200. Current Techniques in Biophysics (3)
Lecture—3 hours. Prerequisite: Biological Sciences 102 or equivalent. Chemistry 110A or equivalent. Current techniques in Biophysics. Topics in 200A include mathematical methods, modeling, mass spectrometry, stochastic process, scanning probe microscopy, electron microscopy, fluorescence, membrane diffusion/mechanics, and single particle tracking. (S/U grading only.)—W. (W.) Faller

200B. Biophysics Laboratory (6)
Laboratory—two 18-hour rotations. Prerequisite: course 200 (may be taken concurrently). One five-week laboratory assignment in the research laboratory of a Biophysics Graduate Group faculty member. Individual research problems with emphasis on methodological/procedural experience and experimental design. May be repeated for credit two times.—F, W, S. (F, W, S.)

231. Biological Nuclear Magnetic Resonance (3)
Lecture—3 hours. Prerequisite: Molecular Cellular Biology 221A or the equivalent or consent of instructor. Principles and applications of magnetic resonance in biomedicine. Fundamental concepts and the basic principles of magnetic resonance applications in the areas of tissue characterization/imaging, metabolic regulation, and cellular bioenergetics. (Same course as Biomedical Science 231.) Offered in alternate years.—S. (S.) Jue

241. Membrane Biology (3)
Lecture—3 hours. Prerequisite: Biological Sciences 102, 103, 104 or consent of instructor. Advanced topics in membrane biochemistry and biophysics. Relationships of the unique properties of biomembranes to their roles in cell biology and physiology. (Same course as Molecular and Cellular Biology 241.)—S. (S.) Crowe, Longo, Voss

255. Biophotonics in Medicine and the Life Sciences (3)
Lecture/discussion—3 hours. Prerequisite: Physics 108 and Biology 101-105; Biomedical Engineering 202 highly recommended; graduate standing. Introduction to the scientific and technological developments of optical and photonic techniques. Emphasis on the interaction of light with living systems. (Same course as Pre-fall 2011 General Education (GE): SciEng—Science and Engineering; SocSci—Social Sciences; Div—Diverse; W—Writing Experience Quarter Offered: F—fall; W—Winter, S—Spring, Su—Summer; 2017-2018 offering in parentheses

Faculty

Biostatistics (A Graduate Group)

Bruce Rannala, Ph.D. (Evolution and Ecology), Chairperson of the Group

Group Office.

Pre-Fall 2011 General Education (GE): SciEng—Science and Engineering; SocSci—Social Sciences; Div—Diverse; W—Writing Experience Quarter Offered: F—fall; W—Winter, S—Spring, Su—Summer; 2017-2018 offering in parentheses
Graduate Study. Biostatistics is a field of science that uses quantitative methods to study life sciences related problems that arise in a broad array of fields. The program provides students with, first, solid training in the basic biostatistical core disciplines and theory; second, with state-of-the-art knowledge and skills for biostatistical data analysis; third, substantial exposure to the biological and epidemiological sciences; and fourth, a strong background in theoretical modeling, statistical techniques and quantitative as well as computational methods. Programs of study and research are offered leading to the M.S. and Ph.D. degrees. The program prepares students for interdisciplinary careers ranging from bioinformatics, environmental toxicology and stochastic modeling in biology and medicine to clinical trials, drug development, epidemiological and medical statistics. The program draws on the strengths of the Biostatistics faculty at UC Davis.

Preparation. Students should have one year of calculus, a course in linear algebra or one year of biological course work, facility with a programming language; and upper-division work in at least one of Mathematics, Statistics and Biology.

Graduate Adviser. Jie Peng (Statistics)

Courses in Biostatistics (BST)

Graduate

222. Biostatistics: Survival Analysis (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: Statistics 131C. Incomplete data; life tables; nonparametric methods; parametric methods; accelerated failure time models; proportional hazard models; statistical models; advanced topics. (Same course as Statistics 222.)—F.

223. Biostatistics: Generalized Linear Models (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: Statistics 131C. Likelihood and linear regression; generalized linear model; Binomial regression; case-control studies; dose-response and bioassay; Poisson regression; Gamma regression; quasi-likelihood models; estimating equations; multivariate GMLs. (Same course as Statistics 223.)—W.

224. Analysis of Longitudinal Data (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: course/Statistics 222, 223. Statistics 229B or permission of instructor. Statistician; advanced methodology, theory, algorithms, and applications relevant for analysis of repeated measurements and longitudinal data in biostatistical and statistical settings. (Same course as Statistics 224.)—S. (S.)

225. Clinical Trials (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: course/Statistics 223 or consent of instructor. Basic statistical principles of clinical designs, including bias, randomization, blocking, and masking. Practical applications of widely-used designs, including dose-finding, comparative and cluster randomization designs. Advanced statistical procedures for analysis of data collected in clinical trials. (Same course as Statistics 222.) Offered in alternate years.—S.

226. Statistical Methods for Bioinformatics (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: course 131C or consent of instructor; data analysis experience recommended. Standard and advanced statistical methodology, theory, algorithms, and applications relevant to the analysis of microarray data. (Same course as Statistics 226.) Offered in alternate years.—S.

