

# Ph.D. Curriculum

## First Year Requirements

All bioengineering students in their first year of study are expected to enroll in the six required core courses in the Engineering Physics and Life Science tracks listed below. First-year students are also required to take both seminars (BENG 281 three times and BENG 282), one quarter of Teaching Experience (BENG 501), the Ethics Course (BENG 292), and BENG 298L Rotation Units in their first year.

## Required Courses for the Ph.D. Degree Program (must be taken for a letter grade)

### 1. Core Courses (total of six required):

*Engineering Physics: select three courses (all courses are 4 units)*

- BENG 202/ CSE 282. Bioinformatics II: Introduction to Bioinformatics Algorithms
- BENG 203/ CSE 283. Genomics/ Proteomics/ Network Biology
- BENG 211. Systems Biology and Bioengineering I: Biological Components
- BENG 216. Neuromorphic Integrated Bioelectronics
- BENG 221. Mathematical Methods for Bioengineering
- BENG 223. Thermodynamics, Statistical Mechanics, and Interfacial Phenomena in Living Systems
- BENG 226. Foundations of Bioengineering I: Tissue and Cell Properties
- BENG 227. Transport Phenomena in Living Systems
- BENG 280A. Principles of Biomedical Imaging

*Life Sciences: select three courses (all courses are 4 units)*

- BENG 204. Systems Medicine: Data Analytics and Mechanisms
- BENG 230A. Biochemistry
- BENG 230B. Cell and Molecular Biology
- BENG 230C. Cardiovascular Physiology
- BENG 230D. Respiratory and Renal Physiology
- BENG 232. Musculoskeletal Health, Injury, and Disease
- BENG 234. Introduction to Neurophysiology: Molecules to Systems
- BENG 241A. Tissue Engineering and Regenerative Medicine: Foundations
- BENG 260/ BGGN 260. Neurodynamics
- BENG 285. Statistical Learning in Bioinformatics

### 2. Seminars (both required):

- BENG 281. Seminar in Bioengineering – 1 unit (F,W,S) *Must be taken each quarter during the first year*
- BENG 282. Seminar in Faculty Research – 1 unit (F)

### 3. Elective Courses (four required):

PhD students are required to complete a total of four approved elective courses by the end of their third year of study. Graduate courses offered in the Bioengineering Department (other than the six required courses) may be used to fulfill the elective requirement, with some exceptions. Students may also take graduate level engineering/ science courses offered in other departments (e.g., MAE, ECE, NANO, etc.) for elective credit with prior faculty advisor approval (see Graduate Coordinator for approval form). Courses taken in fulfillment of the elective course requirement must be taken for letter grade.

Up to two upper division undergraduate courses (4 units, taken for a letter grade) can be counted toward the elective requirement (with Elective Approval Form signed by the faculty advisor).

### 4. Ethics Course (one required):

- BENG 292. Scientific Ethics – 1 unit

Information about how to request enrollment into BENG 292 will be provided via email by the Graduate Coordinator each quarter.

### 5. Teaching Requirement (three required):

One Graduate Instructional Apprenticeship (GIAship) must be completed during the first year. The two remaining GIAships must be done before the end of the third year or Senate exam. Graduate Affairs will authorize enrollment in BENG 501 under the instructor of the course for which the GIAship is being completed. Enrollment is for 2 units for a 25% GIAship (10 hours per week) or for 4 units for a 50% GIAship (20 hours per week). More information about applying for GIAships will be provided by the Teaching Coordinator each quarter.

### 6. Rotations (required enrollment each quarter a rotation is planned):

- BENG 298L. Laboratory Research Rotation – 4 units

Please contact the Graduate Coordinator so the department may set up a section of BENG 298L under the faculty member if one does not already exist for that quarter. A one-to-two-page research summary is due at the end of the quarter in which the rotation is being completed.