathophysiology (3)
This course focuses on the molecular pathophysiology of infectious disease, immunopathology of the cardiovascular system and skin disorders. The impact of a diseased cardiovascular system will be examined. Concepts from cell biology, anatomy, biochemistry, and physiology are covered. Prerequisite(s): CELL 3210.

Prerequisite(s): CELL 3210.

CELL 3750 Cell Biology (3)
An examination of the structure and function of eukaryotic cells. Emphasis is placed on mechanisms of intracellular and transmembrane transport, cellular control, and intercellular and intracellular signaling. Experimental methods and applications will be emphasized. Prerequisite(s): CELL 3030.

Prerequisite(s): CELL 3030.

CELL 3755 Cell Biology Laboratory (1)
Laboratory experience in in vitro methodologies. Students will learn to maintain and manipulate mammalian cell cultures. Prerequisite(s): CELL 2115 and 3750*. (*May be taken concurrently.)

Prerequisite(s): CELL 2115 and 3750*.
* May be taken concurrently.

CELL 3890 Service Learning (0-1)
Students complete a service activity in the community in conjunction with the content of a three-credit co-requisite course. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 3891 Service Learning (0-1)
Students complete a service activity in the community in conjunction with the content of a three-credit co-requisite course. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 3940 Transfer Coursework (0-20)
Transfer Coursework at the 3000 level. Department approval may be required.

Maximum Hours: 99

CELL 4010 Cellular Biochemistry (3)
An examination of the structure and function of biological molecules, energetics of biological reactions, enzyme kinetics, metabolism, synthesis of macromolecules, and assembly of structures. Emphasis is placed on mammalian metabolism and mechanisms of control used to regulate metabolic pathways. Detailed explorations into the chemical function of biomolecules lay the foundation for the course.

Prerequisite(s): CELL 2050 and (CHEM 2420 or 2440).

CELL 4110 Human Histology (4)
Descriptive study of mammalian microscopic anatomy in a physiological context. Lectures and laboratory. Course may be repeated 2 times for credit. Prerequisite(s): CELL 1010. Corequisite(s): CELL 4111.

Prerequisite(s): CELL 1010.
Corequisite(s): CELL 4111.
Course Limit: 2

CELL 4111 Human Histology Lab (0)
Lab section for CELL 4110. Prerequisite(s): CELL 1010. Corequisite(s): CELL 4110.

Prerequisite(s): CELL 1010.
Corequisite(s): CELL 4110.

CELL 4130 Embryology (3)
This course focuses on the vertebrate embryogenesis with specific emphasis on humans. Topics include fertilization, implantation, gastrulation, neurulation, and organogenesis of a variety of structures. Students are expected to understand and describe anatomical and morphological changes that occur during human embryogenesis at organ, tissue, cellular, and molecular levels. Prerequisite(s): CELL 3750.

Prerequisite(s): CELL 3750.

CELL 4160 Developmental Biology (3)
The origin and development of form and patterns in organisms. Recent investigations and research methodology on the processes of growth and differentiation are stressed.

Prerequisite(s): CELL 2050.

CELL 4180 Biomedical Research in Animals (3)
Lectures, readings, presentations, and discussion of the use of animal models in biomedical research. Prerequisites: CELL 3750 or CELL 4010 or approval from instructor

Prerequisite(s): CELL 3750 or 4010.

CELL 4200 General Endocrinology (3)
This course explains the basics of hormone action and hormone interactions with their receptors, with an emphasis on the molecular mechanisms by which homeostasis is maintained in multicellular organisms. Physiological outcomes of hormone actions on different organs, as well as aberrant hormone action will be covered. Prerequisite(s): (CELL 1010 and CELL 2050).

Prerequisite(s): CELL 1010 and 2050.

CELL 4220 Microbiology (3)
Taxonomy, physiology, genetics and ecology of microorganisms. This course will cover the role of microbes in medicine and industry, and as model systems for research. Prerequisite(s): CELL 3750.

