

# BIOINFORMATICS

## Requirements for the B. S. Degree in **BIOINFORMATICS** in the Department of Chemistry and Biochemistry

The Bioinformatics major offers a rigorous, interdisciplinary training in the new and rapidly evolving field of bioinformatics with a strong focus on chemistry and biochemistry. Bioinformatics is the field of advanced computational and experimental methods that model the flow of information (genetic, metabolic, and regulatory) in living systems to provide an integrated understanding of the systems properties of model organisms. This is a new and rapidly evolving field in which large volumes of both qualitative and quantitative data will accrue at an increasing pace, and the bioinformatician must have a substantial mastery of both the sciences and engineering. This interdisciplinary specialization will be offered jointly with computer science and engineering, bioengineering, and biological sciences, each with its own set of requirements and electives. The program offered by the Department of Chemistry and Biochemistry is aimed at a student interested in applying and developing tools of bioinformatics for the study of chemical processes in biological systems.

There is a 50-student limit in all combined bioinformatics majors on campus. As a result, admission to the bioinformatics degree is not guaranteed, but is based on a screening process which evaluates potential majors based on academic excellence. Since bioinformatics is an interdisciplinary major, a steering committee involving faculty from the participating departments will select among the best candidates applying and recommended through each department, while insuring active participation of the departments and divisions offering the major. The final decision on admission to the pre-major and major will be made by the bioinformatics steering committee, in consultation with the departments.

Chemistry and Biochemistry candidates for the major should enroll as either chemistry (major code Chem. 25) or biochemistry (major code Chem. 31) majors until they have completed their screening courses in the first two years and have been admitted to the bioinformatics major.

Please refer to UCSD catalog for application information.

### **The following courses must be taken for a letter grade:**

#### ***Lower-Division Requirements***

1. Calculus and linear algebra (Math. 20A-20C, 20F)
2. General chemistry including laboratory (Chem. 6A-C or 6AH-6CH, and 6BL)
3. Physics (Phys. 2A-B)
4. Biology (BILD 1-2)
5. Computer programming (CSE 11-12)
6. Mathematics for algorithm and systems (CSE 21/Math. 15B)
7. Bioinformatics seminar (BILD 94)

The department recommends that students complete an introductory C programming course before taking CSE 11 and CSE 12, either in their first year or during the summer between their first and second years.

#### ***Upper-Division Requirements***

1. Two quarters of organic chemistry (Chem. 140A- 140B)
2. Organic chemistry (Chem. 140C) or structural biochemistry (Chem. 114A)
3. Metabolic biochemistry (Chem. 114B)
4. Physical chemistry (Chem. 127 accepted, Chem. 131 and 132 recommended)
5. Molecular and cellular biochemistry (Chem. 114D)
6. Two quarters of biochemistry laboratory (Chem. 112A-112B)
7. Genetics (BICD 100)
8. Cell Biology (BICD 110)
9. Two computer science courses (CSE 100 or Math. 176; and CSE 101 or Math. 188)
10. Two additional upper-division electives offered by the Department of Chemistry and Biochemistry (each course must be at least four units) with only one quarter of credit allowed for any given course. Recommended courses are Chem. 100A, 115, 118, and 143A.

The bioinformatics series comprising the following courses:

11. Molecular sequence analysis (BIMM 181 or CSE 181 or BENG 181)
12. Biological databases (Chem. 182 or BIMM 182 or CSE 182 or BENG 182)
13. Applied genomic technologies (BENG 183)
14. Computational molecular biology (Chem. 184 or BIMM 184 or CSE 184 or BENG 184)
15. Bioinformatics lab (BIMM 185)
16. Probability and statistics (Math. 186)

# Suggested Program for the Bioinformatics B.S. from the Department of Chemistry and Biochemistry

(Talk to your college for planning general education courses)

Many courses have enforced prerequisites or are offered once per year.

| FALL  | WINTER   | SPRING  |
|---|--|---|
| <b>FRESHMAN YEAR</b>  |  |   |
| Chem. 6A<br>Math. 20A   | Chem. 6B<br>BILD 1<br>Math. 20B                                      | Chem. 6C<br>Chem. 6BL<br>Math. 20C<br>BILD 94       |
| <b>SOPHOMORE YEAR</b>   |  |   |
| CSE 11 *<br>BILD 2<br>Phys. 2A                                    | Chem. 140A<br>CSE 12<br>Phys. 2B                                     | Chem. 112B**<br>Chem. 140B<br>CSE 21/ Math. 15B     |
| <b>JUNIOR YEAR</b>  |  |   |
| Chem. 114A/140C *<br>BICD 100<br>CSE 100/ Math 176**<br>Math. 20F | Chem. 114B**<br>Chem. 114D**<br>Math. 186<br>CSE 101/ Math. 188      | Elective<br>BIMM 181/ BENG 181/ CSE 181<br>BICD 110 |
| <b>SENIOR YEAR</b>  |  |   |
| Chem. 182/ BIMM 182/ BENG 182/ CSE 182<br>BENG 183                | Chem. 112A**<br>Chem. 127**<br>Chem 184/ BIMM 184/ BENG 184/ CSE 184 | BIMM 185<br>Elective                                |

\* Best time to study abroad. Education Abroad Program deadlines for upcoming year vary by country. See EAP website. See the Chem/Biochem Undergraduate Advisor for assistance in planning to study abroad.

\*\* Certain prerequisite courses are waived for the bioinformatics majors. See the departmental advisor for more information.

## RESOURCES

To be successful in your academic career, you will need to make the most of the services available to you at UCSD. Get connected to the services available to you as soon as possible to make the most of your education!

### **American Chemical Society-Student Affiliates**

Email: [acssa@ucsd.edu](mailto:acssa@ucsd.edu)  
[www-ac.s.ucsd.edu/~acssa](http://www-ac.s.ucsd.edu/~acssa)

**UCSD Web Site:** [www.ucsd.edu](http://www.ucsd.edu)

### **UCSD General Catalog**

[www.ucsd.edu/catalog](http://www.ucsd.edu/catalog)  
purchase at UCSD Bookstore, 858-534-7323

### **UCSD Career Services Center**

858-534-3750, [www-csc.ucsd.edu](http://www-csc.ucsd.edu)

### **UCSD Undergraduate Admissions**

858-534-4831, [admissions.ucsd.edu](http://admissions.ucsd.edu)

### **Campus Walking Tours**

858-822-1455, [campustours@ucsd.edu](mailto:campustours@ucsd.edu)

### **Education Abroad Program**

858-534-1123,  
<http://pao.ucsd.edu/acadint/chemistry.htm>

### **Undergraduate Colleges**

The colleges determine the general education requirements that you must complete in addition to your major requirements. Be sure to meet with a college adviser.

**Thurgood Marshall**, 858-534-4110,

[www.provost.ucsd.edu/marshall](http://www.provost.ucsd.edu/marshall)

**John Muir**, 858-534-3580,

[www.provost.ucsd.edu/muir](http://www.provost.ucsd.edu/muir)

**Revelle**, 858-534-3490,

[www.provost.ucsd.edu/revelle](http://www.provost.ucsd.edu/revelle)

**Eleanor Roosevelt**, 858-534-9864,

[www.provost.ucsd.edu/roosevelt](http://www.provost.ucsd.edu/roosevelt)

**Earl Warren**, 858-534-4350,

[www.provost.ucsd.edu/warren](http://www.provost.ucsd.edu/warren)

**Sixth College**, 858-822-5955,

[www-sixth.ucsd.edu](http://www-sixth.ucsd.edu)