

Fall 2021 Graduate Course Electives

Note - This is not a full comprehensive list. Courses such as advanced journal clubs and departmental Research in Progress are not included.

Always check your Department guidelines and with your department coordinator, thesis advisor, and the course instructor for permission and guidance.

Classroom assignments may change between the time you register and when classes begin. Please check your class schedule for the latest classroom location information before attending class.

Fall 2021 Class Schedule

<https://student.apps.utah.edu/uofu/stu/ClassSchedules/main/1218/index.html>

COVID-19 Central @theU

<https://coronavirus.utah.edu/>

ANAT 7710 – Neuroanatomy				
Class Number	Instructor	Credit Hours	Days/Times	Session
4293	Adam Douglass	1.5	T/Th/F 10:45AM-11:35AM	First Half
Cross listed with NEUSC 6060				
Anatomy of the human nervous system (designed for graduate students).				
<i>Lecture</i>				

ANAT 7750 - Developmental Neurobiology				
Class Number	Instructor	Credit Hours	Days/Times	Session
11313	Michael Deans	1.5	T/Th/F 10:45AM – 11:35AM	Second Half
Cross listed with NEUSC 7750				
Cellular and molecular biology of nervous system development.				
<i>Lecture</i>				

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ANAT 7770 - Neural Regulation of Metabolism

Class Number	Instructor	Credit Hours	Days/Times	Session
12153	Owen Chan	2.0	T/Th 10:45AM – 11:35AM	Full Semester

This course is intended to be a graduate level course that provides a detailed overview of the central mechanisms that regulate peripheral metabolism and feeding. Topics to be covered include neural circuits involved in the regulation of brain glucose sensing, hypothalamic control of energy balance, the hypothalamic melanocortin system, mesolimbic reward system as well as central connections with liver and adipose tissue and brain energetics. These topics will be discussed in the context of both normal functionality and in the pathophysiology of diseases such as obesity and diabetes.

Lecture

ANAT 7790 - Microscopy & Imaging

Class Number	Instructor	Credit Hours	Days/Times	Session
17269	Adam Douglass & Kristen Kwan	1.5	T/F 9:00AM – 10:00 AM	Frist Half

Covers theory and practice of biological light microscopy, including sample preparation and staining, fluorescence and confocal microscopy, digital image analysis and quantitation, and figure preparation. A class project uses data from students' own research.

Special Projects

BIOL 2030 – Genetics

Class Number	Instructor	Credit Hours	Days/Times	Session
Multiple Sections	John Stansfield	3.0	Multiple Sections	Full Semester

Study of classical genetics including the rules of inheritance, transmission genetics, and genes in populations. Also covers molecular analysis of gene structure, function, expression, and evolution.

Contact Biology for permission and graduate level enrollment instructions

Lecture

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BIOL 5425 – Mycology

Class Number	Instructor	Credit Hours	Days/Times	Session
-	Bryn Dentinger	4.0	T/Th 9:10AM – 10:30AM	Full Semester

From mushrooms to molds, this course will provide an overview of the enormously diverse Kingdom Fungi, with an emphasis on their ecology and evolution. Through lectures and labs, this course will use a phylogenetic framework to introduce the major groups of fungi, demonstrate how to recognize and document them, and discuss their significance to the environment and human society. The lab will include a field excursion followed by molecular identification of collected samples using DNA sequencing and phylogenetic analysis.

This course requires registration for a lab section. Students will be automatically registered for this lecture section when registering for the pertinent lab section.

There is a differential tuition fee of \$23.30 per credit hour for these courses. The fees are not covered by the School of Biological Sciences or the Tuition Benefit Program.

For course questions, please contact Bryn Dentinger at bryn.dentinger@utah.edu.

Lecture

BIOL 5510 - Genes, Development, and Evolution

Class Number	Instructor	Credit Hours	Days/Times	Session
17688	Michael Shapiro	3.0	T/Th 10:45AM – 12:05PM	Full Semester

Understanding the molecular basis of evolutionary change is a fundamental challenge in biology. This course focuses on recent scientific literature in genetics and developmental biology to explore the mechanisms that impact evolutionary change. Topics concentrate on animal biology and include the molecular basis of diversity in body plans, limb development and evolution, genetics of pigmentation differences, and variation in other adaptive traits. We will also address how humans have shaped animal diversity through domestication. In some cases, the genes that control normal variation among species are also involved in human disease; therefore, studying the molecular mechanisms of diversity promises a greater understanding of human health. It is recommended (but not required) that BIOL 2030 is taken concurrently or completed prior to taking this course.

