# Curriculum – Bachelor of Science in Quantitative Biology

Quantitative Biology Co-Chairs: Drs. Remo Rohs ([rohs@usc.edu](mailto:rohs@usc.edu)) and Michael Waterman ([msw@usc.edu](mailto:msw@usc.edu))

<table>
<thead>
<tr>
<th>Core Requirements (26 units)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>QBIO 105 Introduction to Quantitative Biology Seminar</td>
<td>2</td>
</tr>
<tr>
<td>BISC 120L -or- BISC 121L General Biology: Organismal Biology and Evolution Advanced General Biology</td>
<td>4</td>
</tr>
<tr>
<td>BISC 220L -or- BISC 221L General Biology: Cell Biology and Physiology Advanced General Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 105aL General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 103L Introduction to Programming</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 104L Data Structures and Functions <em>(prerequisite: CSCI 103)</em></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 151L Fundamentals of Physics I: Mechanics and Thermodynamics <em>(prerequisite: MATH 125 or higher)</em></td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QBIO Specialization Courses (choose 5 courses, 20 units total)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 322aL Organic Chemistry <em>(prerequisite: CHEM 105bL)</em></td>
<td>4</td>
</tr>
<tr>
<td>CSCI 170 Discrete Methods in Computer Science <em>(prerequisite: CSCI 103)</em></td>
<td>4</td>
</tr>
<tr>
<td>CSCI 270 Introduction to Algorithms and Theory Computing <em>(prerequisites: CSCI 104 and CSCI 170)</em></td>
<td>4</td>
</tr>
<tr>
<td>MATH 126 Calculus II <em>(prerequisite: MATH 125)</em></td>
<td>4</td>
</tr>
<tr>
<td>MATH 225 Linear Algebra and Linear Differential Equations <em>(prerequisite: MATH 126)</em></td>
<td>4</td>
</tr>
<tr>
<td>MATH 307 Statistical Inference and Data Analysis I <em>(prerequisite: MATH 125 or higher; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>MATH 308 Statistical Inference and Data Analysis II <em>(prerequisite: MATH 307; spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 152 Fundamentals of Physics II: Electricity and Magnetism <em>(prerequisite: PHYS 151 and MATH 126)</em></td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QBIO Capstone Course (choose 1)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISC 478 Computational Genome Analysis <em>(spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 481 Structural Bioinformatics: From Atoms to Cells <em>(fall only)</em></td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biology Upper Division Elective (choose 1 course, 4 units)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISC 300L Introduction to Microbiology <em>(prerequisites: BISC 320 and CHEM 322aL; spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 307L General Physiology <em>(Prerequisites: BISC 220L/221, spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 313L Evolution and Population Genetics <em>(prerequisites: BISC 120/BISC 121 &amp;BISC 220/BISC 220; spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 315L Introduction to Ecology <em>(prerequisites: BISC 120L/BISC 121L; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 320L Molecular Biology <em>(prerequisite: CHEM 105bL; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 325 Genetics <em>(prerequisites: BISC 120L/BISC 121L, BISC 220L/BISC 221L, BISC 320L, CHEM 322aL, CHEM 322b corequisite; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 330L Biochemistry <em>(prerequisite: CHEM 322aL)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 421 Neurobiology <em>(prerequisite: BISC 220L/BISC 221L; fall only)</em></td>
<td>4</td>
</tr>
</tbody>
</table>
Upper Division Electives (minimum 8 units)  
The first capstone course cannot count toward upper division electives credit  

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISC 321</td>
<td>Science, Technology and Society <em>(prerequisites: BISC 120L/BISC 121L, BISC 220L/BISC 221L, CHEM 105aL/CHEM 115aL, and PHYS 151L; spring only)</em></td>
<td>2</td>
</tr>
<tr>
<td>BISC 403</td>
<td>Advanced Molecular Biology <em>(prerequisite: BISC 320L; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 406L</td>
<td>Biotechnology <em>(prerequisite: BISC 320L; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 407</td>
<td>Cellular and Molecular Neuroscience <em>(spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 408</td>
<td>Systems Neuroscience: From Synapses to Perception</td>
<td>4</td>
</tr>
<tr>
<td>BISC 410</td>
<td>Applications of Molecular Biology to Medicine <em>(prerequisite: BISC 330L; spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 411</td>
<td>Advanced Cell Biology <em>(prerequisites: BISC 220L/BISC 221L &amp; BISC 320L)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 424</td>
<td>Brain Architecture <em>(prerequisite: BISC 421; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 434</td>
<td>Introduction to Genome Science <em>(spring only, even years)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 435</td>
<td>Advanced Biochemistry <em>(prerequisite: BISC 330L; spring only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 444</td>
<td>Practical Analysis of Biological Data in R</td>
<td>2</td>
</tr>
<tr>
<td>BISC 450L</td>
<td>Principles of Immunology <em>(prerequisite: BISC 220L/BISC 221L; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 473L</td>
<td>Biological Oceanography <em>(BISC 120/BISC 121L; fall only)</em></td>
<td>4</td>
</tr>
<tr>
<td>BISC 478</td>
<td>Computational Genome Analysis <em>(spring only)</em> *</td>
<td>4</td>
</tr>
<tr>
<td>BISC 481</td>
<td>Structural Bioinformatics: From Atoms to Cells <em>(fall only)</em> *</td>
<td>4</td>
</tr>
<tr>
<td>BME 430</td>
<td>Principles and Applications of Systems Biology <em>(prerequisites: MATH 245 and BME 210 or CHE 205; fall only)</em></td>
<td>3</td>
</tr>
<tr>
<td>PHYS 444</td>
<td>Physical Biology: From Molecules to Cells <em>(prerequisites: PHYS 152; fall only)</em></td>
<td>4</td>
</tr>
</tbody>
</table>

*Capstone course

---

Research Experience – BISC 490 (10 Units)

Students are required to enroll in 10 units of directed research in a lab approved by the Quantitative Biology Executive Committee or assigned faculty adviser

Yellow = Courses that cannot be taken without CHEM 105b or courses that need prerequisites that require CHEM 105b (e.g. BISC 403 has a BISC 320 pre-requisite. BISC 320 has a CHEM 105b prerequisite)

Blue= Courses that cannot be taken without MATH 125 or courses that need a prerequisite that requires MATH 125 (e.g. MATH 225 has a prerequisite of MATH 126. MATH 126 has a MATH 125 prerequisite)