Fall 2020 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.

Fall 2020 Class Schedule
https://student.apps.utah.edu/uofu/stu/ClassSchedules/main/1208/

Many classes will be Hybrid, IVC Interactive Video Classes or Online due to campus closures and COVID-19 guidance.

COVID-19: RESOURCES FOR GRADUATE AND POSTDOCTORAL STUDIES
https://gradschool.utah.edu/covid-19/

ANAT 7710 - Neuroanatomy

Class Number	Instructor	Credit Hours	Days / Times	Session
4532	**Adam Douglass**	**1.5**	**T/Th/F: 10:45AM-11:35AM**	**First Half**

Cross listed with NEUSC 6060 001
Anatomy of the human nervous system (designed for graduate students).

ANAT 7750 - Developmental Neurobiology

Class Number	Instructor	Credit Hours	Days / Times	Session
12252	**Michael Deans**	**1.5**	**T/Th/F: 10:45AM-11:35AM**	**Second Half**

Cross listed with NEUSC 7750 001
Cellular and molecular biology of nervous system development.

ANAT 7770 - Neural Regulation of Metabolism

Class Number	Instructor	Credit Hours	Days / Times	Session
13262	**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.

BIOL 2030 - Genetics

Class Number	Instructor	Credit Hours	Days / Times	Session
-	**Sandy Parkinson**	**3.0**	**Online N/A**	**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

BIOL 7961 - 002 Computing with Python

Class Number	Instructor	Credit Hours	Days / Times	Session
16173	**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.

BIOEN/ME/ECE 5480 - Ultrasound Imaging and Therapies

Class Number	Instructor	Credit Hours	Days / Times	Session
15466	**Jan Kubanek**	**3.0**	**TuTh / 12:25PM-01:45PM**	**Full Semester**

Recent developments in ultrasonic hardware have provided new imaging methods and new noninvasive therapies that include remote surgeries and targeted delivery of drugs for diseases such as Parkinson's, Alzheimer's, and cancer.
This course will prepare you for jobs in the industry, studies of medicine, and academic research. This would be a great course for grad students as the class will cover applications of the technology that they can use in a research position.
You will get to design your own imaging system and perform a remote brain surgery.

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

BLCHM 6400 - Genetic Engineering

Class Number	Instructor	Credit Hours	Days / Times	Session
-	**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

BLCHM 6410 – Protein & Nucleic Acid Biochemistry

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

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. Cross listed with MBIOL 6410

BLCHM 6450 - Biophysical Chemistry

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

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-Voth for permission and enrollment instructions for cross listed CHEM 7450 section

BLCHM 6460 - Protein Chemistry

Class Number	Instructor	Credit Hours	Days / Times	Session
-	Vahe Bandarian	2.0	M/W/F: 08:20AM-09:25AM	First Half

This is a one-half 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 for cross CHEM 7460 section

CHEM 7040 - 001 Statistical Thermodynamics

Class Number	Instructor	Credit Hours	Days / Times	Session
1946	Peter Armentrout	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.

CHEM 7050 - Classical Thermodynamics

Class Number	Instructor	Credit Hours	Days / Times	Session
15195	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.

CHEM 7240 - Physical Organic Chemistry I

Class Number	Instructor	Credit Hours	Days / Times	Session
1948	Aaron Puri	2.0	T/Th: 09:10AM-10:30AM	First Half

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.

CHEM 7250 - Physical Organic Chemistry II

Class Number	Instructor	Credit Hours	Days / Times	Session
1951	**Ryan Looper**	**2.0**	**M/W/F: 09:35AM-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.

CHEM 7430 - Chemical Biology of Proteins and Nucleic Acids

Class Number	Instructor	Credit Hours	Days / Times	Session
15194	**Ming Hammond**	**2.0**	**T/Th: 10:45AM-12:05PM**	**First 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.

CHEM 7730 – Fundamentals of Electrochemistry

Class Number	Instructor	Credit Hours	Days / Times	Session
14601	**Shelley Minteer & Henry White**	**2.0**	**M/W/F: 09:35AM-10:40AM**	**First Half**

Fees: $54.10. 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.

