



**Biochemistry 551:
Biochemical Methods
Fall 2018**

Course Website: <https://canvas.wisc.edu/courses/104519>

Course Credits: 4

Course Designations and Attributes:

Breadth – Physical Sci counts toward the Natural Sci req

Level – Advanced

L&S credit – Counts as Liberal Arts and Science credit in L&S

Credit Hour Definition: The credit standard for this course is met by an expectation of a total of 180 hours of student engagement with the courses learning activities, which include regularly scheduled instructor:student meeting times (seminars and lectures), regularly scheduled labs, reading, writing, and other student work as described below.

Instructional Mode: In-person

Meeting times and locations:

M 11-11:50: Seminar, location TBA

WF 11-11:50: Lecture, Biochem 1120

Lab section 301: M 12:20-4:00, Biochem 2118

Lab section 302: T 12:20-4:00, Biochem 2118

Lab section 303: W 12:20-4:00, Biochem 2118

Lab section 304: Th 12:20-4:00, Biochem 2118

Instructors:

Dr. Lynne Prost, Associate Faculty Associate

2139A Biochemistry, 420 Henry Mall, lprost@wisc.edu

Office hours: Mon 10-11 (Biochem 2139A) and Wed 9-10 (Biochem Badger Market)

Dr. Alessandro Senes, Associate Professor

415C Biochemistry Labs, 433 Babcock Dr, senes@wisc.edu

Office hours: By appointment, walk-ins welcome

Teaching Assistants:

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Seminar Instructors:

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COURSE INFORMATION:

Course Description: Lab and student seminar. Introduction to modern biochemical laboratory techniques and current biochemical literature. Students will present a seminar based upon scientific literature that parallels experiments they will perform in lab. For advanced undergraduates and non-biochemistry graduate students.

Requisites: Biochem 501 or Biochem 507 or concurrent enrollment

Course Learning Outcomes: By the end of Biochemistry 551, students should be able to:

1. Explain the theory of several fundamental biochemical techniques
2. Form hypotheses based on biochemical principles
3. Design and perform experiments to collect sound scientific data
4. Critically analyze one's own data as well as data from other sources
5. Communicate scientific findings in both oral and written form
6. Value the collaborative nature of biochemistry

Grading:

Points	Grade
> 900	A
850–900	AB
800–849	B
750–799	BC
700–749	C
600–699	D
< 599	F

Assignments:

Assignment	Points per assignment	Total Points
Exams (2)	150	300
Lab performance		100
Pre-lab quizzes (10)	5	50
Mini lab reports (10)	10	100
Final lab report		150
Oral lab report		100
Literature seminar		150
Literature seminar participation		50
Total		1000

Required Course Materials:

Lab manual: must be purchased from the DoIT Tech Store

Software: PyMOL (available through UW) and Prism (available as a free trial)

Course Schedule:

Wed. Sept 5	Lecture 1: Class
Fri. Sept 7	Lecture 2: Protein structure and computational analysis
Mon. Sept 10	<i>Seminar: How to give a scientific presentation</i>
Sept 10-13	Lab 1: Computational analysis of HCAII - Analyze protein structure - Each section selects 2 potential mutations **You must bring a laptop with PyMOL to lab!
Wed. Sept 12	Lecture 3: PCR and Cloning 1
Fri. Sept 14	Lecture 4: PCR and Cloning 2
Mon. Sept 17	<i>Seminar: Instructor Seminar</i>
Sept 17-20	Lab 2: PCR amplification of the <i>HCAII</i> and pETblue2 - Check-in and pipet workshop - PCR amplification of <i>HCAII</i> and pETblue2
Wed. Sept 19	Lecture 5: PCR and Cloning 3
Fri. Sept 21	Scientific writing
Mon. Sept 24	<i>Student seminar 1</i>
Sept 24-27	Lab 3: Analysis of the PCR products - Analysis and purification of PCR product - DNA digest and purification
Wed. Sept 26	Lecture 6: Gel electrophoresis of biomolecules
Fri. Sept 28	Pre-lab: Gibson assembly and transformation (2 TAs) **ATTENDANCE STRONGLY RECOMMENDED**

