Bioengineering Related Graduate Courses
Spring 2016

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

BMSE 201A, Protein Structure and Function Traces the physical interactions by which sequence-specific polypeptides attain a unique, functional native state. Fold design, fold prediction, and protein folding kinetics are also discussed. 2 units. T R 12:30 pm - 1:45 pm

BMSE 202, CH E 202, Biomaterials and Biosurfaces Fundamentals of natural and artificial biomaterials and biosurfaces with emphasis on molecular level structure and function and their interactions with the body. Design issues of grafts and biopolymers. Basic biological, biophysical and biochemical systems reviewed for nonbiologists. 3 units. M W 3:00 pm - 4:15 pm
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 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 and intracellular set of events that generates a response. 3 units. M W F 9:00 am - 9:50 am

BMSE 247, EEMB 247, Quantitative Methods in Biology A review of quantitative methods required to develop models of biological and ecological systems. Topics illustrated through computer exercises. 3 units. R 4:00 pm - 5:00 pm, F 3:00 pm - 4:50 pm

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 272, MATRL 272, Mechanical Force and Biomolecules
Explores single-molecule biophysics and the role of mechanical force in biomolecular behavior. Emphasis is placed on modern experimental techniques and the effects of mechanical stress on DNA conformation, protein unfolding, and force-generation by motor proteins. Recent literature is used throughout. 3 units. M W 12:30 pm - 1:45 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 290HW, Group Studies: Marine Structural Proteins  Presentation and discussion of current research, to be selected from the following list: HW. Marine Structural Proteins.  2 units. TBA

BMSE 294B, MCDB 294, Therapeutic Development  This course will feature a series of presentations and discussions about what goes into the development of a novel therapeutic. Led by scientists from Amgen, presentations will include an introduction to the biotechnology industry, target selection and validation, development of small molecule and large molecule therapeutics, pharmacokinetics and drug metabolism, process development, regulatory and safety considerations and clinical trials. Specific case studies will be discussed, following the development of actual therapeutics from concept to clinic.  2 units. W 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 202, Biomaterials and Biosurfaces  Fundamentals of natural and artificial biomaterials and biosurfaces with emphasis on molecular level structure and function and their interactions with the body. Design issues of grafts and biopolymers. Basic biological, biophysical and biochemical systems reviewed for nonbiologists.  3 units. M W 3:00 pm - 4:15 pm, M W 3:00 pm - 4:15 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 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 base drug design: conformational analysis, docking and binding affinity calculations. Course also teaches proposal writing skills. 3 units. M W F 11:00 am - 11:50 am

**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

**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
ECE 594EG, Computational Systems Biology  This multidisciplinary graduate course focuses on data-centric quantitative modeling of biological systems. It introduces a selection of basic and advance computational methods to gain predictive understanding from biological data. The course covers modeling, analysis and synthesis of processes ranging from molecular bioengineering to physiology. The modeling part will deal with rigorous approaches to select the most appropriate model for a biological process, and to quantify uncertainty in design and prediction. The analysis part will deal with probabilistic and causal methods for the reverse engineering of biological circuitry on the basis of noisy data. The course will consist of lectures and three assignments. The course is aimed at a non-specialized audience with a quantitative background. 1-5 units. T R 4:00 pm - 5:30 pm

ECE 594Z, Nanotechnology  Instruction in these variable unit courses may be carried out by lecture, by laboratory, or by a combination of these. These courses provide a study of topics of current interest in various areas of electrical and computer engineering. 1-5 units. T R 2:00 pm - 3:50 pm

EEMB 247, BMSE 247, Quantitative Methods in Biology  See BMSE 247 for course description.

EEMB 276, Advanced Biostatistics  Accelerated overview of parametric and nonparametric techniques that are used in the biological sciences. The course unifies nearly all traditional statistical tests by expressing them all as a single unified testing protocol. 2 units. M W 10:00 am - 11:50 am, W 1:00 pm- 3:00 pm

EEMB 276L, Advanced Biostatistics Lab  Students use computerized sampling to measure the robustness and power of a wide diversity of parametric vs. nonparametric tests. Students also learn to use computerized software to carry out all the tests described in the lecture class. 2 units. R 4:00 pm - 6:00 pm

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 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 11:00 am - 12:15 am*

MATRL 272, BMSE 272, **Mechanical Forces and Biomolecules** See BMSE 272 for course description.

MATRL 276B, **Biomolecular Materials II: Applications** Interactions and self assembly in biomolecular materials. Chemical and drug delivery systems. Tissue engineering. Protein synthesis using recombinant nucleic acid methods: advance materials development. Nonviral gene therapy. *3 units. T R 11:00 am - 12:15 pm*

MCDB 212, **Molecular Virology** Consideration of selected animal viruses in terms of structure, mechanism of genetic expression, and
effects of viral gene expression on cell function, as well as aspects of the virus-host interaction including viral persistence, interference, and interferon. 5 units. TBA

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

MCDB 266, Optogenetics and Functional Imaging Class is a journal club based on primary literature with rotating presenters and active discussion. This quarter we will focus on Channelrhodopsin
and GCaMP, covering the original papers, new variants, and best use cases. Optogenetics is ten years old now and has proven to be a powerful technique to identify behaviorally critical brain regions and map neural circuit connections. Imaging neuronal activity, in the whole brain of behaving animals, is now possible. Come learn about the development, potential and caveats of these tools. 1 unit. M 11:50 am - 1:00 pm

MCDB 290DN, Developmental Neurobiology  Presentation and discussion of current research. 2 units. TBA

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. T R 3:30 pm - 4:45 pm

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 9:30 am - 10:45 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. M W 2:00 pm - 3:15 pm