Prerequisite(s): CELL 3750.

CELL 4225 Microbiology Laboratory (1)
Laboratory studies of microbial taxonomy, physiology, biochemistry, and genetics.

Prerequisite(s): CELL 4220* and 2115.
* May be taken concurrently.

CELL 4250 Principles In Immunology (3)
An introduction to the biology of the human immune system with review of relevant literature. Students will learn to critically read scientific articles and analyze experimental data. Prerequisite(s): CELL 3750 or 3010.

Prerequisite(s): CELL 3750 or 3010.

CELL 4260 Princ of Biomed Write Capstone (3)
An examination of various types of scientific literature, scientific writing and presentation. Exploration of scientific databases such as PubMed. Emphasis on critical reading of scientific literature and writing in a scientific style. Also satisfies writing intensive requirement.

CELL 4340 Neurobiology of Disease (3)
This is an advanced course which reviews the physiology of the nervous system and the various pathologies that attack the system. The course focuses on the cellular mechanisms of the pathology, what treatments are available, and what the current research literature has to say about the diseases. Emphasis is placed on readings from original clinical and research papers. Pathologies discussed range from motor control and neuromuscular diseases to high cognitive function, autism, and dementia. Prerequisite(s): CELL 3310.

Prerequisite(s): CELL 3310 or NSCI 3310.

CELL 4350 Developmental Neurobiol (3)
A broad overview of the different stages of neural development. Examination of the molecular aspects of developmental neurobiology, with reference to some important signaling pathways involved in neural growth and specification. Particular attention will be given to those active research fields, such as growth cone guidance and collapse, activity-dependent development, and applications of these to injury and disease. Prerequisite(s): CELL 3750, 3010, 3030, 3310 or NSCI 3310.

Prerequisite(s): CELL 3750, 3010, 3030, 3310 or NSCI 3310.

CELL 4370 Molecular Neurobiology (3)
Introduction to the molecular biology of neurons and neuronal functions. Topics of study will include: the molecular composition of nerve cells, and how this provides a basis for their functional properties; their synaptic connectivity; how they receive, transmit, and retain information at a molecular level. Studies will focus on current research in the field of molecular neurobiology. Prerequisite(s): CELL 3310, 3320, NSCI 3310 or 3320.

Prerequisite(s): CELL 3310, 3320, NSCI 3310 or 3320.

CELL 4430 Introductory Bioinformatics (3)
The aim of this course is to introduce biology and computer science students to computational research techniques using biological data. This field, generally referred to as bioinformatics, is growing faster then the current workforce available. We will cover the experimental methods used to create the biological data, how to understand the data in the context of biology, and the common computational methods used to derive understanding and make hypothesis from this data. The course will be taught through relevant, hands on projects, and all the tools are computer based. The projects will be based around "omics" data, which is the basis of personalized medicine and precision oncology. This course is designed to be approachable for all students, regardless of their current computational abilities or computer ownership. Prerequisite(s): CELL 3030*. (* May be taken concurrently.)

Prerequisite(s): CELL 3030*.
* May be taken concurrently.

CELL 4440 Advanced Molecular Biology (3)
Current topics in molecular biology with emphasis on higher-order chromatin structure and transcription, mutability, and DNA repair mechanisms in prokaryotes and eukaryotes. Other topics include: nuclear hormone receptors, HOX gene activation in development, RNAi, and genome organization.

Prerequisite(s): CELL 3030, 6030 or 6030.

CELL 4450 Genome Biology (3)
Genome-level science is changing the pace of biomedical research and medicine. This course will examine how whole genomes, transcriptomes, and proteomes are studied, and what we are learning about the biology of multiple organisms using these novel techniques. Epigenetics, genomics. and proteomics will be covered in the context of disease and the development of novel therapeutics. Prerequisite(s): CELL 3030.

Prerequisite(s): CELL 3030.

