BIOPHYSICS (PHD)

Visit program website. (https://biophysics.ucsf.edu/)

Degree Offered: PhD
Program Leadership:
Tanja Kortemme, PhD, Program Director
James Fraser, PhD, Associate Program Director
Admission Inquiries:
Nicole Flowers, Program Administrator

Program Information
The Biophysics program spans research at the interface of physics, chemistry, and biology. It is aimed at students who want to explore the physical properties, structures, and interrelationships of living things by using physics and chemistry to quantify biological processes at the molecular, cellular, and systems levels.

Early access to emerging technologies allows students in the UCSF Biophysics graduate program to explore biology in entirely new ways — before these technologies are generally available to other scientists. As important, the Biophysics faculty has achieved high recognition both nationally and internationally for its accomplishments. More than 10 members of the faculty are members of the National Academy of Sciences. UCSF faculty members pioneered applications of electron microscopy, crystallography, NMR, and image reconstruction techniques. The UCSF Biophysics graduate program ranks among the top in the U.S., according to a report by the National Research Council.

Faculty
More than 50 faculty members are associated the Biophysics program from the departments of bioengineering and therapeutic sciences, biochemistry, pharmaceutical chemistry, cell and tissue biology, neurology, and physiology; as well as the Gladstone Institute and the Cardiovascular Research Institute at UCSF.

The Biophysics program is a member of the Quantitative Biosciences Consortium (https://qbc.ucsf.edu/) (QBC), the Program in Biological Sciences (https://pibs.ucsf.edu/) (PIBS), and the Integrative Program in Quantitative Biology (https://qbc.ucsf.edu/) (IPQB) at UCSF.

Sub-disciplines
- Biophysical Approaches to Cell Biology
- Complex Biological Systems
- Computational and Theoretical Biophysics
- Membrane Biophysics
- Protein Engineering and Synthetic Biology
- Proteomics and Genomics
- Structural Biology

_Admission Requirements_
Bachelor’s degree in a related field.

Learning Outcomes
Passing the Qualifying Exam
1. Understands how to pose a scientific question.
2. Is able to develop a systematic approach to its solution.
3. Can interpret the results of that approach concisely and rigorously.
4. Is able to frame that interpretation both within the context of the system in question and of other related biological systems.
5. All proposals must include a section on the incorporation of responsible conduct of research in your project.

Graduation Criteria
Obtaining a PhD from UCSF signifies that a student has demonstrated the ability to perform and complete high-quality research that makes an original contribution to their field. In practice, the expectation is that at least one first-author paper is "in press" before the thesis is signed. Learning to respond to reviewer critiques is a critical part of graduate training. There is, however, no simple bureaucratic formula to determine what is sufficient, and often the body of work forming a thesis is reported in multiple first-author publications; there are way too many scenarios, and so we rely on the judgment of the thesis committees to make the evaluation of a substantial and original contribution to science.

General Principles: The thesis committee has broad authority to determine when a student has completed a sufficient body of scientific work to graduate, literally by "signing off" on the thesis. In rare cases, the Executive Committee and the program director may become involved in the process, e.g., if the student and his/her adviser do not agree on when it is appropriate for the student to graduate. In no case is it acceptable for a student to ask their committee to sign their thesis solely because they have accepted a job or wish to "move on" for one reason or another. The degree will not be granted until the thesis committee is satisfied that the requirements for graduation have been met, e.g., by completing the publication process for a critical portion of the thesis, regardless of whether the student remains "in residence" at UCSF.

Additional Information
Program Faculty
- Find a program faculty list (https://biophysics.ucsf.edu/people/faculty/) on the program website.

Career Outcomes
- Find career outcomes and other data on PhD programs (https://graduate.ucsf.edu/program-statistics/#career) on the Graduate Division website.

