

## Bioengineering Related Graduate Courses Spring 2017

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**ENGR 220C, Tissue/Systems Bioengineering** This course introduces students to tissue and organism- level organization with application of engineering principles for analysis. Topics include: cardiovascular, respiratory, digestive, and central nervous systems, structural components of organisms (bones and muscles), immune system, and of pharmacology. *3 units. T R 9:30 am - 10:45 am*

**ENGR 225, Current Topics in Bioengineering** Seminar series highlighting current topics and advances in bioengineering presented by UCSB faculty or visiting scientists providing context and motivation for bioengineering learning, introducing students to concepts outside of their primary research specialty, and promoting interdisciplinary thinking and research collaboration. *1 unit. R 2:00 pm - 3:15 pm*

**ENGR 230, Bioengineering Student Seminar** Seminar series where students present their original thesis research and also review journal articles that critically analyze contemporary bioengineering research. Three quarters of ENGR 230 are required for the optional BioE graduate emphasis. Presentations will be evaluated and feedback provided. *1 unit. T 2:00 pm - 3:15 pm*

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**BMSE 204, MCDB 245, Post-translational Protein Processing** Structure/function relationships in interesting macromolecules isolated from marine organisms. Focus is on well-characterized pathways from horseshoe crabs, abalones, mussels, and fish as well as others. *4 units. T R 11:00 am - 12:15 pm, F 9:00 am - 9:50 pm*

**BMSE 215, Biophyscal Thermodynmaics** An overview of those parts of chemical thermodynamics relevant to the study of biomolecules and biological systems. Topics include fundametnal biopolymer structure formation. *2 units. T R 9:30 am - 10:45 am*

**BMSE 223, Chem 223, MCDB 223, Signal Transduction** A cell's growth is controlled by positive and negative cues from its surroundings. A discussion of the cell's signaling mechanisms that recognize these cues and initiate an intracellular set of events that generates a response. *3 units. M W F 9:00 am - 9:50 am*

**BMSE 252, Principles of Bioengineering** An overview of various aspects of bioengineering including modeling of physiological functions, biomedical devices, drug delivery, and tissue engineering. *2 units. T R 9:30 am - 10:45 am*

**BMSE 265, BMSE Seminar Discussion Group** A weekly seminar discussion group to review, in advance, relevant literature of participating BMSE seminar guests. *1 unit. T 3:00 pm - 4:00 pm*

**BMSE 290BP, Group Studies: Bacterial Pathogenesis** Presentation and discussion of current research, to be selected from the following list: BP. Bacterial Pathogenesis. *2 units. TBA*

**BMSE 290CE, Group Studies: C. elegans Development** Presentation and discussion of current research, to be selected from the following list: CE. C. elegans Development. *2 units. TBA*

**BMSE 290DN, Group Studies: Development Neurobiology** Presentation and discussion of current research, to be selected from the following list: DN. Developmental Neurobiology. *2 units. TBA*

**BMSE 294B, MCDB 294B, Bioengineering: Career and Development Opportunities** Based on presentations by experts from the bioengineering industry. Presenters describe their companies' technologies and developments, including biosensors, therapeutics, tissue engineering, quantum dots and advanced instrumentation. Training and educational requirements for different career tracks are discussed. *2 units. M 10:00 am - 12:00 pm*

**BMSE 595, Biochemistry/Molecular Biology Literature Seminar** A critical review of research in selected areas of biochemistry-molecular biology. *2 units. TBA*

**BMSE 595BG, Biochemistry/Molecular Biology Literature Seminar**

A critical review of research in selected areas of biochemistry-molecular biology. *2 units. TBA*

**CH E 241, Advanced Science and Engineering of Energy Conversion**

The course provides a framework for understanding the energy supply issues facing society with a focus on the science, engineering, and economic principles of the major alternatives. Emphasis will be on the physical and chemical fundamentals of energy conversion technologies. *3 units. M W 8:00 am - 9:15 am*

**CH E 272, Omics-enabled Biotechnology** Integrates genomic, transcriptomic, metabolomic, and proteomic approaches to quantify and understand intricate biological systems. Complementary bioinformatics approaches to curate the large datasets associated with these experiments are also discussed. Recent examples from the literature reinforce core concepts, ranging from applications to human health to the environment. By the end of the course, students should be able to design an integrated experiment that capitalizes on these omics-based approaches to enhance the scope of their research. *3 units. T R 12:30 pm - 1:45 pm*

**CHEM 223, BMSE 223, MCDB 223, Signal Transduction** See BMSE 223 for course description.

**CHEM 239, Selected Topics in Organic Chemistry** Selected topics from organic chemistry the contents of this course will vary. *1-4 units. M W 2:00 pm - 3:15 pm*