CELL 4480 Head and Neck Anatomy (3)
This 3 credit lecture and laboratory course focuses on the gross anatomy of the head and neck, as well as central nervous system anatomy. This includes cadaver dissection of the head, neck, cranial nerves, and brain. This class mirrors dental and medical school anatomy courses and will prepare students to succeed in medical school, dental school, or allied health professions. Does not count toward CMB major. Prerequisite: CELL 4490, 6490.

Prerequisite(s): CELL 4490 or 6490.

CELL 4490 Anatomy (4)
An exploration of the back, upper and lower extremities with an emphasis on bones, muscles, arteries, nerves, and veins in these regions of the human body. Does not count toward CMB major. Corequisite(s): CELL 4491.

Corequisite(s): CELL 4491.

CELL 4491 Anatomy Lab (0)
Does not count toward CMB major. Co-requisite lab for CELL 4491 Anatomy.

Corequisite(s): CELL 4490.

CELL 4500 Adv Molec Neurobiology (3)
This course provides detailed description and in-depth discussion of current techniques and experimental topics in the field of molecular neurobiology. Prerequisite(s): CELL 4370 or NSCI 4370.

Prerequisite(s): CELL 4370 or NSCI 4370.

CELL 4560 Internship (1-3)
An experiential learning process coupled with pertinent academic course work. Open only to juniors and seniors in good standing. Registration is completed in the CMB Department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 4570 Internship (1-3)
An experiential learning process coupled with pertinent academic course work. Open only to juniors and seniors in good standing. Registration is completed in the CMB Department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 4660 Special Topics (0-4)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department. Course may be repeated up to unlimited credit hours. Prerequisite(s): CELL 3030 and 3750.

Prerequisite(s): CELL 3030 and 3750.

Maximum Hours: 99

CELL 4665 Special Topics Lab (1-3)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 4710 Molecular Biology of Cancer (3)
The complex multistep process which transforms a normal cell into a cancer cell, carcinogenesis, will be examined with emphasis on current molecular insights. Major topics include oncogenes, tumor suppressor genes, tumor viruses, genetic instability, metastasis, the regulation of gene expression in cancer cells, and cancer treatment strategies. This course also requires students to analyze and present research papers. Prerequisite(s): CELL 3750.

Prerequisite(s): CELL 3750.

CELL 4730 Neurodevelopment and Disease (3)
The assembly of a functional nervous system is one of the most complex developmental processes in nature. This course provides advance knowledge on the mechanisms controlling nervous system development, at the cellular, circuit, and functional levels, and how failure on these mechanisms underlie neurodevelopmental disorders. Also, this course will introduce the student to most current techniques and research topics on neurodevelopment. Prerequisite(s): CELL 3310 or NSCI 3310.

Prerequisite(s): CELL 3310 or NSCI 3310.

CELL 4780 Developmental Genetics (3)
This course examines the genetic pathways regulating development and the underlying molecular mechanisms by which these pathways are regulated. The goal of the course is to expose students to topics and techniques shaping the field of development biology.

CELL 4890 Service Learning (0-1)
Students complete a service activity in the community in conjunction with the content of a three-credit co-requisite course. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 4910 Independent Study (1-3)
The student will participate in laboratory research under direction of a faculty member. Students may perform their independent study in a laboratory outside of the CMB department or even at another institution; the student will still need a departmental sponsor to act as the instructor of record, and the grade for the project will be submitted by the CMB faculty sponsor in consultation with the host laboratory supervisor. The student may sign up for 1, 2, or 3 hours of independent study, depending on the time that can be devoted to the project. 1 credit can be earned for 3 - 4 hr/wk during the semester or 45-60 total hours over the summer. 2 credits can be earned for 6 - 8 hr/wk during the semester or 90-120 total hours over the summer. 3 credits can be earned for 9 - 12 hr/wk during the semester or 135-180 total hours over the summer. Independent study may be used once to fulfill a laboratory elective requirement for the major. Independent study can fulfill the capstone requirement for the major if the student learns how to read the scientific literature under supervision and presents the project before the end of the semester. The format can be a written paper, a poster defense, or an oral presentation, but it must include the rationale for the project, the materials and methods, the experimental results, and an interpretation of those data. Course may be repeated up to six credit hours.

