

# BIOENGINEERING (BIOENGR)

## BIOENGR 215 Laboratory Rotation (1-8 Units) Fall, Winter, Spring, Summer

*Instructor(s):* Staff

*Prerequisite(s):* Consent of instructor and Bioengineering Graduate Advisor.

*Restrictions:* Graduate students in Bioengineering.

*Activities:* Lab science

Laboratory research rotations are to allow students to become familiar with different areas of research, learn new experimental techniques, obtain experiences in unique research laboratories, and ultimately to identify a lab in which to conduct dissertation research. Rotation projects should involve hands-on research and be a piece of work that the student can present at the end of the rotation.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** Yes

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** Yes

## BIOENGR 221 Tissue Mechanobiology (2.5-3 Units) Winter

*Instructor(s):* Jeffrey Lotz, Tamara Alliston, Valerie Weaver

*Restrictions:* None

*Activities:* Lecture, Independent Study

A central role for many tissues is to support physical forces (tension, compression, shear, pressure). This course will introduce the mechanisms by which cells respond to load; how these mechanisms are relevant to normal function & disease etiology; progression; prevention & treatment; an overview of tissue mechanics (relationships between force, stress/strain), mechanisms of cell/matrix interactions, examples of tissue modeling & remodeling in response to physical stimuli.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 240 Principles of Magnetic Resonance Imaging (4 Units) Fall

*Instructor(s):* Peder Larson

*Prerequisite(s):* None

*Restrictions:* Not open to students who have passed BIOMED IMG 201. If not enrolled in Master's of Science in Biomedical Imaging (MSBI) program then students must obtain instructor approval.

*Activities:* Lecture

This introductory course aims to teach the basic principles behind magnetic resonance imaging (MRI). It will cover the physical principles of magnetic resonance, image formation, and image reconstruction, MRI hardware, contrast generation, and common artifacts. Cross-listed with BIOMED IMG 201.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** Yes

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 241 Metabolism and Magnetic Resonance Spectroscopy (3 Units) Winter

*Instructor(s):* John Kurhanewicz

*Prerequisite(s):* Bioengineering 240 or Biomedical Imaging 201

*Restrictions:* none

*Activities:* Lecture, Lab science

This course is designed to follow Bioengineering 240 or Biomedical Imaging 201, Magnetic Resonance Imaging. It will build on the fundamental aspects of magnetic resonance physics presented in the first course, but will focus on MR spectroscopy which provides metabolic and biochemical information. The course will cover basic theory, underlying biochemistry and physiology, techniques for acquiring and processing MR spectroscopic data, and biomedical applications for this emerging medical modality.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 242 Principles of Tissue Engineering (2 Units) Spring

*Instructor(s):* Tejal Desai

*Prerequisite(s):* Consent of instructor.

*Restrictions:* none

*Activities:* Lecture

Introduction to the principles of tissue engineering. Engineered matrices should emulate the physiological environment of cells. Analysis of biochemical, physico-chemical and biomechanical environment of cells; the role of cellular biomechanics in tissue engineering; biomaterials and biocompatibility; synthetic scaffolds; biosurface engineering; engineered tissues and organs.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD)**

**enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 245 Machine Learning Algorithms for Medical Imaging (3-4 Units) Spring

*Instructor(s):* Srikantan Nagarajan, Yang Yang, Ashish Raj

*Prerequisite(s):* Calculus, linear algebra, undergraduate physics (electromagnetism), or consent of instructor.

*Restrictions:* None.

*Activities:* Lecture, Seminar, Project, Discussion

The goal of this course is for students to understand various machine learning algorithms that are used in brain imaging, and to gain hands-on experience using them in student projects, homework, and student-driven class-presentations. Common machine learning algorithms used for MRI, fMRI, EEG, MEG, and ECOG, will be the focus of the course.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD)**

**enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 249 Group Studies (1-8 Units) Fall, Winter, Spring

*Instructor(s):* Staff

*Prerequisite(s):* Graduate standing

*Restrictions:* None

*Activities:* Seminar, Project

Advanced study in various subjects through seminars on topics to be selected each year, informal group studies of special problems, group participation in comprehensive design problems, or group research on complete problems for analysis and experimentation.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD)**

**enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 250 Research (1-8 Units) Fall, Winter, Spring, Summer

*Instructor(s):* Staff

*Prerequisite(s):* Graduate standing

*Restrictions:* none

*Activities:* Lab science

In this course, students will work together with a primary research advisor to select a research question and design a project plan that will be carried out by the student. Through this experience, the student will gain experience in research strategy and execution, as well as experimental techniques and analysis and interpretation of results. At the conclusion of this course, the student will present on their progress.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD)**

**enroll in this course?** Yes

**Repeat course for credit?** Yes

## BIOENGR 260 Translational Challenges in Medicine (1 Units) Fall

*Instructor(s):* Marc Shuman

*Prerequisite(s):* none

*Restrictions:* none

*Activities:* Lecture

This course focuses on solutions to challenges in the diagnosis and treatment of diseases of the eye, hereditary disorders and cancer. Lecturers with diverse skills discuss their experience in navigating this process. They have successfully solved challenges in their fields that led to commercialization. They will cover technical and scientific limitations and opportunities for advances with inventions in biomarker development and technology for delivery of new types of treatment.