There is a differential tuition fee of \$23.30 per credit hour for these courses. The fees are not covered by the School of Biological Sciences or the Tuition Benefit Program.

Lecture

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BIOL 5720 – Biology of Biotechnology: The Path to Invent Medicines

Class Number	Instructor	Credit Hours	Days/Times	Session
19526	Ryan Watts	1.0	F 12:55PM – 2:50PM	Frist Half

This course will introduce students to the world of biotechnology discovery and development and will teach real-world applications of biology in industry. From how to found a company, to the rigorous steps needed to bring a drug to patients, students will be introduced to the process of drug discovery and development from multiple perspectives, offering awareness around different career paths in the biotechnology industry. The course will also offer a basic understanding of functions that work in parallel with discovery research and drug development, including business strategy, portfolio decision-making and program management.

Lecture

BIOL 7961 – 002 - Computing with Python

Class Number	Instructor	Credit Hours	Days/Times	Session
14182	David Goldenberg	2.0	T/Th 10:45AM – 12:05PM	Second Half

Topics of special interest taught when justified by student and faculty interest. Content varies from year to year.

Special Topics

BIO C 7100 - 001 Metabolism

Class Number	Instructor	Credit Hours	Days/Times	Session
5102	Jared Rutter	1.0 – 2.0	TBA	Full Semester

Student and faculty discussion of advanced-level topics not covered in formal courses.

This class will be held in EIHG room 6400.

Advanced Seminar: Student and faculty discussion of advanced-level topics not covered in formal courses. Contact Jared Rutter, rutter@biochem.utah.edu , for course info and permission to register.

Special Topics

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BIO C 7100 - 002 Adv Mthds Electron Microscopy

Class Number	Instructor	Credit Hours	Days/Times	Session
14317	Peter Shen	1.0	TBA	First Half
Student and faculty discussion of advanced-level topics not covered in formal courses.				
<i>Special Topics</i>				

BLCHM 6400 - Genetic Engineering

Class Number	Instructor	Credit Hours	Days/Times	Session
14692	Greg Ducker & Matt Miller	2.0	M/W/F 8:35AM – 9:25AM	Second Half

This course covers essential techniques used in genetic engineering. Assuming modest background in biology, the course introduces fundamental aspects of molecular biology including mechanisms for storage of information in DNA and transfer of this information to RNA and protein molecules.

Manipulations of DNA molecules to rearrange or remodel genetic information (cloning) are described from both theoretical and practical viewpoints. Topics covered include the use of restriction endonucleases, amplification of DNA sequences using the polymerase chain reaction (PCR), detection of DNA and RNA using hybridization (Southern and Northern blotting), properties of cloning vectors and their use in constructing genomic and cDNA libraries, DNA sequencing and sequence analysis, creating and detecting mutations in DNA and introducing these mutations into a genome, and expression and characterization of proteins.

Contact Bioscience Program Office, bioscience@genetics.utah.edu for permission and enrollment instructions

Lecture

BLCHM 6450 - Biophysical Chemistry

Class Number	Instructor	Credit Hours	Days/Times	Session
1792	Jessica Swanson	2.0	M/W/F 9:35AM – 10:40AM	Second Half

Cross listed with CHEM 5450 & CHEM 7450

Topics covered include: Basics of thermodynamics and statistical mechanics, with applications in biochemistry; transport phenomena; enzyme kinetics and inhibition; kinetic isotope effects; principles and applications of absorbance, fluorescence, and CD spectroscopies.

Contact Chemistry and Jessica Swanson for permission and enrollment instructions

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Lecture

BLCHM 6460 - Protein Chemistry

Class Number	Instructor	Credit Hours	Days/Times	Session
7133	Vahe Bandarian	2.0	M/W/F 8:20AM – 9:25AM	First Half

Cross listed with CHEM 5460 & CHEM 7460

This is a one half semester course which focuses on the mechanisms of chemical reactions involving peptides and proteins and methods for their study. Subject matter includes enzyme mechanisms, chemical modification of proteins and cofactor chemistry. Prerequisite: organic chemistry.