Maximum Hours: 6

CELL 4920 Independent Study (1-3)
Can only be taken for S/U credit after 6 credits of CELL 4910. The student will participate in laboratory research under direction of a faculty member. Students may perform their independent study in a laboratory outside of the CMB department or even at another institution; the student will still need a departmental sponsor to act as the instructor of record, and the grade for the project will be submitted by the CMB faculty sponsor in consultation with the host laboratory supervisor. The student may sign up for 1, 2, or 3 hours of independent study, depending on the time that can be devoted to the project. The hours needed per credit are similar to CELL 4910. Independent study may be used once to fulfill a laboratory elective requirement for the major. Independent study can fulfill the capstone requirement for the major if the student learns how to read the scientific literature under supervision and presents the project before the end of the semester. The format can be a written paper, a poster defense, or an oral presentation, but it must include the rationale for the project, the materials and methods, the experimental results, and an interpretation of those data. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 4940 Transfer Coursework (0-20)
Transfer coursework at the 4000 level. Departmental approval required.

Maximum Hours: 99

CELL 4990 Honors Thesis (3)
Honors thesis research, first semester. Register in department.

CELL 5000 Honors Thesis (4)
Honors thesis research, second semester. Register in department.

CELL 5110 Capstone Component: CELL 4910 (0)
Corequisite(s): CELL 4910.

Corequisite(s): CELL 4910.

CELL 5111 Capstone Component: CELL 4920 (0)
Corequisite(s): CELL 4920.

Corequisite(s): CELL 4920.

CELL 5380 Study Abroad (1-20)
Courses taught abroad by non-Tulane faculty. Does not count toward Tulane GPA. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 6000 Biomedical Ethics (3)
An interdisciplinary course that examines the moral principles that apply to biology and medicine. Ethical principles will be analyzed in relation to such topical issues as informed consent, abortion, death and dying, allocation of scarce resources, personhood, AIDS, risk, human experimentation, and public policy. Case studies and class discussion will complement lectures and video presentations.

CELL 6010 Cellular Biochemistry (3)
An examination of the structure and function of biological molecules, energetics of biological reactions, enzyme kinetics, metabolism, synthesis of macromolecules, and assembly of structures. Emphasis is placed on mammalian metabolism and mechanisms of control used to regulate metabolic pathways. Detailed explorations into the chemical function of biomolecules lay the foundation for the course. In addition, a term paper or oral presentation is required.

CELL 6030 Molecular Biology (3)
The course is designed to provide basic knowledge of molecular biology. Topics covered include DNA replication, gene structure and regulation, transcription, translation, and protein structure and regulation. Basic laboratory techniques and experimental design in molecular biology are emphasized. Prerequisite(s): CELL 2050.

Prerequisite(s): CELL 2050.

CELL 6035 Molecular Biology Lab (1)
Laboratory experience in molecular biology techniques. Students will learn to analyze DNA via gel electrophoresis; isolate, detect, and quantitate RNA and/or protein; and use plasmids to clone and express a gene.

CELL 6040 Trends in Neuroscience (1)
Students select, analyze, present, and discuss recent empirical articles in the field of Neuroscience.

CELL 6050 Foundations of Pharmacology (3)
This course explains cellular mechanisms by which drugs act in the body. Specific topics include basic pharmacokinetics, drug receptor interactions, drug tolerance, toxicity and drug interactions. The course integrates biology and chemistry by using examples of drug action on the autonomic and central nervous systems, cardiovascular and endocrine systems as well as the treatment of infections. Concepts from cell biology, anatomy, biochemistry, neurochemistry and physiology are covered.

