

IGPNS Recommended Electives List

Animal Science 414: Ruminant Nutrition

Integrates basic nutrition concepts and ration balancing skills by teaching students to balance and troubleshoot rations for various domesticated ruminants. 2 cr.

Pre-Requisites: An Sci/ Dy Sci 311

Biochem 550: Topics in Medical Biochemistry

Biochemical and molecular analysis of selected human diseases. Topics will include lipid metabolism and atherosclerosis, cell cycle regulation and oncogene function in cancer, and human immunodeficiency virus (HIV) structure, life cycle, and mechanism of acquired immunodeficiency disease syndrome (AIDS). 2cr

Prerequisites: Biochem 501 or 507

Biochemistry 551: Biochemical Methods

Introduction to modern biochemical laboratory techniques and current biochemical literature. Students will present a seminar based upon scientific literature that parallels experiments they will perform in lab. For advanced undergraduates and non-biochemistry graduate students. 4cr.

Pre-requisites: Biochem 501 or Biochem 507 or concurrent enrollment

Biochemistry 601: Protein and Enzyme Structure and Function

Protein structure and dynamics. Protein folding. Physical organic chemistry of enzymatic catalysis. Analysis of enzyme kinetics and receptor-ligand interactions. Enzymatic reaction mechanisms. 2cr.

Pre-requisites: CHEM 345 and (Biochem 501 or 507)

Biochemistry/Genetics 620: Eukaryotic Molecular Biology

This course focuses on the basic molecular mechanisms that regulate DNA, RNA, and protein metabolism in eukaryotic organisms. This course is intended for advanced undergraduates and first year graduate students with a firm knowledge of basic biochemistry.

Biochemistry 645: Molecular Control of Metabolism and Metabolic Disease

Examination of various physiological states and how they affect metabolic pathways. Discussion of a number of special topics related to the unique roles of various tissues and to metabolic pathways in disease states, including adipocyte biology, beta-cell biology, epigenetics, inflammation, and aging related diseases. 3cr.

Pre-requisites: Biochem 501 or 508 or graduate standing

Biochemistry 630: Cellular Signal Transduction Mechanisms

Comprehensive coverage of human hormones, growth factors and other mediators; emphasis on hormone action and biosynthesis, cell biology of hormone-producing cells. 3cr.

Pre-requisites: Biochem 501 or Biochem 507 & 508 & Cell biology or instruct consent

Biochemistry 729: Advanced Topics

Specialized subjects of current interest.

Examples include: From Atoms to Molecules, Foundations of Biochemistry, Responsible Conduct of Research, Synthetic Biology

Biomolecular Chemistry 504: Human Biochemistry Laboratory

Introduction to basic biochemistry and molecular biology lab techniques through investigation of an enzyme involved in human metabolism. 3cr.

Pre-requisites: Biochem 501, 507, 508, Bmolchem 503, or concurrent enrollment, or graduate/professional standing

Biomolecular Chemistry 627: Methods and Technologies for Protein Characterization

This course seeks to engage students interested in chemical instrumentation and those who desire to apply proteomic technologies to current biological problems. Understanding the current proteomics landscape, the limitations of these technologies, and their practical applications are among the course learning objectives. 2-3cr.

Prerequisites: Graduate Standing

Biomolecular Chemistry 704: Comprehensive Human Biochemistry

Lectures, conferences, and lab. Comprehensive basics in the chemistry, enzymology, and metabolism of living systems, with emphasis on the biochemical aspects of function and control. 5cr.

Pre-requisites: Chem 344, Physics 104, and Zoology; Professional;/graduate student standing

Biomolecular Chemistry 720: Experimental Design and Paradigms in Cellular Biochemistry and Molecular Biology

A literature-based course taught in module format and covering the following areas from historical to modern contexts: biochemistry of post-translational modification of proteins, model organisms, transcriptional switches, chromosome replication, and RNA in biological regulation. 3cr.

Pre-requisites: Graduate/Professional Standing

CBE 781: Biological Engineering: Molecules, Cells, and System

Protein engineering and protein-protein interactions, receptor-ligand binding, cell metabolism and signaling, metabolic engineering and synthetic biology, tissue engineering. Additional topics may be covered such as: regenerative medicine, biomaterials, microbe-host interactions. 3cr

CRB 630: Proteomics for Biologists

Proteomics and metabolomics are playing an increasingly important role in biology and medicine. Many biology labs are now starting to use proteomics and metabolomics in their research projects. This course is designed specifically for students in biological sciences who have interests to learn proteomics and metabolomics. It will integrate formal classroom lectures with one-on-one consultation. Lectures include the essential fundamentals and applications in mass spectrometry-based proteomics and metabolomics to address biological/medical problems. Meanwhile, one-on-one consultation will be offered to respond to students' individual needs, including the design of proteomics/metabolomics experiments, troubleshooting, and proper interpretation of the results. Students who take this course should have basic chemistry and biochemistry knowledge. 2 cr.

