Biochemistry 570:
Computational Modeling of Biological Systems

Credits: 3

Course URL: https://canvas.wisc.edu/courses/143566

Course Designations and Attributes:
> Breadth – Biological Science
> Level – Advanced

Meeting Time and Location
> TR 1:00 – 2:15
> 2131 DeLuca Biochemistry Building (http://maps.wisc.edu/s/f54i8pa1)

Instructional Mode: face-to-face

Credit Hour Definition
> This class meets for two 75-minute class periods each week over the spring semester and carries the expectation that students will work on course learning activities (watching video lectures, reading, problem sets, studying, etc) for about 2 hours out of classroom for every class period.

INSTRUCTORS AND TEACHING ASSISTANTS

Instructors:
> Dr. Philip Romero, Assistant Professor
> promero2@wisc.edu, 3204B Biochemical Sciences
> Office hours: Tuesdays, 2:30-3:30 PM
>
> Dr. Ophelia Venturelli, Assistant Professor
> venturelli@wisc.edu, 3204C Biochemical Sciences
> Office hours: Thursdays, 4:00 – 5:00 PM

Teaching Assistant
> Wenbo Lu
> wlu54@wisc.edu, 3266 Biochemical Sciences
> Office hours: Thursdays, 2:30 – 3:30 PM

COURSE DESCRIPTION

Introduction to the mathematical and computational tools needed to model biological systems spanning from molecules to ecosystems. Topics include metabolic pathways, gene regulation, biomolecular networks, infectious disease, and population dynamics. The goal of this course is to teach life sciences undergraduates the fundamentals in quantitative thinking and analytical reasoning about complex biological systems. This course requires no prior knowledge of differential equations, linear algebra, or programming.

Requisites: (MATH 217, 221, or 275) and ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, BIOCORE 381, or (BIOLOGY/ZOOLOGY 101, 102 and BIOLOGY/BOTANY 130), or graduate/professional standing

LEARNING OUTCOMES

By the end of Biochemistry 570, students should be able to:
1. Perform scientific computations in the Python programming language
2. Design, simulate, and analyze mathematical models of biological systems
3. Understand how to model biological systems across different scales
4. Think critically about model assumptions/validity
5. Communicate scientific findings in oral and written form

GRADING

Grade breakdown

Class participation	5%
Homework	15%
Midterm exam	25%
Final project	25%
Final exam	30%

Letter Grades

Points	Grade
90-100	A
85-89	AB
80-84	B
75-79	BC
70-74	C
60-69	D
0-59	F

REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

- *Mathematical Modeling in Systems Biology: An Introduction*, by Brian Ingalls
  - Available free online: http://www.math.uwaterloo.ca/~bingalls/MMSB/

- Access to a computer with the Python programming language installed.
  - Python is available on all UW-Madison Computer Labs (InfoLabs) computers https://it.wisc.edu/services/computer-labs-infolabs/

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

- Exams are cumulative, take-home, with open notes and books
- There is a final project that will involve an in depth computational/mathematical analysis of a biological system
- Any late work will be deducted 10% per day

HOMEWORK & OTHER ASSIGNMENTS

- You will have six homework assignments over the course of the semester. Homework will be assigned every other Thursday and is due two weeks later.

RULES, RIGHTS & RESPONSIBILITIES

- See the Guide's Rules, Rights and Responsibilities

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to

identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/