CELL 6070 Neurobiology of Aging (3)
This course will survey the current literature in clinical and research journals regarding the Neurobiology of the aging process. Emphasis is placed on the state of research in aging, looking at experimental design issues as well as published results. Connections will be drawn between the research literature and current clinical practice, as well as what the research literature says regarding aging and lifestyle.

CELL 6080 Adv Dev & Cell Biol II (3)
Lectures, readings, and discussion of the literature in the fields of cellular, developmental, and molecular biology.

CELL 6110 Human Histology (4)
Descriptive study of mammalian microscopic anatomy in a physiological context. Lectures and laboratory. In addition, a term paper is required.

CELL 6111 Human Histology Lab (0)
Lab section for CELL 6110

CELL 6130 Embryology (3)
Anatomical study of developmental processes in humans. Lecture. In addition, a term paper is required. Course may be repeated 2 times for credit.

Prerequisite(s): CELL 3750.
Course Limit: 2

CELL 6131 Embryology Lab (0)
Lab section for CELL 6130

CELL 6160 Developmental Biology (3)
The origin and development of form and patterns in organisms. Recent investigations and research methodology on the processes of growth and differentiation are stressed. In addition, a term paper is required.

CELL 6170 Psychedelics (3)
This course will examen the pharmacology, neuroscience, and sociological impacts of psychedelic drugs. Emphasis will be on the actions of these agents at the cellular and neuronal network level. Potential therapeutic applications and existing published data will be examined.

CELL 6180 Biomedical Research in Animals (3)
Lectures, readings, presentations, and discussion of the use of animal models in biomedical research. A term paper is required. Prerequisites: CELL 3750 or CELL 4010 or approval from instructor

CELL 6200 General Endocrinology (3)
This course explains the basics of hormone action and hormone interactions with their receptors, with an emphasis on the molecular mechanisms by which homeostasis is maintained in multicellular organisms. Physiological outcomes of hormone actions on different organs, as well as aberrant hormone action will be covered.

CELL 6210 Physiology (3)
This course is a survey of the organ systems of the human body. The cellular and molecular mechanisms of organ function are discussed. Emphasis is placed on clinical implications. Oral presentations are required.

CELL 6220 Microbiology (3)
Taxonomy, physiology, genetics and ecology of microorganisms. This course will cover the role of microbes in medicine and industry, and as model systems for research. In addition, a term paper is required. Prerequisite(s): CELL 3750.

Prerequisite(s): CELL 3750.

CELL 6225 Microbiology lab (1)
Laboratory studies of microbial taxonomy, physiology, biochemistry, and genetics.

CELL 6230 Virology (3)
In the virology lecture course you will learn about the structural and reproductive cycles for the major classes of viruses. You will gain an understanding of the structural and genetic factors involved in the virus-host cell interaction. You will also learn about the techniques used to study viruses. You will be using all this knowledge to identify new viruses, solve case studies, hypothesize how specific features of viruses evolved, and propose experiments to study the virus life cycle. A mock research proposal is required.

CELL 6310 Cellular Neuroscience (3)
In-depth coverage of the basic principles of cellular neuroscience, including the biophysical basis of the membrane potential, action potential generation and propagation, and synaptic signaling. Students will be introduced to the synaptic organization of higher neural systems, such as the visual system and somatic sensory system.

CELL 6320 Systems Neuroscience (3)
The subject of this course is the human nervous system, its anatomy, connectivity and function. Discusses the normal structure of the nervous system and the relationship of that structure to physiological function. The course is taught from a practical, clinical point of view and is intended to prepare students for further study in the neurosciences. In addition, a term paper is required. Prerequisite(s): CELL 3310, NSCI 3310, CELL 6310 or NSCI 6310.

Prerequisite(s): CELL 6310 or NSCI 6310.

CELL 6325 Neuroanatomy Lab (1)
The subject of this course is the anatomy of the human nervous system. Students will learn to identify and map the structure and position of nuclei, pathways, and anatomical divisions of the brain and spinal cord. The course is a practical correlate to Systems Neuroscience, and is intended to prepare students for further study in the neurosciences. Prerequisite(s): CELL 3320* or NSCI 3320*. (* May be taken concurrently.)