Prerequisites: Graduate Student or Biochem 501 or Biochem 507)

Family Medicine 701: Perspectives in Multidisciplinary Clinical & Translational Research

An overview of clinical investigation, including translational research; observational, experimental and quasi experimental designs; efficacy and effectiveness; behavioral and community interventions; qualitative methods; educational research; quality assurance; health economics; bioethics; pharmacotherapy trials; health disparities, and patents. 2cr

Kinesiology 774: Metabolic responses to exercise and stress

Examination of the metabolic and biochemical responses to acute and chronic exercise and environmental stress. Emphasis placed on the mechanisms underlying these responses. 2cr.
Prerequisites: Physiol 720 or cons instr.)

Kinesiology 779: Human Muscle Function in Health and Disease

Multidisciplinary seminar on human muscle function in health and disease. 2cr
Prerequisites: Graduate Students

Life Science Communication 560: Scientific Writing

This course is intended for students in science disciplines to learn how to communicate and translate scientific research for a general audience. 3cr.
Pre-requisites: Graduate/Professional Standing

Medicine 701: Cell Signaling and Human Disease

This course is intended for PhD and MSTP students interested in medically relevant basic science. Landmark discoveries, as well as current knowledge and controversies in human health, with an emphasis on cancer biology, will be covered. 1cr

Medicine 720: Endocrinology and Metabolism

Designed to provide students with a broad grounding in endocrinology and metabolism at the graduate level, with an emphasis on human and human-related disorders wherever possible from a research perspective. This course explores the physiological and molecular mechanisms by which the endocrine regulation of metabolism acts to preserve mammalian health, and how dysfunction in these mechanisms leads to disease, with an emphasis on diabetes, obesity and hypertension. Focuses primarily on whole animal/human endocrinology and organ systems regulating adult human health. Basic concepts of cell biology and biochemistry are also covered as a precursor to advanced topics courses to be taken later in the course of biomedical graduate studies. This course bridges basic science with clinical outcomes and exposes students to adult endocrine pathologies as well as case studies for real-world applications of course material. 2cr.
Pre-Reqs: Graduate Standing

Nutri Sci 875: Vitamin A; Molecule to Man

Topics course

Oncology 703: Carcinogenesis and Tumor Cell Biology

Viral, chemical, and physical factors involved in tumor formation in humans and experimental animals; biology and biochemistry of neoplasia, both in vivo and in vitro. 3cr
Pre-reqs: Graduate/Professional Student

Population Health Science 650: Intro to Pop. Health Sciences**Population Health Sciences 664: Prevention of Childhood overweight and obesity**

This course is intended to provide students with theoretical and practical knowledge to develop, implement, and evaluate obesity prevention interventions. This course will emphasize pediatric obesity prevention with a focus on nutrition and physical activity health behaviors and environments. 2cr.
Pre-requisites: MPH or Graduate Student

Population Health Sciences 888: Public Health Genomics

Public health genomics uses knowledge gained from genetic and molecular research along with a consideration of ethical, legal, and social implications (ELSI) to prevent disease and improve the health of the population. Students enrolled in this course will be provided an introduction to public health genomics through a review of fundamental principles of genetics, followed by lectures and discussions on the use of genetic information in clinical and research settings and its implications for disease management and prevention. Students will also gain an awareness of policies that guide public health and will be able to discuss current ethical, legal, and social implications of these policies. These learning objectives will be met through readings and videos, lectures, and discussions of recent journal articles and current topics in public health genomics. 1cr

Pathology-Biology 675: Special Topics**Pathology 750: Cellular and Molecular Biology/Pathology**

The emphasis is on our current understanding of molecular and cellular mechanisms. Wherever possible, human diseases are used to illustrate the outcome at the organismal level of defects in these mechanisms. Lectures will draw from the current research literature and cover topics such as cell and tissue organization, intracellular sorting, cell migration and growth. Students in Cellular and Molecular Pathology graduate program must enroll for lectures (2 credits) and discussion section (1 credit)
Pre-requisites: Graduate/Professional Standing

Pathology 751: Cell and Molecular Biology of Aging

Cellular and molecular pathophysiology of human disease typically afflicting the aged, such as Alzheimer's, osteoporosis, Type II diabetes and arthritis, experimental systems to study aging. 3cr.
Pre-requisites: Graduate/Professional Standing