**CHEM 242C, Chemical Aspects of Biological Systems** Macromolecular biosynthesis and specialized cellular processes. A survey of nucleic acid and protein biosynthesis, characterization of lipids and membranes; function of membranes in transport, energy transduction, and cellular control; mechanisms of muscle contraction and cell motility; neurochemistry. *3 units. T R 2:00 pm - 3:15 pm*

**CHEM 245, Computational Biochemistry** Introduction to molecular modeling and molecular dynamics. Discussion of practical considerations of energy minimization, solvent modeling, structure-based drug

design. Practical computer graphics experience. *3 units. T R 3:30 pm - 4:45 pm*

**CHEM 246, Membrane Biochemistry** Introduction to the structures and roles of lipids and their behavior, liposomes, membrane proteins and kinetics, protein, sorting, and signal transduction. *3 units. M W 12:30 pm - 1:45 pm*

**CHEM 251, Protein Processing** Structure/function relationships in interesting macromolecules isolated from marine organisms. Focus is on well-characterized pathways from horseshoe crabs, abalones, mussels, and fish as well as others. *4 units. T R 11:00 am - 12:15 pm, F 9:00 am - 9:50 pm*

**CHEM 259, Selected Topics in Biological Chemistry** Selected topics from bio-organic, biophysical, or biological chemistry. The content of this course will vary. *1-4 units. 9:30 am - 10:45 am*

**CHEM 262A, Drug Design** Sources for new drugs. Biochemistry of diseases. Target validation techniques. Mechanism of action of enzymes and receptors. Enzyme inhibition and receptor binding studies. Structure based drug design: conformational analysis, docking and binding affinity calculations. Course also teaches proposal writing skills. *3 units. M W F 11:00 am - 11:50am*

**CHEM 290, Seminar in Chemistry and Biochemistry** Presentation of seminar required of all departmental graduate students. *2 units. F 10:00 am - 11:50 am*

**CMPSC 281B, Advanced Topics in Computer Vision** Advanced topics in computer vision: image sequence analysis, spatio-temporal filtering, camera calibration and hand-eye coordination, robot navigation, shape representation, physically-based modeling, regularization theory, multi-sensory fusion, biological models, expert vision systems, and other topics selected from recent research papers. *4 units. T R 10:00 am - 11:50 am*

**DYNS 592, DYNS Seminar** Research seminar for special interest groups in dynamical neuroscience. *1 unit. TBA*

**ECE 281B, Advanced Topics in Computer Vision** Advanced topics in computer vision: image sequence analysis, spatio-temporal filtering, camera calibration and hand-eye coordination, robot navigation, shape representation, physically-based modeling, multi-sensory fusion, biological models, expert vision systems, and other topics selected from recent research papers. *4 units. T R 9:00 am - 10:50 am*

**EEMB 511, Writing Science-EEMB Colloquium** A hands-on workshop to polish writing skills. Modules focus on story telling to make ideas compelling, streamlining to make writing compact and effective, and developing flow of ideas and paragraphs. Students work on a chapter, paper, or proposal. *2 units. M W 1:00 pm - 3:50 pm*

**EEMB 595AL, Energetics of Animal Locomotion** A critical review of research in selected fields of biology. *2 units. TBA*

**EEMB 595EV, Evolutionary Biology** A critical review of research in selected fields of biology. *2 units. R 3:00 pm - 4:50 pm*

**EEMB 595T, Parasitology** A critical review of research in selected fields of biology. *2 units. M 2:30 pm - 3:30 pm*

**MATRL 200C, Structure Evolution** Study of phenomena underlying the evolution of structure across the relevant length and time scales in Materials. Structural defects. Driving forces, mechanisms and kinetics of structural change. Diffusional transport. Fundamentals of phase transformations. Crystallization. Evolution of microstructural features and patterns. *4 units. M W 10:00 am - 11:50 am, F 9:00 am - 10:50 am*

**MATRL 209C, Introduction to Electron Microscopy** This course is a practical introduction to electron microscopy with a focus on transmission electron microscopy (TEM). The aims of the course are to (i) introduce students to the functions and operating principles of TEM, (ii) describe the concepts and theory leading to various forms of image contrast, (iii) provide an understanding of electron scattering, both kinematical and dynamical, and (iv) gain exposure to image analysis methods. A primary goal is to have students gain the knowledge and experience needed to become competent electron microscopists and apply these tools for their research. We will complement

classroom lectures with practical exercises on electron microscopes and corresponding simulation tools. *3 units. M W 3:30 pm - 4:45 pm*

**MATRL 226, Symmetry and Tensor Properties of Materials**

Description of the principles of crystal symmetry, functional materials, and their properties, including dielectrics, piezoelectrics, and magnetic and transport phenomena. Fundamental concepts, tensorial and mathematical description of functional behavior. *3 units. T R 12:30 pm - 1:45 pm*

