

## Bioengineering Related Graduate Courses Fall 2017

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**ENGR 220A, Molecular Bioengineering** ENGR 220A WILL BE OFFERED IN WINTER 2018, INSTEAD OF FALL 2017. ENGR 220B WILL BE OFFERED IN SPRING 2018, ANTICIPATED RETURN TO NORMAL SCHEDULE (ENGR 220A-FALL, ENGR 220B-WINTER, ENGR 220C-SPRING) in the 2018-2019 ACADEMIC YEAR. This course Introduces students to molecular components of biology with application of engineering principles for analysis. Topics include: molecular components of cells, DNA/RNA structure and function, protein structure/function/folding, gene and protein regulation, DNA replication, and experimental and computational research methods. *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 201A, Proteins** 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 9:30 am - 10:45 am*

**BMSE 201B, Chemistry and Structure of Nucleic Acids** Primary, secondary, and higher-order structures of DNA and RNA, thermo-

dynamic stability and folding, protein-nucleic acid interactions, ribozymes, applications to gene regulation, RNA world evolution. *2 units. T R 9:30 am - 10:45 am*

**BMSE 205A, Biochemical Techniques** Practical theory and application of basic biochemical techniques. Topics include SDS-PAGE, buffers, centrifugation, antibody methods, spectroscopy and fluorescence techniques. *1 unit. T R 12:30 pm - 2:20 pm*

**BMSE 229, Protein Biochemistry** Discussion topics relevant to structure-function relationships in proteins including the chemical reactivity of amino acid side chains, posttranslational modifications, and the covalent and noncovalent interactions of multimeric structures. Case studies involve recent advances in structure-function relationships of mechanoproteins. *2 units. M W F 10:00 am - 10:50 am*

**BMSE 235, Experimental Strategies in Molecular Genetics** Discussion of experimental strategies used to purify, analyze, and manipulate nucleic acids, isolate molecular clones from complex genomes, physically map genomes, analyze gene expression, and perform reverse genetics. *1 unit. M W F 10:00 am - 10:50 am*

**BMSE 276A, Informational Macro- and Supra-Molecules** Survey of classes of biomolecules (lipids, carbohydrates, proteins, nucleic acids). Structure and function of molecular machines (enzymes for biosynthesis, motors, pumps). *3 units. T R 11:00 am - 12:15 pm*

**BMSE 290A, Group Studies: Biomolecular Materials Synthesis** Presentation and discussion of current research, to be selected from the following list: A. Biomolecular Materials Synthesis. *2 units. TBA*

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

**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 290C, Group Studies: Bacterial Pathogenesis** Presentation and discussion of current research, to be selected from the following

list: C. Studies in regulation of cell proliferation; CC. Centromeres and Chromosomes - Models and Analysis; CS. Advanced topics in Chromosome Segregation; PM. Molecular Plant-Microbe interactions. *2 units. T R 12:30 pm 1:45 pm*

**BMSE 290DN, Group Studies: Developmental 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*

**Ch E 210A, Fundamentals and Applications of Classical Thermodynamics and Statistical Mechanics**

Fundamental concepts in classical thermodynamics and statistical mechanics for engineering students. Establishes the framework within which problems can be solved using methodologies that start with molecular level understanding. *4 units. M W 12:30 pm - 1:45 pm, F 12:30 pm - 1:45 pm*

**Ch E 228, Non-Newtonian Fluids, Soft Materials and Chemical Products**

Overview of soft materials (suspensions, gels, polymers, surfactants, emulsions, powders and granules) that arise in diverse industries, including consumer products, foods, advanced materials, biotechnology, and mineral and energy production. Influence of non-Newtonian rheology (shear-thickening and thinning, viscoelasticity, extension- thickening, yield stresses, normal stress differences, and metastability) upon handling, processing, production, and performance of chemical products. Strategies to design chemical products that meet performance targets, and to scale-up production. Real-world case studies and classroom demonstrations. *3 units. T R 11:00 am - 12:15 pm*

**ECE 235, Stochastic Processes in Engineering**

A first-year graduate course in Stochastic processes, including: review of basic probability; gaussian, poisson, and Wiener processes; wide-sense stationary processes; covariance function and power spectral density; linear systems driven by random inputs; basic Wiener and Kalman filter theory. *4 units. M W 5:00 pm - 6:50 pm*

**ECE 278A, Digital Image Processing** Two-dimensional signals and systems. Two-dimensional Fourier and z- transforms. Discrete Fourier transform, two-dimensional digital filters. Image processing basics, image enhancement and restoration. Special image processing software available for laboratory experimentation. *4 units. T R 10:00 am - 11:50 am*

**MATRL 228, Computational Materials** Basic computational techniques and their application to simulating the behavior of materials. Techniques include: finite difference methods, Monte Carlo, molecular dynamics, cellular automata, and simulated annealing. *3 units. T R 3:30 pm - 4:45 pm*

**MATRL 271A, Syn & Prop of Macro** Basics of preparation of polymer and macromolecular assemblies, and characterization of large molecules and assemblies. Discussion of chemical structure, bonding, and reactivity). *3 units. M W 2:00 pm - 3:15 pm*

