BIOINFORMATICS

Department of Biology

Biological Sciences Building, Room 329
(909) 537-5305 **biology.csusb.edu**

Department of Chemistry and Biochemistry

Chemical Science Building, Room CS-204
(909) 537-5318 **chem.csusb.edu**

School of Computer Science and Engineering

Jack Brown Hall, Room 307
(909) 537-5326 **cse.csusb.edu**

Bachelor of Science

Bioinformatics

FACULTY: Richard Botting, Arturo Concepcion, Kimberley Cousins, George Georgiou, Ernesto Gomez, Yasha Karant, Yu Jung Kim, Kenneth Mantei (Emeritus), Josephine Mendoza, Anthony Metcalf, Larry Mink, Owen Murphy, Dennis Pederson (Emeritus), Haiyan Qiao, Keith Schubert, Douglas Smith, John Tate, David Turner, Kerstin Voigt (Director), Shumei Yang, Tong Yu, Kay Zemoudeh, Renwu Zhang

Bioinformatics is essentially the interdisciplinary study of biology and biochemical systems using mathematics and computer science. Bioinformatics is a growing area, with many definitions and descriptions. Bioinformatics is the use of computers and statistics to make sense out of the huge mounds of data that are accumulating from high-throughput biological and chemical experiments, such as sequencing of whole gnomes, DNA microarray chips, two-hybrid experiments, and tandem mass spectrometry.

There are three different approaches to bioinformatics:

1. Tool building. Creating new programs and methods for analyzing and organizing data.
2. Tool using. Using existing programs and data to answer biologically interesting questions.
3. Tool maintenance. Setting up databases, translating biologists' questions into ones that programs can answer, keeping the tools working and the databases up to date.

The main goal of the degree is to prepare the students for graduate studies in bioinformatics. A secondary goal is to provide the students with very relevant bioinformatics skills that will be useful for Research and Development in the growing biotechnology industries.

The degree is jointly administered by the Department of Biology, the Department of Chemistry and Biochemistry, and the School of Computer Science and Engineering. The program is housed in the School of Computer Science and Engineering.

B.S. IN BIOINFORMATICS

Requirements (131-132 units)

Total units required for graduation: 194

Requirements for the B.S. in Bioinformatics:

Lower-division requirements (74 units)

1. BIOL 200. Biology of the Cell (5)
2. BIOL 201. Biology of Organisms (5)
3. BIOL 202. Biology of Populations (5)
4. CHEM 215. General Chemistry I: Atomic Structure and Chemical Bonding (6)
5. CHEM 216. General Chemistry II: Principles of Chemical Reactions (6)
6. CHEM 221A. Organic Chemistry I: Lecture (3)
7. CHEM 221B. Organic Chemistry I: Laboratory (1)
8. CHEM 222A. Organic Chemistry II: Lecture (3)
9. CHEM 222B. Organic Chemistry II: Laboratory (1)
10. CHEM 223A. Organic Chemistry III: Lecture (3)
11. CHEM 223B. Organic Chemistry III: Laboratory (1)
12. CSE 122. Bioinformatics (2)
13. CSE 201. Computer Science I (4)
14. CSE 202. Computer Science II (4)
15. MATH 211. Calculus I (4)
16. MATH 212. Calculus II (4)
17. MATH 262. Applied Statistics (4)
18. MATH 272. Discrete Mathematics (4)
19. PHIL 191. Ethics (4)
20. PHYS 221. General Physics I (5)

Upper-division requirements (57-58 units)

1. BIOL 300. Cell Physiology (5)
2. BIOL 400. Molecular Biology (5)
3. A minimum of five units chosen from:
   - BIOL 423. Genetics (5)
   - BIOL 424. Comparative Animal Physiology (6)
   - BIOL 431. Comparative Plant Physiology (6)
   - BIOL 440. Principles of Development (5)
   - BIOL 450. Ecology (5)
   - BIOL 455. Marine Biology and Ecology (5)
4. CHEM 436A. Biochemistry I: Lecture (4)
5. CHEM 436B. Biochemistry I: Laboratory (1)
6. Five units chosen from:
   - CHEM 451. Physical Chemistry for Biochemists I (5)
   - CHEM 455. Physical Chemistry I (5)
7. CSE 330. Data Structures (4)
8. CSE 431. Algorithm Analysis (4)
9. CSE 500. Introduction to Formal Languages and Automata (4)
10. CSE 535. Numerical Computation (4)
11. CSE 550. Advanced Bioinformatics I: Sequence Analysis (4)
12. CSE 551. Advanced Bioinformatics II: Numerical Modeling (4)
13. CSE 572. Database Systems (4)
14. MATH 372. Combinatorics (4)