

BIOCHEMISTRY AND MOLECULAR BIOLOGY

Biochemistry and Structural Biology; Cell Biology and Genetics; Cancer Biology Subtracks

BMB 5000f. CANCER BIOLOGY I: INTRODUCTION TO CANCER BIOLOGY; MOLECULAR, CELLULAR AND GENETIC BASIS OF CANCER (3 cr; A-F) Billadeau This course will provide an introductory foundation for understanding cancer biology through the discussion of normal and abnormal tissue pathology, and the molecular, cellular and genetic mechanisms that contribute to tumorigenesis. Topics that will be covered in the course include: the histopathology of cancer, tumor initiation and promotion, oncogenes and tumor suppressors, cell cycle control, cell migration and angiogenesis. In addition, several lectures will focus on the cellular, molecular and genetic approaches to study cancer in vitro and in animal models.

BMB 5200w,s. BMB WORKSHOP. (1 cr/yr; S-N) Strehler, Katzmann Work-in-progress presentations on experimental research projects, given by graduate students in the Biochemistry and Molecular Biology tracks, occasional guest speakers.

Register for this course winter quarter only.

BMB 5350f. HORMONES AND CANCER. (1 cr; S-N; offered even years) Tindall

This course is a didactic class design to give the student an overview of hormonal carcinogenesis. The malignancies to be covered include breast cancer, prostate cancer, endometrial cancer, ovarian cancer, and thyroid cancer. The course will review epidemiology, signaling pathways, the role of hormones, and novel therapeutic approaches of the mentioned cancers. The course is expected to give students a basic knowledge on the hormonal aspects of cancer, as well as stimulate new ideas in students currently working on a specific field of hormone-related cancers.

BMB 5400s. DEVELOPMENTAL BIOLOGY. (2 cr; A-F) Urrutia, Fernandez-Zapico

Model organisms: *Drosophila melanogaster*, *Caenorhabditis elegans*, *Mus Musculus*, *Brachydanio rerio* and *Xenopus laevis*. Cellular process of developing organisms. Genetic analysis of development. Early development: molecular basis of embryo polarity, maternal effect, patterning mechanisms and signal transduction cascades. Molecular mechanisms of organogenesis: derivatives of the primary germ layers. Molecular model of differential gene expression: Homeobox. Sex development pathways. Teratogenesis. Regeneration and aging.

BMB 5500w. HUMAN CYTOGENETICS. (2 cr; A-F; offered even years) Jalal

Emphasizes structure and function of chromosomes and how cytogenetics relates to human clinical problems. Topics include karyotype evolution, aneuploidy, polyploidy, structural anomalies, nomenclature, and principles of banding. A review of chromosomal syndromes, chromosome breakage syndromes, cell division, and genomic imprinting is included. Some clinical areas to be discussed include prenatal diagnosis, malignant hematologic disorders, and pediatric and obstetrical problems with chromosome anomalies. Research topics include the chromosomal and molecular bases of cancer and molecular cytogenetics.

BMB 8000f. BIOLOGICAL MACROMOLECULES. (3 cr; A-F; prereq Core 6100 or equiv) Owen, Ramirez-Alvarado. Offered starting 2005.

Learn how to avoid mistakes in the interpretation of experimental results involving your favorite macromolecule. This intermediate level course builds on CORE 6100, exploring quantitative methods to study proteins and nucleic acids. Topics include the physical principles and measurement of photonics, hydrodynamics and spectroscopy, as well as case studies.

BMB 8030f. DATA ANALYSIS AND MATHEMATICAL MODELING IN BIOMEDICAL RESEARCH. (3 cr; A-F; offered even years; prereq linear algebra, calculus, basic computer skills or consent of instructor) Bajzer

An introduction to the art of mathematical modeling and to methods for data fitting with applications to biomedical sciences. Theoretical knowledge along with data reduction practice are offered to provide sufficient skills in using data fitting procedures. Students are encouraged to apply acquired knowledge to their own research projects.

BMB 8040s. FRACTALS AND CHAOS IN BIOSCIENCES. (2 cr; A-F; prereq college calculus) Bajzer
An overview of applications of fractals and chaos in biosciences. The emphasis is on general understanding of basic concepts (selfsimilarity, scaling, dimension, sensitivity to initial conditions, bifurcations, chaotic data, control of chaos, etc.) and their applications (protein backbone, neurons, ion channel kinetics, glycolysis, allosteric enzymes, pulmonary hypertension, tumor growth, etc.). Mathematical aspects and technical details are reduced to a minimum.