Prerequisite(s): CELL 3320* or NSCI 3320*.
* May be taken concurrently.

CELL 6340 Neurobiology of Disease (3)
Advanced course on the higher neural functions of the nervous system and neurological diseases resulting from disruption of these functions. An emphasis is placed on the physiology of the nervous system and neural dysfunction caused by inherited and acquired diseases. Topics range from motor control and neuromuscular diseases to high cognitive function and dementia. In addition, a term paper is required.

CELL 6350 Developmental Neurobiol (3)
A broad overview of the different stages of neural development. Examination of the molecular aspects of developmental neurobiology, with reference to some important signaling pathways involved in neural growth and specification. Particular attention will be given to those active research fields, such as growth cone guidance and collapse, activity-dependent development, and applications of these to injury and disease. In addition, a term paper is required.

CELL 6370 Molecular Neurobiology (3)
Introduction to the molecular biology of neurons and neuronal functions. Topics of study will include: the molecular composition of nerve cells, and how this provides a basis for their functional properties; their synaptic connectivity; how they receive, transmit, and retain information at a molecular level. Studies will focus on current research in the field of molecular neurobiology. In addition, a term paper is required.

CELL 6400 Regenerative Biology (3)
This course provides the various cellular and molecular mechanisms of natural or injury-induced regeneration in vertebrates and the applications to the development of therapies to restore tissues and organs damaged by injury or disease. Attributes: Capstone

CELL 6430 Introductory Bioinformatics (3)
The aim of this course is to introduce biology and computer science students to computational research techniques using biological data. This field, generally referred to as bioinformatics, is growing faster then the current workforce available. We will cover the experimental methods used to create the biological data, how to understand the data in the context of biology, and the common computational methods used to derive understanding and make hypothesis from this data. The course will be taught through relevant, hands on projects, and all the tools are computer based. The projects will be based around "omics" data, which is the basis of personalized medicine and precision oncology. This course is designed to be approachable for all students, regardless of their current computational abilities or computer ownership. Prerequisite(s): CELL 6030*. (* May be taken concurrently.)

Prerequisite(s): CELL 6030*.
* May be taken concurrently.

CELL 6440 Adv Molecular Biology (3)
Current topics in molecular biology with emphasis on higher-order chromatin structure and transcription, mutability, and DNA repair mechanisms in prokaryotes and eukaryotes. Other topics include: nuclear hormone receptors, HOX gene activation in development, RNAi, and genome organization. In addition, a term paper is required.

CELL 6450 Genome Biology (3)
Genome-level science is changing the pace of biomedical research and medicine. This course will examine how whole genomes, transcriptomes, and proteomes are studied, and what we are learning about the biology of multiple organisms using these novel techniques. Epigenetics, genomics. and proteomics will be covered in the context of disease and the development of novel therapeutics. Prerequisite(s): CELL 3030 or NSCI 4370.

Prerequisite(s): CELL 3030 or NSCI 4370.

CELL 6480 Head and Neck Anatomy (3)
This 3 credit lecture and laboratory course focuses on the gross anatomy of the head and neck, as well as central nervous system anatomy. This includes cadaver dissection of the head, neck, cranial nerves, and brain. This class mirrors dental and medical school anatomy courses and will prepare students to succeed in medical school, dental school, or allied health professions. Prerequisite: CELL 6490/4490

Prerequisite(s): CELL 6490.

CELL 6490 Anatomy (0-4)
An exploration of the back, upper and lower extremities with an emphasis on bones, muscles, arteries, nerves, and veins in these regions of the human body. Corequisite(s): CELL 6491.

Corequisite(s): CELL 6491.

CELL 6491 Anatomy Lab (0)
Co-requisite lab for CELL 6491 Anatomy

Corequisite(s): CELL 6490.

