

# QUANTITATIVE BIOLOGY, DOCTORAL MINOR

Technological innovations have revolutionized the scale and detail with which biological systems can be explored. With that revolution has come a demand for scientists who can develop and analyze quantitative and predictive models of biological systems. The doctoral minor in Quantitative Biology (<https://qbi.wisc.edu/>) is designed to complement the depth of training in biological or quantitative sciences that a student achieves through UW–Madison’s graduate programs with the breadth that is needed to conduct research under this paradigm. In addition to coursework in biological, quantitative, and integrated courses, students in the program will take an inter-disciplinary research seminar to prepare them for research that crosses these boundaries. This training will prepare students for careers in academic and industrial settings, where the ability to cross disciplinary lines and work in teams with diverse expertise is critical.

## ADMISSIONS

Candidates should have an undergraduate degree in a biological, quantitative, or physical science/engineering. A minimum GPA of 3.0 (on a 4.0 scale) is required.

Students interested in completing a Quantitative Biology minor should discuss with their thesis advisor and/or contact the minor’s faculty director to determine appropriate coursework.

## 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 M E 780	Methods in Quantitative Biology	1
<b>Quantitative Courses (Choose One)</b>		
CBE 660	Intermediate Problems in Chemical Engineering	3-4
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 608	Mathematical Methods for Physical Modeling in 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	
<b>Integrated Courses (Choose One)</b>		<b>3</b>
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 776	Advanced Bioinformatics	
B M I/STAT 877	Statistical Methods for Molecular Biology	
BIOCHEM 570	Computational Modeling of Biological Systems	
GENETICS 885	Advanced Genomic and Proteomic Analysis	
MICROBIO 657	Bioinformatics for Microbiologists	
ONCOLOGY 675	Advanced or Special Topics in Cancer Research	
<b>Biological Courses (Choose One)</b>		<b>2-3</b>
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
PATH 750	Cellular and Molecular Biology/ Pathology
ZOOLOGY 570	Cell Biology

## PEOPLE

QBI PhD minor committee:

A. Gitter (BMI)  
M. McClean (BME)  
S. Roy (BMI)  
O. Venturelli (Biochem)

For a complete list of relevant QBio faculty, please see All Faculty  
(<https://qbi.wisc.edu/research/all-faculty/>).