Pathology 803: Pathogenesis of Major Human Diseases

This course will focus on disease pathogenesis and discussion of the leading disease research model. Throughout the course, we will combine expert clinicians, basic scientists, and literature review on specific major diseases. 3 cr.
Prerequisites: Upper-level general cell boil course or Path 703

Quantitative Methods**BMI 541: Introduction to Biostatistics**

Course designed for the biomedical researcher. Topics include: descriptive statistics, hypothesis testing, estimation, confidence intervals, t-tests, chisquared tests, analysis of variance, linear regression, correlation, nonparametric tests, survival analysis and odds ratio. 3cr.
Pre-requisite: Graduate Standing

BMI 542: Introduction to clinical trials statistics

Intended for biomedical researchers interested in the design and analysis of clinical trials. Topics include definition of hypotheses, measures of effectiveness, sample size, randomization, data collection and monitoring, and issues in statistical analysis. Statistics graduate students should take Stat 641. 3cr.
Pre-requisites: Stats 541 or equivalent

CRB 630: Proteomics Approaches for Biologists

Proteomics and metabolomics are playing an increasingly important role in biology and medicine. Many biology labs are now starting to use proteomics and metabolomics in their research projects. This course is designed specifically for students in biological sciences who have interests to learn proteomics and metabolomics. It will integrate formal classroom lectures with one-on-one consultation. Lectures include the essential fundamentals and applications in mass spectrometry-based proteomics and metabolomics to address biological/medical problems. Meanwhile, one-on-one consultation will be offered to respond to students' individual needs, including the design of proteomics/metabolomics experiments, troubleshooting, and proper interpretation of the results. Students who take this course should have basic chemistry and biochemistry knowledge. 2cr.

Prerequisites: Graduate Student or Biochem 501 or Biochem 507

Genetics 885: Advanced Genomic and proteomic analysis

With the availability of genome sequences and high-throughput techniques, organismal physiology can now be examined on a global scale by monitoring the behavior of all genes or proteins in a single experiment. This course will present modern techniques in genomics and proteomics, with particular focus on analyzing the data generated by these techniques. Course material will cover genomic sequencing, comparative sequence analysis, phylogeny construction and phylogenomics, transcription factor motif discovery, DNA microarray analysis, techniques in mass spectrometry, proteomic screening methods, and protein-interaction network analysis. In addition to lecture time, the course consists of a 2-hour per week computer lab where students get hands-on experience analyzing genomic and proteomic datasets. In addition, students conduct a semester-long computational project of their choice that uses multiple computational methods discussed in class. 3cr.

Class enrollment is limited to 20 students due to computer lab space.

Prerequisites: General statistics, intermediate or advanced Genetics, and instructor consent

Statistics 571: Statistical Methods for Bioscience I

Descriptive statistics, distributions, one and two-sample normal inference, power, one-way ANOVA, simple linear regression, categorical data, non-parametric methods; underlying assumptions and diagnostic work. 4 cr.

Statistics 572: Statistical Methods for Bioscience II

Continuation of Forestry 571. Polynomial regression, multiple regression, two-way ANOVA with and without interaction, split-plot design, subsampling, analysis of covariance, elementary sampling, introduction to bioassay. 4cr.

Prerequisites: Stats/Forestry/Hort 571

Course	When Offered	Fall	Spring	Summer
Animal Science 414		X		
Biochem 550			X	
Biochem 551		X	X	
Biochem 601		X		
Biochem/Genetics 620			X	
Biochem 645		X		
Biochem 630		X		
Biochem 729 (topics vary)		X	X	
Biomolecular Chem 504		X	X	
Biomolecular Chem 627			X	
Biomolecular Chem 704		X		
Biomolecular Chem 720			X	
CBE 781		X		
CRB 630			X	
Family Medicine 701			X	
Kines 774 (occasionally)			X	
Kines 779			X	
Life Science Comm 560			X	X
Medicine 701			X	
Medicine 720			X	
Nutri Sci 875			X	
Oncology 703		X		
Pop Health 650		X	X	X
Pop Health 664		X		
Pop Health 888			X	
Pathology-Biology 675 (varies)		X	X	X
Pathology 750			X	
Pathology 751		X		
Pathology 803 (occasionally)		X		
Quantitative Methods Courses				
BMI 541		X		
BMI 542		X		
CRB 630			X	
Genetics 885 (even years)		X		
Statistics 571		X		
Statistics 572			X	