Mon. Oct 1	<i>Student seminar 2</i>
Oct 1-4	Lab 4: Gibson assembly reaction and transformation <ul style="list-style-type: none"> - Gibson assembly reaction - Transform the clones into <i>E. coli</i> DH5α
Wed. Oct 3	Lecture 7: Overexpression of proteins/Overexpression systems
Fri. Oct 5	Lecture 8: Emerging Biochemical Techniques 1: CRISPR/Cas

Mon. Oct 8	<i>Student seminar 3</i>
Oct 8-11	Lab 5: Screening for pETblue2- <i>HCAII</i> clones <ul style="list-style-type: none"> - Inoculate bacterial cultures prior to lab period - Miniprep DNA - Screen by restriction digest - Transform clones into <i>E. coli</i> RB DE3
Wed. Oct 10	Exam Review
Fri. Oct 12	Exam 1 on lectures 2 - 8

Mon. Oct 15	<i>Student seminar 4</i>
Oct 15-18	Lab 6: Induction of His-tagged <i>HCAII</i> expression <ul style="list-style-type: none"> - Induce cultures with IPTG - Collect samples for analysis - Measure cell growth - Pellet culture for purification
Wed. Oct 17	Lecture 9: Protein purification
Fri. Oct 19	Hypothesis workshop

Mon. Oct 22	<i>Student seminar 5</i>
Oct 22-25	Lab 7: Purification of wild type and mutant <i>HCAII</i> <ul style="list-style-type: none"> - Cell lysis, Ni Column

Wed. Oct 24	Lecture 10: UV/Vis spectroscopy
Fri. Oct 26	Lecture 11: Fluorescence spectroscopy
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Mon. Oct 29	<i>Student seminar 6</i>
Oct 29-Nov 1	Lab 8: Analysis of His-tagged HCAII expression and purification <ul style="list-style-type: none"> - Pour SDS-PAGE gels - Analysis of HCAII expression by electrophoresis - Spectroscopic determination of concentration
Wed. Oct 31	Lecture 12: Protein folding
Fri. Nov 2	Pre-lab: Intrinsic tryptophan fluorescence (2 TAs) **ATTENDANCE REQUIRED**
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Mon. Nov 5	<i>Student seminar 7</i>
Nov 5-8	Lab 9: Intrinsic tryptophan fluorescence <ul style="list-style-type: none"> - Measure stability of wt and mutant protein
Wed. Nov 7	Lecture 13: Enzyme Kinetics
Fri Nov 9	Pre-lab: Enzymatic activity of HCAII (2 TAs) **ATTENDANCE REQUIRED**
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Mon. Nov 12	<i>Student seminar 8</i>
Nov 12-15	Lab 10: HCAII enzyme activity <ul style="list-style-type: none"> - Measure enzymatic activity of wild type and mutant HCAII
Wed. Nov 14	Lecture 14: Ligand Binding
Fri. Nov 16	Pre-lab: FRET to detect ligand binding (2 TAs) **ATTENDANCE REQUIRED**
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Mon. Nov 19 *Student seminar 9*

Nov 19-22 NO LAB THIS WEEK

Wed. Nov 21 NO CLASS

Fri. Nov 23 NO CLASS

Mon. Nov 26 *Student seminar 10*

Nov 26-29 Lab 11: FRET
 - Use FRET to detect ligand binding to HCAII

Wed. Nov 28 Guidelines for Oral Report, Final Report, and Independent Lab

Fri. Nov 30 Lecture 15: Emerging Biochemical Techniques 2: Microscopy

Mon. Dec 3 *Student seminar 11 (if necessary)*

Dec 3-6 Independent Lab

Wed. Dec 5 Exam Review

Fri. Dec 7 **EXAM 2 on lectures 9 - 15**

Mon. Dec 10 NO CLASS

Dec 10-13 **Group Oral Reports** (Rooms TBD)

Wed. Dec 12 NO CLASS

Fri. Dec 14 NO CLASS

Mon. Dec 17 **LAB REPORT DUE**

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/>