Contact Chemistry and Vahe Bandarian for permission and enrollment instructions

Lecture

CHEM 7040 – 001 - Statistical Thermodynamics

Class Number	Instructor	Credit Hours	Days/Times	Session
1821	Michael Gruenwald	2.0	M/W/F 11:00AM – 12:05PM	First Half

This course introduces the statistical machinery used to connect molecular behavior with thermodynamic principles. Covered topics are useful for chemists, physicists, biologists, and engineers.

Lecture

CHEM 7050 - Classical Thermodynamics

Class Number	Instructor	Credit Hours	Days/Times	Session
13564	Valerie Molinero	2.0	M/W/F 11:00AM – 12:05PM	Second Half

This course covers classic topics of thermodynamics, including phase and chemical equilibria, solutions, and electrochemistry. Students will learn to derive and understand fundamental thermodynamic relations, equations, and formulae and explore their importance in modern applications. The material covered in this course is useful for scientists and engineers with a thorough understanding of undergraduate thermodynamics.

Lecture

Fall 2021 Graduate Course Electives

CHEM 7240 - Physical Organic Chemistry I				
Class Number	Instructor	Credit Hours	Days/Times	Session
1823	Aaron Puri	2.0	T/Th 9:10AM – 10:30AM	First Half
Fee: \$45.00				
Physical organic chemistry studies the approaches to deciphering the mechanisms of organic reactions and the principles that govern host-guest binding. The topics include stereochemistry, conformational analysis, thermochemistry, acidity, tools to decipher reaction mechanisms, rate laws, kinetic isotope effects, linear free energy relationships.				
<i>Lecture</i>				
CHEM 7250 - Physical Organic Chemistry II				
Class Number	Instructor	Credit Hours	Days/Times	Session
1826	Ryan Looper	2.0	M/W/F 9:35AM – 10:40AM	Second Half
Course examines organic reaction mechanisms involving all fundamental reaction types. Included will be complex mechanisms as combinations of fundamental steps, orbital symmetry controlled reactions (with Woodward-Hoffman, Fukul, and Zimmerman treatments), trajectory analysis and radical reactions				
<i>Lecture</i>				
CHEM 7430 - Chemical Biology of Proteins and Nucleic Acids				
Class Number	Instructor	Credit Hours	Days/Times	Session
13563	Ming Hammond	2.0	T/Th 9:10AM – 10:30AM	Second Half
This course is intended for advanced undergraduate students in Chemistry, Biology, Biochemistry, Biotechnology, and Bioengineering. The subject matter will include a brief background on biomolecular structure and function, then focus on the use of organic chemistry as a tool for manipulating biomolecules, exploring the breakthrough technologies that have enabled recent advantages in fields including protein labeling, protein interactions, biosensors, and nanotechnology.				
<i>Lecture</i>				

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CHEM 7730 – Fundamentals of Electrochemistry

Class Number	Instructor	Credit Hours	Days/Times	Session
13147	Shelley Minteer & Henry White	2.0	M/W/F 9:35AM – 10:40AM	First Half

Fee: \$54.12

This course will provide an overview of the fundamental concepts of electrochemical science. The course is devoted to the basic principles underlying chemical reactions at the electrode/electrolyte interface.

Lecture

CHEM 7740 – Techniques and Applications of Electrochemistry

Class Number	Instructor	Credit Hours	Days/Times	Session
14503	Shelley Minteer & Henry White	2.0	T/Th 9:10AM – 10:30AM	Second Half

This course is designed to introduce you to electrochemical reaction mechanisms, electroanalytical techniques, and electrochemical technologies. Topics to be covered include: a variety of voltammetric and amperometric techniques, electrochemical reaction mechanisms and modified electrodes, and modern electrochemical technologies.

Lecture

CHEM 7770 - Analytical Spectroscopy and Optics

Class Number	Instructor	Credit Hours	Days/Times	Session
13565	John Conboy	2.0	T/Th 9:10AM – 10:30AM	First Half

Three lectures, one discussion per week for 7.5 weeks. This course provides an overview of the principles of optical spectroscopy covering the following topics: Basic optics, such as light propagation, polarization, Fresnel's equations, and elementary optics. Mechanics of optical spectroscopy, including light sources, wavelength selection, and detectors. Sensitivity and dynamic range in spectroscopic measurements. Advanced topics in absorbance, fluorescence and vibrational (IR and Raman) spectroscopy. Surface spectroscopic methods based on optical waveguides, total internal reflection, and surface plasmon resonance. Nonlinear optical spectrometers, including second-harmonic generation and sum-frequency generation.