**MATRL 228, Computational Materials** Basic computational techniques and their application to simulating the behavior of materials. Techniques include: finite difference methods, MonteCarlo, molecular dynamics, cellular automata, and simulated annealing. *3 units. M W 2:30 pm - 3:15 pm*

**MATRL 271C, Properties of Macromolecules** Fundamentals of the properties of macromolecular solutions, melts, and solids. Viscosity, diffusion and light scattering from dilute solutions. Elements of macromolecular solid state structure. Thermal properties and processes. Mechanical and transport properties. Introduction to electrical and optical properties of macromolecules. *3 units. T R 9:30 am - 10:45 am*

**MCDB 223, Ch E 223, BMSE 223, Signal Transduction** See BMSE 223 for course description.

**MCDB 225, Development** The molecular mechanisms of pattern formation and cellular differentiation that underlie developmental processes in a variety of important model systems. *2 units. M W F 9:00 am - 9:50 am, T R 8:00 am - 9:15 am*

**MCDB 226C, Basic Pharmacology: Principles and Chemotherapy**

Fundamental principles of pharmacology, drug-receptor theory, biochemical mechanisms of action of drugs. *4 units. M W F 10:00 am - 10:50 am, F 9:00 am - 9:50 am, W 8:00 am - 8:50 am*

**MCDB 245, BMSE 204, Post- Translational Protein Processing**

See BMSE 204 for Course Description.

**MCDB 246, Stem Cell Biology in Health and Disease** Basic biology of embryonic and adult stem cells and nuclear transfer, with emphasis on latest findings from the current literature. *4 units. M W 2:00 pm - 3:15 pm*

**MCDB 253, Neurobiology III: Developmental Neurobiology** This course begins with fertilization and moves through sequential stages in the development of the nervous system, including cell migration and differentiation, axon outgrowth and pathfinding, programmed cell death, synaptogenesis, learning, memory, neurodegenerative conditions and current strategies for neuronal regeneration. *4 units. T R 9:30 am - 10:45 am*

**MCDB 263, Progress in Biochemistry and Molecular Biology** Research seminars presented by invited speakers on current research topics. *1 unit. R 11:00 am - 12:15 pm*

**ME 211, Pattern Formation and Self-Organization** Introductory course to the processes of pattern formation and self-organization in natural systems (physical and biological systems), as well as in engineering. The goal of the course is to explain how ordered spatial structures appear in different systems. We will discuss the common aspects and the differences in the mechanisms that establish the patterns, and introduce various techniques used in different disciplines to study the formation of spatially extended structures. *3 units. T R 11:00 am - 12:15 pm*

**ME 292, Design Transducer** Design issues associated with microscale transduction. Electrodynamics, linear and nonlinear mechanical behavior, sensing methods, MEMS-specific fabrication rules, and layout are all covered. Modeling techniques for electromechanical systems are also discussed. *3 units. M W 8:00 am - 9:15 am*

**PSTAT 231, Data Mining** Introduction to data mining techniques. Model assessment and performance evaluation. Data preparation. Programming techniques for transforming raw data into a form suitable for predictive modeling. Extracting data to a form that predictive models can utilize. Incorporating non-numeric data in predictive models. Techniques for managing exceptional and extreme data.

Building predictive models using SAS Enterprise Miner 5 in SAS 9, including Decision Trees, Neural Networks, and Bayesian Networks. *4 units. T R 5:00 pm - 6:15 pm*

**PSTAT 274, Time Series** Stationary and non-stationary models, seasonal time series, ARMA models: calculation of ACF, PACF, mean and ACF estimation. Barlett's formula, model estimation: Yule-Walker estimates, ML method. Identification techniques, diagnostic checking, forecasting, spectral analysis, the periodogram. Current software and applications. *4 units. W F 12:30 pm - 1:45 pm*

**PSY 221C, Multivariate Analysis in Psychology and Related Social Sciences** The use in psychology of the general linear model, multiple regression, discriminant function analysis, factor-analysis, and principal components analysis *4 units. T R 9:30 am - 11:00 am; F 9:00 am - 10:50 am*

**PSY 231, Cognitive Neuroscience** Examination of the neurological basis of cognition with material drawn from research in psychology, neurology and the neurosciences with brain injured and healthy human and non-human subjects. Topics include memory, language, and perception. *4 units. W 9:00 am - 11:50 am*

**PSY 269, Neuroanatomy** An examination of the organization of the vertebrate nervous system. Topics include neurohistological techniques; neurology and neuropsychology; comparative neuroanatomy; neural degeneration; developmental neuroscience. *4 units. W 9:00 am - 11:50 am*