Degree Requirements
- Minimum GPA of 3.0
- All core courses and required activities taken and passed
- Six quarters in residence plus a minimum of three registered quarters after advancement to candidacy
- Pass qualifying examination
- Completion and submission of the dissertation
- For additional details, please see: graduate.ucsf.edu/phd-degree (https://graduate.ucsf.edu/phd-degree/)

Year 1
- Courses
- Lab rotations
- Choose research adviser
Year 2
• Research
• Form orals committee
• Complete oral qualifying exam (by end of 2nd year)

Year 3
• Research
• Advancement to Candidacy
• Form a thesis committee
• Bi-annual evaluation of progress by thesis committee

Year 4
• Research
• Publish results
• Bi-annual evaluation of progress by thesis committee
• 4th-year research talk

Years 5–6
• Research
• Publish results
• Bi-annual evaluation of progress by thesis committee
• 5th-year research talk
• Complete thesis
• Exit seminar
• PhD awarded

Approved Electives

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOPHYSICS 205B</td>
<td>Complex Biological Systems B</td>
<td>2.5-4</td>
</tr>
<tr>
<td>BIOPHYSICS 241</td>
<td>Physical Biology</td>
<td>5</td>
</tr>
<tr>
<td>BIO MD INF 203</td>
<td>Biocomputing Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>BIO MD INF 206</td>
<td>Statistical Methods for Bioinformatics</td>
<td>4</td>
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</tbody>
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Non-course Requirements
• Attendance at annual QBC (Quantitative Biosciences Consortium) Retreat
• Introductory bootcamp before start of first year
• Faculty Student Talks in first year
• Pass qualifying exam
• Dissertation and exit talk

Core Courses

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tr>
<td>Core Courses</td>
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<tr>
<td>BIOPHYSICS 219</td>
<td>Special Topics in Biophysics ¹</td>
<td>3</td>
</tr>
<tr>
<td>BIOPHYSICS 204A</td>
<td>Macromolecular Structure and Interactions</td>
<td>4</td>
</tr>
<tr>
<td>BIOPHYSICS 204B</td>
<td>Methods in Macromolecular Structure</td>
<td>4</td>
</tr>
<tr>
<td>BIOPHYSICS 205B</td>
<td>Complex Biological Systems B</td>
<td>2.5-4</td>
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Additional Non-Core Requirements

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<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>BIOPHYSICS 215</td>
<td>Laboratory Rotation</td>
<td>1-8</td>
</tr>
<tr>
<td>BIOPHYSICS 220</td>
<td>Biophysics Seminar</td>
<td>1</td>
</tr>
<tr>
<td>BIOPHYSICS 223</td>
<td>Scientific Communication Seminar</td>
<td>1</td>
</tr>
<tr>
<td>BIOPHYSICS 224</td>
<td>Critical Topics in Biophysics</td>
<td>1</td>
</tr>
<tr>
<td>BIOPHYSICS 250</td>
<td>Research</td>
<td>1-8</td>
</tr>
<tr>
<td>BIOPHYSICS 297</td>
<td>Scientific writing; applying for the NSF predoctoral fellows</td>
<td>1</td>
</tr>
<tr>
<td>BIOSTAT 273</td>
<td>Introduction to Biostatistics</td>
<td>1</td>
</tr>
<tr>
<td>GRAD 202</td>
<td>Racism in Science</td>
<td>3</td>
</tr>
<tr>
<td>GRAD 214</td>
<td>Responsible Conduct of Research for Basic Scientists</td>
<td>1.5</td>
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Total Units 25-40.5

¹ In the spring quarter, students are required to take any three of the mini courses from the following list: BIOCHEM 210 Special Topics, BIOPHYSICS 219 Special Topics in Biophysics, BIOMED SCI 270 Special Topics in Biomedical Sciences, BIO MD INF 219 Special Topics in Bioinformatics, CHEMISTRY 219 Special Topics in Basic and Translational Chemical Biology, GRAD 219 Special topics in racism and social justice in science, NEUROSCI 219 Special Topics in Basic and Translational Neuroscience, PHARMGENOM 219 Special Topics in Pharm Sci and Pharmacogenomics

² Only considered core for those with a designated emphasis in Complex Biological Systems, elective for others