Lecture

Fall 2021 Graduate Course Electives

H GEN 6030 - Special Topics in Genetics

Class Number	Instructor	Credit Hours	Days/Times	Session
7311	Mark Metzstein	2.0	TBA	Full Semester
Seminar for Human Genetics graduate students covering current topics in the scientific literature.				
<i>Seminar</i>				

H GEN 7380 - Biochemical Genetics

Class Number	Instructor	Credit Hours	Days/Times	Session
8942	Nicola Longo & Marzia Pasquali	3.0	M: 3:30PM – 5:30PM W: 4:30PM – 5:30PM	Full Semester

This course will educate physicians and graduate students on the fundamentals of biochemical genetics. Includes inborn errors of metabolism and several common disorders, such as diabetes and hypertension, which have biochemical bases correctable by diet or other medical intervention. Provides overview of biochemical pathways, practical experience on how the biochemical pathways can be studied *in vivo* and *in vitro*, the molecular bases of common metabolic problems, the mechanism of inheritance including recurrence risk, and how to rationally treat metabolic blocks.

Lecture

MDCRC 6521 – Medicine & Physiology for Molecular Biologists

Class Number	Instructor	Credit Hours	Days/Times	Session
14034	Kevin Whitehead	1.0-5.0	T/Th 9:10AM – 10:30AM	Full Semester

This course explores and provides a richer understanding of human physiology and pathophysiology. This information is critical for understanding the importance of any molecular mechanism at the level of cells, organ and whole animals, and applying this information to humans.

This course has a DIFFERENTIAL TUITION attached to it that is NOT covered by the Tuition Benefit Program.

Special Topics

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MBIOL 6410 – 002 - Protein & Nucleic Acid Biochemistry

Class Number	Instructor	Credit Hours	Days/Times	Session
8540	Brenda Bass & Paul Sigala	2.0	M/W/F 10:45AM – 11:35AM	First Half

Cross listed with BLCHM 6410 & MBIOL 6410

The Biochemistry course covers the structure and function of nucleic acids and proteins, as well as the thermodynamics and kinetics of their interactions with each other and with other biologically important molecules. It is expected that all students have taken an undergraduate course in Biochemistry, and you may find it useful to review chapters discussing the above-mentioned subjects in an undergraduate Biochemistry textbook. You will also need to have a basic working knowledge of kinetics and thermodynamics. (So, if you are not comfortable working with equilibrium constants, free energies, and rate constants, please review these topics in an undergraduate chemistry text.) There are no required texts for this class; readings from various texts will be made available to the class. Some professors may administer a pre-quiz at the start of their lectures to make sure you are adequately prepared for the material to be covered

Contact Bioscience Program Office, bioscience@genetics.utah.edu for permission and enrollment instructions

Lecture

MBIOL 6420 - G3: Genetics, Genomes, and Gene Expression

Class Number	Instructor	Credit Hours	Days/Times	Session
8541	Anthea Letsou	3.0	M/W/F 8:35AM – 9:25AM	Full Semester

This course covers transmission genetics, methods of genetic and genome analysis in model systems and humans, as well as transcriptional and post-transcriptional mechanisms of gene regulation. Lectures cover both classical achievements and recent advances in these fields, with readings based chiefly in the primary literature. Grades are based on exams and problem sets. In previous years, we have found that some students have struggled in this graduate level course in Genetics. Success in G3 requires a foundational understanding of transmission genetics (i.e. successful completion of an undergraduate course in genetics) as the course focuses heavily on genetic analysis. All students should review the basic concepts and students who have not taken a comprehensive undergraduate course in Genetics or have been working in a lab for a number of years should delay taking G3 until the following fall and complete a prerequisite undergraduate course.

Contact Bioscience Program Office, bioscience@genetics.utah.edu for permission and enrollment instructions.

