**QUANTITATIVE BIOLOGY, DOCTORAL MINOR**

**REQUIREMENTS**

PhD candidates in any department or program may obtain an interdisciplinary minor in Quantitative Biology by earning:

- A minimum of 10 credits from the courses listed below, including:
  - A required, 1-credit research seminar (students are advised to take during first year of graduate program)
  - One course from a quantitative science
  - One course from a biological science
  - One integrated course

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Students must complete the following course.</td>
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<tr>
<td>B M E 780</td>
<td>Methods in Quantitative Biology</td>
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**Quantitative Courses** 3-4

Students must complete one of the following courses.

- CBE 660 Intermediate Problems in Chemical Engineering
- COMP SCI/E C E 760 Introduction to Optimization
- COMP SCI/E C E 524 Machine Learning
- MATH 443 Applied Linear Algebra
- MATH/COMP SCI 513 Numerical Linear Algebra
- MATH/COMP SCI 514 Numerical Analysis
- MATH 519 Ordinary Differential Equations
- MATH 531 Probability Theory
- MATH 605 Stochastic Methods for Biology
- MATH 619 Analysis of Partial Differential Equations
- MATH/COMP SCI 714 Methods of Computational Mathematics I
- STAT/MATH 431 Introduction to the Theory of Probability
- STAT/B M I 541 Introduction to Biostatistics
- STAT/F&W ECOL/HORT 571 Statistical Methods for Bioscience I
- STAT/F&W ECOL/HORT 572 Statistical Methods for Bioscience II
- STAT 609 Mathematical Statistics I
- STAT 610 Introduction to Statistical Inference
- STAT/I SY E/MATH/OTM 632 Introduction to Stochastic Processes
- B M I 826 or B M I/STAT 620 Special Topics in Biostatistics and Biomedical Informatics (Statistics in Human Genetics)

**Integrated Courses**

3

Students must complete one of the following courses.

- B M I COMP SCI 775 Computational Network Biology
- B M I COMP SCI 776 Advanced Bioinformatics

**Biological Courses** 2-3

Students must complete one of the following courses.

- BIOCHEM 570 Computational Modeling of Biological Systems
- BOTANY/PL PATH 563 Phylogenetic Analysis of Molecular Data
- GENETICS 885 Advanced Genomic and Proteomic Analysis
- MICROBIO 657 Bioinformatics for Microbiologists
- ONCOLOGY 778 Bioinformatics for Biologists

**Mathematical Courses**

- STAT/MATH 709 Mathematical Statistics
- STAT/MATH 710 Mathematical Statistics
- B M E 556 Systems Biology: Mammalian Signaling Networks
- B M E/CBE 782 Modeling Biological Systems
- B M E/CBE 783 Design of Biological Molecules
- B M I COMP SCI 576 Introduction to Bioinformatics
- B M I/BIOCHEM/BMOLCHEM/MATH 609 Mathematical Methods for Systems Biology
- B M I COMP SCI 775 Computational Network Biology
- B M I COMP SCI 776 Advanced Bioinformatics
- B M I/STAT 877 Statistical Methods for Molecular Biology
- BIOCHEM 570 Computational Modeling of Biological Systems
- BOTANY/PL PATH 563 Phylogenetic Analysis of Molecular Data
- GENETICS 885 Advanced Genomic and Proteomic Analysis
- MICROBIO 657 Bioinformatics for Microbiologists
- ONCOLOGY 778 Bioinformatics for Biologists
- BIOCHEM 601 Protein and Enzyme Structure and Function
- BIOCHEM/MICROBIO 612 Prokaryotic Molecular Biology
- BIOCHEM/MICROBIO 620 Eukaryotic Molecular Biology
- BIOCHEM/BOTANY 621 Plant Biochemistry
- BIOCHEM 625 Mechanisms of Action of Vitamins and Minerals
- BIOCHEM/CHM 704 Chemical Biology
- BIOCHEM 719 From Atoms to Molecules
- GENETICS 466 Principles of Genetics
- GENETICS/BOTANY/PL M & I/PL PATH 655 Biology and Genetics of Fungi
- GENETICS 701 Advanced Genetics
- MICROBIO 526 Physiology of Microorganisms
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<tr>
<td>MICROBIO 607</td>
<td>Advanced Microbial Genetics</td>
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<tr>
<td>MICROBIO/ BMOLCHEM 668</td>
<td>Microbiology at Atomic Resolution</td>
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<tr>
<td>ONCOLOGY 703</td>
<td>Carcinogenesis and Tumor Cell Biology</td>
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<tr>
<td>PATH 750 &amp; PATH 752</td>
<td>Cellular and Molecular Biology/ Pathology and Cellular and Molecular Biology/ Pathology Seminar</td>
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<tr>
<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
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**Total Credits** 10