BMB 8050f. BIOLOGICAL KINETICS. (3 cr; S-N; prereq college level biochemistry or biophysics, college calculus, college chemistry, basic computer skills) Bajzer, Caride An overview of applications of kinetic analysis to various biological problems including complex steady-state and pre-steady-state enzyme kinetics, kinetics of protein folding, ion pumps, calcium signaling, oscillatory biochemical reactions, neurotransmitter release and tumor growth. Experimental, theoretical and practical aspects are covered in sufficient detail to allow participants to approach their kinetic problems with an adequate background.

BMB 8070w. CANCER BIOLOGY II: MOLECULAR MECHANISMS OF CANCER: SIGNAL TRANSDUCTION PATHWAYS AND NETWORKS. (3 cr; A-F; offered even years; prereq BMB 5000) Billadeau

This course will provide a basic core of information on the molecular mechanisms through which cells receive and respond to external signals in the normal state, while highlighting how dysregulation of these signaling pathways contributes to tumorigenesis. Emphasis will be on the principles of cell signaling through specific cell surface receptors or within specific signaling networks. In addition, the molecular, genetic and biochemical strategies by which cell signaling pathways are being elucidated will be discussed. Topics to be covered include: the regulation of cell signaling pathways through cell surface receptors and hormone receptors, intracellular kinases and GTP-binding proteins, NF- κ B, apoptosis, and DNA damage signaling.

BMB 8075s. CANCER BIOLOGY III: EPIGENETICS, EPIDEMIOLOGY AND GENOMICS IN CANCER. (3 cr; A-F; offered even years; prereq BMB 5000, BMB 8000) Billadeau

This course is designed to provide the student with an understanding of how cancer genetics, epigenetics, proteomics and functional genomics can be utilized to identify cancer causing genes. Topics will include: Environmental and genetic epidemiology of cancer, cytogenetics, epigenetics and chromatin remodeling, arrays and biomarkers, RNA interference, and viruses in human malignancy.

BMB 8300f,w,s,su. MASTER'S PROJECT IN BIOCHEMISTRY AND MOLECULAR BIOLOGY. (3 cr; A-F) Staff

Readings in biochemistry and molecular biology culminating in the submission of the Master's thesis. Topics are chosen by student in consultation with the advisor and an advisory committee. May be taken only once for credit.

BMB 8320s. SPECIAL TOPICS IN CANCER BIOLOGY. (1 cr; S-N) Staff

This course is a didactic class devoted each spring quarter to the biology of a selected malignancy. Examples of cancers to be studied in this format include breast cancers, pancreatic cancer, prostate cancer, malignant melanoma, multiple myeloma, neurooncology, GI cancers, and certain hematologic malignancies, as well as others. These topics will be covered on a rotating basis.

BMB 8350f. GENOMIC AND PROTEOMIC ANALYSIS USING BIOINFORMATICS TECHNIQUES. (1 cr; S-N) Vasmatzis

This course will review current topics in bioinformatics that are useful to clinical and basic science investigators. With the human genome project approaching completion, the continuous growth of the EST database, and the accumulation of microarray and SAGE data, the availability of genomic information is increasing exponentially. This data is not only applicable to the discovery of human genes, but it can also be used for determining gene expression signatures of cells in normal developmental stages, or in different stages of disease. The course will provide an introduction to a few databases that hold genomic data, and will discuss the tools that can be used to analyze such data. A few examples will be presented on how Bioinformatics is used in clinical research, with particular emphasis on its application to the study of

cancer. In addition, the course will provide instruction regarding bioinformatics methods to analyze protein information, including protein structure prediction, protein classification, structural modeling, and methods to predict protein function as well as sub-cellular localization.

BMB 8390f,w,s,su. INDEPENDENT STUDY IN BIOCHEMISTRY AND MOLECULAR BIOLOGY (1-2 cr; A-F) Staff

Tutorials arranged on an individual basis in selected advanced topics in biochemistry and molecular biology. Students are expected to define a topic and specific reading list in consultation with a member of the faculty. Mastery of the subject matter is assessed by examination or by submission of a formal review of the subject area.

BMB 8500f,w,s. BMB JOURNAL CLUB. (1 cr/yr; S-N) Mer

Students of the Biochemistry and Molecular Biology programs present readings from the current scientific literature in partnership with assigned faculty.