**School:** Graduate Division

**Department:** Translational Medicine Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 270 Translational Challenges: Diagnostics, Devices & Therapeutics (2 Units) Winter

*Instructor(s):* Shuvo Roy

*Restrictions:* None

*Activities:* Lecture

This course covers a broad range of topics in the development and operation of medical diagnostics, devices, and therapeutics and combines lectures, readings, case studies, and class discussion. It will feature regular UCSF faculty as well as industry professionals.

**School:** Graduate Division

**Department:** Translational Medicine Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 280 What, Why, and How of Medical Devices by Clinicians (1 Units) Winter, Spring

*Instructor(s):* Hanmin Lee

*Prerequisite(s):* Consent of instructor.

*Restrictions:* None

*Activities:* Lecture

The goal of this course is to give students interested in medical device innovation an introduction to the workings of the health system. Learners will explore the structure of hospital systems and distinguish stakeholders and their roles. By learning how different players put medical technology to use, students will learn to identify gaps and unresolved needs.

**School:** Graduate Division

**Department:** Translational Medicine Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** Yes

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## BIOENGR 281 Biological Aspects of Bioengineering (1 Units) Fall

*Instructor(s):* Adam Abate

*Prerequisite(s):* None.

*Restrictions:* Graduate standing.

*Activities:* Lecture

The objective of this course is to introduce students to the broad range of bioengineering research that is associated with biological applications. Students will be exposed to problems in cellular and molecular engineering, tissue engineering and modeling neural and complex systems. Each session will involve presentations from invited faculty members of specific areas of research.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## **BIOENGR 283 Designing Clinical Research for Industry (2 Units) Spring**

*Instructor(s):* Shuvo Roy

*Prerequisite(s):* Graduate standing

*Restrictions:* Instructor approval required.

*Activities:* Lecture

Introduces students to the strategies applied to clinical study design for a variety of medical technologies. Main elements of a clinical protocol such as objectives, study design, patient population, sample size and endpoints will be taught in context of company value creation and risk reduction. Students will receive an overview on the regulatory requirements associated with conducting clinical trials for medical technologies. Course will be taught by industry experts.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** Yes

**Course Grading Convention:** Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## **BIOENGR 285 Health Care Finance & Economics (2 Units) Fall**

*Instructor(s):* Joanne Spetz

*Prerequisite(s):* None.

*Restrictions:* None.

*Activities:* Lecture, Project, Web work

This course focuses on how current health care financing systems and emerging trends affect strategic technology development and market decisions. This course is designed so students understand the underlying drivers of rising health spending, the policies that might slow it, and the impact of possible policies on future product markets. The course covers the fundamental components of health economics, financial analysis, and strategies to increase health care value.

**School:** Graduate Division

**Department:** Translational Medicine Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## **BIOENGR 296 MTM Capstone Project (UCSF) (3 Units) Fall, Winter, Spring**

*Instructor(s):* Shuvo Roy

*Prerequisite(s):* None

*Restrictions:* This course is restricted to MTM program students.

*Activities:* Lecture, Project

The objective of the MTM program is to develop leaders who can synthesize the technical, economic, and social issues involved in the design and operation of complex medical devices, systems, and organizations. Students will develop and demonstrate these skills through the capstone project and course activities. This course combines classroom instruction with outside project work. In addition to lecture, teams meet with outside mentors and develop project.

**School:** Graduate Division

**Department:** Translational Medicine Program

**May the student choose the instructor for this course?** No

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** Yes

## **BIOENGR 297 Special Study (1-8 Units) Fall, Winter, Spring**

*Instructor(s):* Staff

*Prerequisite(s):* None

*Restrictions:* None

*Activities:* Seminar, Project

Reading and conferences for properly qualified students under the direction of a member of the staff.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** Letter Grade, P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## **BIOENGR 298 Master's Thesis for Bioengineering (1-8 Units) Fall, Winter, Spring, Summer**

*Instructor(s):* Staff

*Prerequisite(s):* Advancement to candidacy and permission of the graduate adviser

*Restrictions:* none

*Activities:* Project

For graduate students engaged in writing the thesis for the master's degree.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No

## **BIOENGR 299 Dissertation (0 Units) Fall, Winter, Spring**

*Instructor(s):* Staff

*Prerequisite(s):* Advancement to candidacy and permission of the graduate adviser

*Restrictions:* Course is limited to students who have completed their fieldwork and are in the dissertation writing phase of their degree.

*Activities:* Independent Study

This course is for students who have finished research and data collection, and are writing their dissertation. It is customized by the instructor for each student(s), depending upon their exact dissertation topic.

**School:** Graduate Division

**Department:** Bioengineering Program

**May the student choose the instructor for this course?** Yes

**Does enrollment in this course require instructor approval?** No

**Course Grading Convention:** P/NP (Pass/Not Pass) or S/U (Satisfactory/Unsatisfactory)

**Graduate Division course:** Yes

**Is this a web-based online course?** No

**Is this an Interprofessional Education (IPE) course?** No

**May students in the Graduate Division (i.e. pursuing Master or PhD) enroll in this course?** Yes

**Repeat course for credit?** No