

# QUANTITATIVE BIOLOGY, DOCTORAL MINOR

## REQUIREMENTS

Students who are candidates for the Ph.D. degree 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, divided into four categories:
  - 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

Code	Title	Credits
<b>Required</b>		<b>1</b>
B M E 780	Methods in Quantitative Biology	
<b>Quantitative Courses (Choose One)</b>		<b>3-4</b>
CBE 660	Intermediate Problems in Chemical Engineering	
COMP SCI/E C E/ I SY E 524	Introduction to Optimization	
COMP SCI/ E C E 760	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	
STAT/MATH 709	Mathematical Statistics	

STAT/MATH 710 Mathematical Statistics

### Integrated Courses (Choose One) 3

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

### Biological Courses (Choose One) 2-3

BIOCHEM 501	Introduction to Biochemistry
BIOCHEM 601	Protein and Enzyme Structure and Function
BIOCHEM/ GENETICS/ MICROBIO 612	Prokaryotic Molecular Biology
BIOCHEM/ GENETICS/ MD GENET 620	Eukaryotic Molecular Biology
BIOCHEM/ BOTANY 621	Plant Biochemistry
BIOCHEM 625	Mechanisms of Action of Vitamins and Minerals
BIOCHEM/ PHMCOL-M/ ZOOLOGY 630	Cellular Signal Transduction Mechanisms
BIOCHEM/ CHEM 704	Chemical Biology
GENETICS 466	Principles of Genetics
GENETICS/ BOTANY/M M & I/ PL PATH 655	Biology and Genetics of Fungi
GENETICS 701	Advanced Genetics
MICROBIO 607	Advanced Microbial Genetics
MICROBIO/ BMOLCHEM 668	Microbiology at Atomic Resolution
ONCOLOGY 703	Carcinogenesis and Tumor Cell Biology

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PATH 750 Cellular and Molecular Biology/  
Pathology

ZOOLOGY 570 Cell Biology