Recommended Electives

Animal Science 414: Ruminant Nutrition (3 cr - Fall) Integrates basic nutrition concepts and ration balancing skills by teaching students to balance and troubleshoot rations for various domesticated ruminants.

Animal Sciences 849: Genetic Epidemiology (3 cr - Fall) An introduction to genomic epidemiology, including a general overview of genetics and Mendelian and complex inheritance, as well as various elements of study design, such as participant ascertainment; phenotype definition; biologic sample selection; genotyping, sequencing, and quality control; measurement of covariates; and choice of analytic methods. Briefly covers original study designs; focuses on current study designs.

Biochem 550: Principles of Human Disease and Biotechnology (2 cr - Fall/Spring) Covers modern approaches to human diseases and biotechnology, emphasizing the molecular and biochemical basis of cancer and metabolic disorders with an overview of recent advances in applied biotechnology. Investigates the mechanisms of disease onset, progression, and therapeutic strategies through contemporary primary research literature.

Biochem 551: Biochemical Methods (4 cr - Fall/Spring) Introduction to modern biochemical laboratory techniques and current biochemical literature. Includes student seminar presentations based upon scientific literature that parallels experiments performed in the lab.

Biochem 601: Protein and Enzyme Structure and Function (2 cr - Fall) Protein structure and dynamics. Protein folding. Physical organic chemistry of enzymatic catalysis. Analysis of enzyme kinetics and receptor-ligand interactions. Enzymatic reaction mechanisms.

Biochem 620: Eukaryotic Molecular Biology (3 cr - Spring) Focuses on the basic molecular mechanisms that regulate DNA, RNA, and protein metabolism in eukaryotic organisms.

Biochem 625: Mechanisms of Action of Vitamins and Minerals (2 cr - Spring) Emphasizes the importance of coenzyme and cofactors of enzymes (i.e., vitamins and minerals) in biochemistry. All aspects of the biochemistry of coenzymes will be covered, including their biosynthesis as far as is known, the biochemical reactions they catalyze, their chemical and spectroscopic properties, and the mechanisms by which they facilitate biochemical reactions.

Biochem/Nutri Sci 645: Molecular Control of Metabolism and Metabolic Disease (3 cr - Fall) 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.

Cell and Regenerative Biology 630: Proteomics Approaches for Biologists (2 cr - Fall) 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. Includes the essential fundamentals and applications in mass spectrometry–based proteomics and metabolomics to address biological/medical problems. Design of proteomics/metabolomics experiments, troubleshooting, and proper interpretation of the results.

Cell and Regenerative Biology 710: Developmental Genetics (3 cr - Fall) Covers a broad range of topics in animal development, with an emphasis on molecular mechanisms. Focuses on common themes, with the goal of understanding and analyzing current research in developmental biology and genetics.

Genetics 626: Genomic Science (2 cr - Spring) Brings cutting-edge topics in the genomic sciences into the reach of those in chemistry, biology, engineering, computer science & statistics fields. Enables biologically-oriented students to deal with advances in analytical science so that they may incorporate new genomic science concepts into their own scientific repertoires.

Genetics 885: Advanced Genomic and Proteomic Analysis (3 cr - Fall) 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 includes a computer lab where students get hands-on experience analyzing genomic and proteomic datasets. Students should have coursework in general statistics and intermediate or advanced genetics.

Kinesiology 774: Metabolic Responses to Exercise and Environmental Stress (2 cr - Spring) Examination of the metabolic and biochemical responses to acute and chronic exercise and environmental stress. Emphasis placed on the mechanisms underlying these responses.

Kinesiology 779: Human Muscle Function in Health and Disease (2 cr - Spring) Multidisciplinary seminar on human muscle function in health and disease. The course is geared toward advanced undergraduate and graduate students in kinesiology, physical and occupational therapy, motor control and behavior, neurophysiology resident in neurology and other related allied health professionals.

Life Science Communication 561: Writing Science for the Public (3 cr - Spring) Focuses on science writing concepts and techniques that can be used to communicate purposefully and effectively with public audiences about science, research, and technology.