Register in fall quarter only (1 cr./year). Attendance required fall, winter and spring.

BMB 8510f,w,s. CURRENT TOPICS IN CANCER BIOLOGY. (1 cr; S-N) Billadeau

This journal club will discuss current primary literature covering all aspects of cancer biology. The journal club will meet once per week and be conducted under the open discussion format with directed student and faculty presentations. During the fall quarter, journal articles of fundamental and historic interest in the area of cancer biology will be read and discussed. Topics to be covered include: cell cycle, oncogenes, tumor suppressors, growth factors, signal transduction, metastasis, DNA tumor viruses, retroviruses.

BMB 8650s. RECEPTOR TRAFFICKING AND SIGNALING TUTORIAL. (2 cr; A-F; offered odd years; prereq core courses 6100, 6150 and 6250) Katzmann, Horazdovsky

This tutorial focuses on understanding the molecular basis of receptor traffic and signaling in eukaryotic cells. Special attention is directed toward contributions by the cytoskeleton and vesicular transport machinery during endocytosis and secretion. Students prepare oral presentations describing a synthesis of appropriate topics.

BMB 8660f. TRANSLATIONAL AND TRANSCRIPTIONAL REGULATION OF GENE EXPRESSION. (2 cr; A-F; offered odd years; prereq core courses 6100, 6150 and 6250) Chen, Couch, Janknecht

This tutorial discusses transcription factor families and mechanisms of translational regulation. Emphasis is placed on the ways which transcription factors are regulated by post-translational modifications using examples from the current literature.

BMB 8665w. DNA/PROTEIN INTERACTIONS, REPAIR, REPLICATION, AND RECOMBINATION. (2 cr; A-F; offered even years; prereq core courses 6100, 6150 and 6250 or consent of instructor) Maher, McMurray

This tutorial begins with a study of the fundamental physical and chemical principles of DNA recognition by proteins. Subsequent topics focus on key characteristics of the major classes of DNA binding proteins. The second half of the tutorial concerns basic mechanisms of DNA repair processes emphasizing the roles of DNA repair processes in human diseases.

BMB 8670w. BIOCHEMISTRY AND CELL BIOLOGY OF MEMBRANE LIPIDS AND PROTEINS. (2 cr; A-F; offered even years; prereq core courses 6100, 6150 and 6250 or consent of instructor) Pagano, Owen

This tutorial reviews and discusses the following topics: lipid structures and biophysical properties; liposomes; sphingolipid metabolism and biology; lipid asymmetry and transbilayer movement; lipid traffic in eukaryotic cells; lipid metabolic diseases.

BMB 8675w. PROTEIN STRUCTURE AND DYNAMICS. (2 cr; A-F; offered odd years; prereq core courses 6100, 6150 and 6250 or consent of instructor) Mer, Ramirez-Alvarado.

This tutorial discusses various models of protein folding including the experimental approaches and computational methods for predicting and determining structure. Examples from the current literature highlight protein structure, proteomics and functional proteomics.

BMB 8801f,w,s. CONCEPTS OF VESICULAR TRAFFICKING JOURNAL CLUB. (1 cr; S-N; prereq Core 6250) McNiven

Study of the basic mechanisms by which cells package, process, and transport synthesized and/or endocytosed proteins.

BMB 8900f,w,s,su. BMB THESIS PROPOSAL. (2 cr; S-N) Harris The Thesis Proposal will be a formal document (15 pages, single spaced) based on the format of a NIH grant proposal consisting of: Specific Aims (1 page), Background (2-3 pages), Preliminary Data (3-5 pages) and Experimental Design & Methods (6-9 pages). The oral examination (by the oral qualifying examination committee) will explore the contents of the proposal as well as the general scientific knowledge of the candidate. We understand that preparing a Thesis Proposal and passing the oral examination is a requirement for each student, but giving credits for this process formalizes the procedure and shows the importance of this process to the student. We encourage other tracks to adopt a similar recognition of the Thesis Proposal.

Research

BMB 8840f,w,s,su. RESEARCH IN BIOCHEMISTRY AND MOLECULAR BIOLOGY. (6 cr/qtr; S-N) Staff

Graduate thesis research for Master's students under supervision of staff.

BMB 8890f,w,s,su RESEARCH IN BIOCHEMISTRY AND MOLECULAR BIOLOGY. (S-N) Staff

Graduate thesis research for Ph.D. students under supervision of staff.