CELL 6550 Synaptic Organization of the Brain (3)
The goal of this course is to discuss and understand functional connections within and between areas of the brain to lead to a greater understanding of brain function and behavior. We will focus on limbic and memory systems. A strong emphasis will be placed on in- class discussions and student presentations to enhance critical thinking and oral presentation skills.

Prerequisite(s): CELL 3310 or NSCI 3310.

CELL 6560 Pathophysiology (3)
This course focuses on the molecular pathophysiology of infectious disease, immunopathology of the cardiovascular system and skin disorders. The impact of a diseased cardiovascular system will be examined. Concepts from cell biology, anatomy, biochemistry, and physiology are covered. Oral presentations are required.

CELL 6660 Special Topics (0-4)
Courses offered by visiting professors or permanent faculty. For description, consult department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 6665 Special Topics Lab (1-3)
Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 6710 Molecular Biology of Cancer (3)
The complex multistep process which transforms a normal cell into a cancer cell, carcinogenesis, will be examined with emphasis on current molecular insights. Major topics include oncogenes, tumor suppressor genes, tumor viruses, genetic instability, metastasis, the regulation of gene expression in cancer cells, and cancer treatment strategies. This course also requires students to analyze and present research papers.

CELL 6730 Neurodevelopment and Disease (3)
The assembly of a functional nervous system is one of the most complex developmental processes in nature. This course provides advance knowledge on the mechanisms controlling nervous system development, at the cellular, circuit, and functional levels, and how failure on these mechanisms underlie neurodevelopmental disorders. Also, this course will introduce the student to most current techniques and research topics on neurodevelopment.

CELL 6750 Cell Biology (3)
An examination of the structure and function of eukaryotic cells. Emphasis is placed on mechanisms of intracellular and transmembrane transport, cellular control, and intercellular and intracellular signaling. Experimental methods and applications will be emphasized. A term paper is required as part of this course.

CELL 6755 Cell Biology Lab (1)
Laboratory experience in in vitro methodologies. Students will learn to maintain and manipulate mammalian cell cultures.

CELL 6840 Current Topics Dev Biol (2)
Reports and discussions of current literature on developmental processes. Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 6940 Transfer Coursework (0-20)
Transfer coursework at the 6000 level. Departmental approval required.

Maximum Hours: 99

CELL 7110 Research Rotations (1-3)
Individual research supervised by faculty.

CELL 7120 Research Rotations (1-3)
Individual research supervised by faculty.

CELL 7130 Research (2-10)
Individual research supervised by faculty. Course may be repeated 2 times for credit.

Course Limit: 2

CELL 7260 Graduate Communications (3)
In today's competitive science market place, effective communication can be the deciding factor in obtaining postdoctoral fellowships, faculty positions or alternative career options, as well as in getting grants funded and manuscripts published. Deliberate practice of these skills is therefore critical for graduate level science trainees. This course will involve extensive discussion and practice of oral and written communication. By the end of the semester, students will have prepared a draft of their proposals required for qualifying exams and will receive input on the clarity, rigor, format, grammar, and writing style of this document. This course is open to Ph.D. students only, and is recommended to students in their 4th semester of graduate study.

CELL 7450 Genome Biology (3)
Genome-level science is changing the pace of biomedical research and medicine. This course will examine how whole genomes, transcriptomes, and proteomes are studied, and what we are learning about the biology of multiple organisms using these novel techniques. Epigenetics, genomics. and proteomics will be covered in the context of disease and the development of novel therapeutics.

CELL 7860 Master's Seminar (3)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 7870 Doctoral Seminar (1)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 7940 Trasfer Credit-Grad (1-12)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99

CELL 7990 Research (1-9)
Individual research supervised by faculty.

CELL 8000 Research (3)
Individual research supervised by faculty.

CELL 9990 Dissertation Research (3)
Course may be repeated up to unlimited credit hours.

Maximum Hours: 99