Medical Genetics 565: Human Genetics (3 cr - Fall) Principles, problems, and methods of modern human genetics. Focuses on how researchers discover the genetics of diseases and how those discoveries are used to improve clinical practice. Surveys aspects of (i) the molecular function of the human genome, (ii) the basic principles of human genetics including statistical genetics, quantitative genetics, and genomic variation in human populations, (iii) the genetics of rare disorders and common diseases, and genomic analysis approaches, including genome-wide association studies and sequencing, and (iv) how genetics are used in medicine and discussions covering ethical considerations of human genomic data.

Medicine 720: Endocrinology and Metabolism (3 cr - Spring) Provides a broad grounding in endocrinology and metabolism with an emphasis on human and human-related disorders wherever possible. Explores further 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.

Nutritional Sciences 875: Advance Topics (1-6cr) Assorted topics in nutritional sciences.

Oncology 703: Carcinogenesis and Tumor Cell Biology (3 cr – Fall) 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.

Pathology 750: Cellular and Molecular Biology/Pathology (2 cr – Spring) Emphasizes 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. Focuses on different cell types and how cells function. We also discuss how cells talk to themselves and each other. Topics include mechanisms of cell survival and division. Provides an overview of a broad set of cell biology topics to demonstrate the breadth and diversity of cellular functions.

Pathology 751: Biology of Aging (2 cr – Fall) Examines the molecular, cellular, physiological, and clinical aspects of aging beyond basic biology in a biomedical/clinical research setting. Aging and age-related diseases are examined via the combined expertise of basic scientists and clinicians covering a range of topics directly relevant to biology of aging research, including the clinical perspective, the research perspective, and the integration of the two.

Pathology 803: Pathogenesis of Major Human Diseases (3 cr – Fall) 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.

Population Health Sciences 552: Regression Methods for Population Health (3 cr – Spring) Introduction to the primary statistical tools used in epidemiology and health services research; multiple linear regression, logistic regression and survival analysis.

Population Health Sciences 636: Public Health Genomics (1 cr – Spring) Provides an introduction to public health genomics through a review of fundamental principles of genetics, the use of genetic information in clinical and research settings, and its implications for disease management and prevention, and health promotion. Explores policies that guide public health and discusses current ethical, legal, and social implications of these policies.

Population Health Sciences 651: Advanced Regression Methods for Population Health (3 cr – Fall) Extension of regression analysis to observational data with unequal variance, unequal sampling and propensity weights, clusters and longitudinal measurements, using different variance structures, mixed linear models, generalized linear models and GEE. Matrix notation will be introduced and underlying mathematical and statistical principles will be explained. Examples use data sets from ongoing population health research.

Population Health Sciences 798: Epidemiologic Methods (3 cr – Spring) The main emphasis is the design and interpretation of epidemiologic studies. Includes hands-on experience in the evaluation of epidemiologic evidence, the analysis of epidemiologic data, and the discussion of strategies aimed to improve study validity and efficiency.

Population Health Sciences 849: Genomic Epidemiology (2 cr – Fall/Spring) An introduction to genomic epidemiology, including a general overview of genetics and Mendelian and complex inheritance, as well as various elements of study design, such as participant ascertainment; phenotype definition; biologic sample selection; genotyping, sequencing, and quality control; measurement of covariates; and choice of analytic methods. Briefly covers original study designs; focuses on current study designs.

Statistics 541: Introduction to Biostatistics (3 cr – Fall) Course designed for the biomedical researcher. Topics include: descriptive statistics, hypothesis testing, estimation, confidence intervals, t-tests, chi-squared tests, analysis of variance,

linear regression, correlation, nonparametric tests, survival analysis and odds ratio. Biomedical applications used for each topic.

Statistics 542: Introduction to Clinical Trials I (3 cr - Fall/Spring) 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 571: Statistical Methods for Bioscience I (4 cr - Fall) 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.

Statistics 572: Statistical Methods for Bioscience II (4 cr - Spring) Polynomial regression, multiple regression, two-way ANOVA with and without interaction, split-plot design, subsampling, analysis of covariance, elementary sampling, introduction to bioassay.

Statistics 641: Statistical Methods for Clinical Trials (3 cr - Fall) Statistical issues in the design of clinical trials, basic survival analysis, data collection and sequential monitoring.

Statistics 642: Statistical Methods for Epidemiology (3 cr - Spring) Methods for analysis of case-control, cross sectional, and cohort studies. Covers epidemiologic study design, measures of association, rates, classical contingency table methods, and logistic and Poisson regression.