Lecture

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MBIOL 7570 - Case Studies and Research Ethics				
Class Number	Instructor	Credit Hours	Days/Times	Session
6095 / 17138	Joyce Havstad	1.0	Online	First Half / Second Half
Cross listed with PHIL 7570				
An examination of research integrity and other ethical issues involved in scientific research. Topics may include scientific fraud, conflicts of interest, plagiarism and authorship designation, and the role of science in formulating social policy. This course is designed for graduate students, post-docs and regular faculty in the sciences.				
Enrollment does not require a permission code				
<i>Lecture</i>				
NEUSC 6100 - Visual Neuroscience and Retinal Diseases				
Class Number	Instructor	Credit Hours	Days/Times	Session
18603	Jun Yang	3.0	T/Th 1:15PM – 2:45PM	Full Semester
The visual system has provided fundamental information about brain function in part because of the ease of manipulating the stimulus (light) and the easy accessibility of the sensory tissue (retina is the only part of the CNS that can be examined without surgery). This course will provide a comprehensive overview of retinal development, cell biology, circuitry, physiology, and pathology as well as visual cortex signal process. This course will be taught by a team of knowledgeable instructors. The participants will gain an understanding of how various facets of light stimuli become encoded into neuronal signals and how these signals are segregated into parallel streams of visual information that encode luminance, color, direction selectivity, and form. We will study synaptic physiology of tonic & phasic neurotransmission that underlie the center-surround organization of receptive fields. In the end, we will examine novel insights about the roles of the immune system, vascular system and glial cells in regulation of retinal function and disease.				
<i>Lecture</i>				

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ONCSC 6700 – Cancer Genomics

Class Number	Instructor	Credit Hours	Days/Times	Session
19951	Jay Gertz & K-T Varley	2.0	T 3:00PM – 5:00PM	Second Half

Genomic assays have revolutionized our understanding of the molecular defects that occur in cancer genomes. This knowledge has shaped our understanding of how tumors arise, revealed extensive heterogeneity within and between patients' tumors, influenced our treatment strategies, and led to new insights about the basic biology of transcription regulation. This course will introduce students to genomic assays that can be used to study cancer. Emphasis will be placed on understanding the capabilities and limitations of different genomic methods and exploring how the techniques can be applied to address new questions. This is an advanced seminar course with a focus on primary literature, student presentations, and project based learning.

Prerequisite: This course is designed for graduate students that have completed their first year.

Masks currently required @ 3' distance please refer to:

<https://pulse.utah.edu/site/HCI/HCICOVID19/Pages/Conference%20Rooms.aspx>

Special Topics

PATH 7330 - Basic Immunology

Class Number	Instructor	Credit Hours	Days/Times	Session
5085	Hans Haecker	3.0	T/Th 2:00PM – 3:30PM	Full Semester

Cross listed with PATH 5030

Basic Immunology, PATH 7330, is designed to survey major topics in immunology, and is appropriate for Ph.D. students needing a survey course in immunology.

Lecture

PHCEU 7010 - Molecular Biology for Pharmaceutical Scientists

Class Number	Instructor	Credit Hours	Days/Times	Session
10554	Carol Lim & Katherine Bowman	1.5	M/W 11:00AM – 12:30PM	Second Half

This course will review fundamental aspects of genetic engineering and molecular biology, with application to health sciences.

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Lecture

PHCEU 7030 - Macromolecular Therapeutics and Drug Delivery

Class Number	Instructor	Credit Hours	Days/Times	Session
8286	You Han Bae	2.0	T/Th 8:50AM – 10:50AM	First Half

Introduction to polymer in Pharmaceutics and drug delivery. Transport phenomena in drug delivery systems. Macromolecular and vesicular carriers. Biorecognition and drug targeting. Protein, oligonucleotide, and gene delivery systems.

Lecture

PHCEU 7040 – Biotechnology

Class Number	Instructor	Credit Hours	Days/Times	Session
15750	Jim Herron & Shawn Owen	3.0	M/W 9:40AM – 11:45AM	First Half

Principles of kinetics and mechanisms of organic reactions and structure-reactivity relationships applied to pharmaceutical systems. Mechanisms of the degradation and stabilization of drugs, proteins, and DNA.

Lecture

PH TX 7113 - Essentials of Pharmacology and Drug Development

Class Number	Instructor	Credit Hours	Days/Times	Session
13531	Lou Barrows & Gabriel Bosse	3.0	T/Th 1:30PM – 3:00PM	Full Semester

This course will introduce graduate students to the basic principles of pharmacology and toxicology. The first half of the course will focus on the role of drug molecule structure, receptor physiology, ion channels, transporter functions, ligand binding kinetics and intracellular signaling in relation to biological effects of drugs.

The second half of the course will introduce the basic principles of pharmacokinetics including physiochemical factors and individual variations that affect the absorption, distribution, metabolism and excretion of drugs. This course will also introduce the students to drug development principles including strategies used by pharmaceutical companies for drug screening, the role of regulatory agencies, designing of clinical trials and issues related to risk assessment during drug development

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including adverse drug reactions and the role of pharmacogenetics.

Lecture