**MATRL 276A, Biomolecular Materials I: Structure and Function** Survey of classes of biomolecules (lipids, carbohydrates, proteins, nucleic acids). Structure and function of molecular machines (enzymes for biosynthesis, motors, pumps). *3 units. T R 11:00 am - 12:15 am*

**MATRL 284, Synthetic Chemistry of Macromolecules** Molecular architecture and classification of macromolecules. Different methods for the preparation of polymers: free radical polymerization, ionic polymerization, condensation polymerization and coordination polymerization. Bulk, solution, and emulsion polymerization. Principles of copolymerization, block copolymerization, grafting, network formation, chemical reactions on polymers. *3 units. T R 2:00 pm - 3:15 pm*

**MCDB 226A, Basic Pharmacology** History and scope of pharmacology as a basic science; principles of drug action and relationship of pharmacology to physiology, chemistry, biochemistry emphasized. *4 units. M W F 9:00 am - 9:50 am*

**MCDB 226AL, Basic Pharmacology** Analysis of drug sites and mechanisms of action using isolated tissues, organs, and intact animal

preparations.. *4 units. T 8:00 am - 9:15 am, 9:30 am - 5:00 pm; T 8:00 am - 9:15 am, R 9:30 am - 5:00 pm*

**MCDB 229, Protein Biochemistry** Discussion topics relevant to structure-function relationships in proteins including the chemical reactivity of amino acid side chains, posttranslational modifications, and the covalent and noncovalent interactions of multimeric structures. Case studies involve recent advances in structure-function relationships of mechanoproteins. *2 units. M W F 10:00 am - 10:50 am*

**MCDB 231, General Microbiology** Introduction to biological properties of microorganisms historical foundations of the field of microbiology; a study of major groups of microorganisms, their structure, physiology, cultivation, and pathogenicity. *4 units. M W F 10:00 am - 10:50 am*

**MCDB 235, Experimental Strategies in Molecular Genetics** Discussion of experimental strategies used to purify, analyze, and manipulate nucleic acids, isolate molecular clones from complex genomes, physically map genomes, analyze gene expression, and perform reverse genetics.. *4 units. M W F 10:00 am - 10:50 am*

**MCDB 251, Neurobiology I: Cellular Organization and Biophysics of the Nervous System** Nervous system properties ranging from single cells to whole organisms, using examples from vertebrates/invertebrates studied in terms of morphology, physiology, behavior. *4 units. M W 3:30 pm - 4:45 pm*

**MCDB 263, Progress in Biochemistry and Molecular Biology** Research seminars presented by invited speakers on current research topics. *1 unit. R 12:30 pm - 1:45 pm*

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

**MCDB 290MR, Introduction to Microscopy for the Bio-sciences** An introduction to microscopy emphasizing light microscopy techniques and principals. A wide variety of microscopy techniques will be introduced while students gain hands-on experience with transmitted light and fluorescence imaging and exposure to high-end imaging instruments. *2 units. W 1:00 pm - 3:00 pm*

**ME 219, Mechanics of Materials** Matrices and tensors, stress deformation and flow, compatibility conditions, constitutive equations, field equations and boundary conditions in fluids and solids, applications in solid and fluid mechanics. *3 units. T R 8:00 am - 9:15 am*

**ME 220A, Fundamentals of Fluid Mechanics** Introductory course in fluid mechanics. Basic equations of motion (continuity, momentum, energy, vorticity), coordinate transformations, "potential" flow, thin airfoil theory, conformal mapping, vortex dynamics, boundary layers, stability theory, laminar/turbulent transition, turbulence. Inviscid/viscid, irrotational/rotational, incompressible/ compressible flow examples. *3 units. T R 11:00 am - 12:30 pm*

**PSTAT 231, Data Mining** Data Mining is used to discover patterns and relationships in large data sets. Topics will include: data exploration, classification and regression trees, random forests, clustering and association rules. Building predictive models focusing on model selection, model comparison and performance evaluation. Emphasis will be on concepts, methods and data analysis; and students are expected to complete a significant class project, individual or team based, using real world data. *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. M W 2:00 pm - 3:15 pm*

**PSY 211, Basic Concepts in Behavioral Neuroscience** Intended to provide fundamental understanding of neuroscience and behavior for graduate students at the beginning of their studies. Provides a broad overview of brain function with focus on the molecular, cellular, system, and behavioral level of analysis in order to instill a comprehensive appreciation of the biological mechanisms important to behavior. *4 units. T R 2:00 pm - 3:15 pm*

**PSY 221A, Design and Measurement** Experimental design and statistical analysis in psychological research. Includes basic probability,

sampling and distribution theory, hypothesis testing, and estimation.  
*4 units. T R 9:30 am - 11:00 am; F 9:30 am-10:45 am*

**PSY 232, Neuroimaging** Introduces students to the theoretical and practical issues involved in conducting functional magnetic resonance imaging (fMRI) experiments. Content includes basic MR physics, physiology of the BOLD signal, experimental design, image processing, statistical analysis, and brain mapping. *4 units. R 1:00 pm - 3:30 pm*

**PSY 268, Brain Development** An examination of the major developmental events producing the organization and connectivity of the nervous system. offered concurrently with Psychology 168, but graduate students will be required to complete additional reading and writing assignments.. *4 units. M W 3:30 pm - 4:45 pm*