CHEM 7740 – Techniques and Applications of Electrochemistry

Class Number	Instructor	Credit Hours	Days / Times	Session
16833	**Shelley Minteer & Henry White**	**2.0**	**T/Th: 07:30AM-08:50AM**	**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.

CHEM 7770 - Analytical Spectroscopy and Optics

Class Number	Instructor	Credit Hours	Days / Times	Session
15197	**John Conboy**	**2.0**	**T/Th: 09:10AM-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 dectors. 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 spectroscopes, including second-harmonic generation and sum-frequency generation.

H GEN 7380 - Biochemical Genetics

Class Number	Instructor	Credit Hours	Days / Times	Session
9618	**Nicola Longo & Marzia Pasquali**	**3.0**	**M: 03:30PM-05:30PM W: 04:30PM-05:30PM**	**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.

MDCRC 6521-003 – Medicine & Physiology for Molecular Biologists

Class Number	Instructor	Credit Hours	Days / Times	Session
15932	**Kevin Whitehead**	**2.0**	**TuTh: 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.

MBIOL 6410 Protein & Nucleic Acid Biochemistry

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

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.
Contact Bioscience Program Office, bioscience@genetics.utah.edu for permission and enrollment instructions. Cross listed with BLCHM 6410

MBIOL 6420 G3: Genetics, Genomes, and Gene Expression

Class Number	Instructor	Credit Hours	Days / Times	Session
-	**Anthea Letsou**	**3.0**	**M/W/F: 08:35AM-09:25AM**	**Full Semester**

Prerequisite: Comprehensive undergraduate Genetics class.
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.
Contact Bioscience Program Office, bioscience@genetics.utah.edu for permission and enrollment instructions.

MBIOL 7570 - Case Studies and Research Ethics

Class Number	Instructor	Credit Hours	Days / Times	Session
6514	**Joyce Havstad**	**1.0**	**Online**	**-**

Cross listed PHIL 7570 001
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

PATH 7330 - Basic Immunology

Class Number	Instructor	Credit Hours	Days / Times	Session
5398	**June Round**	**3.0**	**T/Th: 02:00PM-03:30PM**	**Full Semester**

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.

PHCEU 7010 - Molecular Biology for Pharmaceutical Scientists

Class Number	Instructor	Credit Hours	Days / Times	Session
11407	**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.

PHCEU 7030 - Macromolecular Therapeutics and Drug Delivery

Class Number	Instructor	Credit Hours	Days / Times	Session
8914	**You Han Bae**	**2.0**	**T/Th: 08:50AM-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.

PHCEU 7040 - Biotechnology

Class Number	Instructor	Credit Hours	Days / Times	Session
18823	**Jim Herron**	**3.0**	**M/W: 09:40AM-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.

PH TX 7113 - Essentials of Pharmacology and Drug Development

Class Number	Instructor	Credit Hours	Days / Times	Session
15142	**Lou Barrows & Shashank Tandon**	**3.0**	**M/W: 01:30PM-03:00PM**	**Full Semester**

This course is designed to provide basic didactic information in the underlying concepts of pharmacology for the beginning graduate student. The primary emphasis of the course is to provide new graduate students in the Department of Pharmacology and Toxicology, or other

graduate students in the biomedical sciences (Neuroscience, Biological Chemistry, or Molecular Biology programs) with fundamental knowledge about pharmacology and drug treatment. It is anticipated that students who complete this course would be able to apply these fundamental concepts to more advanced curricula and research endeavors in the disciplines of pharmacology and toxicology.

PHYS 6230 - Properties and Functions of Processive Molecular Motors

Class Number	Instructor	Credit Hours	Days / Times	Session
17923	**Michael Vershinin**	**3.0**	**-**	**Full Semester**

This course will provide an overview of microtubule and actin-based motors: their structure, their function (including topics of motor regulation,) and the quantitative approaches used to study and model motor activity. Students with back grounds in biology or physics are equally encouraged. The class will outline the biological context of motoractivity, discuss motor families and details of their mechano-chemical activity, and further cover measurement and modeling techniques as well as related advanced topics.