252. Advanced Topics in Biostatistics (4) Lecture—3 hours; discussion/laboratory—1 hour. Prerequisite: course 222, 223. Biostatistical methods and models involving genetic; bioinformatics and genomics; longitudinal or functional data; clinical trials and experimental design; analysis of environmental data; dose-response, nutrition and lab markers; advanced research studies and epidemiology; computer-intensive or Bayesian methods in biostatistics. May be repeated for credit with consent of advisor when topic differs. (Same course as Statistics 252.) Offered in alternate years.—S.

290. Seminar in Biostatistics (1) Seminar—1 hour. Restricted to graduate standing. Seminar on advanced topics in the field of biostatistics. Presentation by members of the Biostatistics Graduate Group and other guest speakers. May be repeated for up to 12 units of credit. (S/U grading only)—F, W, S, F, W, S.

298. Directed Group Study (1-5) Prerequisite: consent of instructor.

299. Special Study for Biostatistics Graduate Students (1-12) Prerequisite: consent of instructor. (S/U grading only)

299D. Dissertation Research (1-12) Prerequisite: advancement to Candidacy for Ph.D. and consent of major professor. Research in biostatistics under the supervision of major professor. (S/U grading only)

Biotechnology—(College of Agricultural and Environmental Sciences)

Faculty. Includes members of the Department of Animal Science, on page 162; Engineering: Chemical Engineering, on page 276; Computer Science, on page 230; Engineering: Biological and Agricultural, on page 266; Food Science and Technology, on page 340; Land, Air and Water Resources, on page 192; Molecular and Plant Pathology, on page 513; Plant Sciences, on page 514; Viticulture and Enology, on page 584; and the College of Biological Sciences, on page 191.

The Major Program

Every living organism, from the smallest and most primitive bacteria to every plant, insect, animal or human being, contains DNA as the primary genetic material. DNA directs all cellular processes, creating the incredible variety and diversity of living organisms in the biosphere. Biotechnology focuses on the mechanics of life processes and their application. Biotechnology means “life technology” and represents an integrated, multidisciplinary field, with a profound impact today on almost every aspect of human endeavor.

Preparation. UC Davis students who wish to change their major to Biotechnology must complete the following courses (representing the subject areas of Biological Sciences, Chemistry, and Mathematics) with a grade point average of at least 2.00. All of these courses must be taken for a letter grade:

Biotechnologies

- Biological Sciences 2A, 2B, 2C...
- Chemistry 2A, 2B, 2C...

Mathematics, one of the following groups:

- Mathematics 1A, 1B, or Mathematics 17A, 18B, or Mathematics 21A, 21B

The Program. In the first two years, students develop a strong and general background in biological science with an emphasis on fundamental concepts and basic principles of genetics, molecular biology and cell biology. Four options, Animal Biotechnology, Plant Biotechnology, Fermentation/Microbial Biotechnology, and Bioinformatics, provide in-depth training and specialized knowledge in an aspect of biotechnology. Each option has a strong laboratory component to reinforce the theoretical concepts. Students also do an internship in a biotechnology company or university or government laboratory.

Internships and Career Opportunities. In the last decade, more industries are turning to biotechnology to solve problems and improve products, creating vast opportunities for individuals trained in biotechnology in the agricultural, food and beverage, health care, chemical, pharmaceutical and biocatalytic, and environmental and bioremediation industries.

Graduates trained in the technologies designed for biotechnology will find their training applicable to advanced research in molecular biology, genetics, biochemistry, and the plant and animal sciences.

B.S. Major Requirements:

Preparatory Subject Matter .......................... 57-69

- Biological Sciences 2A-2B-2C .................. 15
- Chemistry 2A-2B-2C .......................... 15
- Chemistry 8A, 8B or 118A, 118B, 118C or 128A, 128B, 128C, 129A .................. 6-12
- Mathematics 16A, 16B, or 17A, 17B, or 21A, 21B .................. 6-12
- Physics 7A-7B .......................................... 8

- Plant Sciences 120 or Statistics 100 ......... 4

Science and Technology .......................... 22

- Chemistry 8A, 8B or 118A, 118B, 118C or 128A, 128B, 128C, 129A .................. 6-12
- Mathematics 16A, 16B, or 17A, 17B, or 21A, 21B .................. 6-12
- Physics 7A-7B .......................................... 8
- Plant Sciences 120 or Statistics 100 ......... 4

B.S. Major Requirements .......................... 4

- Select one course from the following options...

Depth Subject Matter .......................... 16-20

- Biological Sciences 101 ..................... 4
- Biological Sciences 104 ..................... 3
- Molecular and Cellular Biology 121 or 161 ............ 3
- Biotechnology 171 .......................... 3

- Internship or independent research; course 192 or 199 or Biotechnology 189 ....... 3

- Undergraduate research proposal: Biotechnology 188 (optional) ....... 3

- Honors undergraduate thesis (optional) ....... 1

Areas of Specialization (choose one)

Fermentation/Microbiology Biotechnology

- Microbiology 104, Biological Sciences 102 and 103 or Animal Biology 115 and 103, Microbiology 104 or Food Science and Technology 104L, Molecular and Cellular Biology 160L or Biotechnology 161A, One of Microbiology 115, 120, 121, 130, 170, Plant Pathology 130; and a second course from the previous list or one of Biological Sciences 181, 183, Molecular and Cellular Biology 182, 230, 233, 237; or an interdisciplinary course approved by the major advisor. (S/U grading only) 

Select from: