

CBE 781
Fall 2020

Biological Engineering: Molecules, Cells and Systems

Instructor	Prof. John Yin	
Office Hours	By appointment (john.yin@wisc.edu), on-line	
Class meetings	Tu Th 9:30-10:45 pm, on-line: canvas.wisc.edu/courses/220447	
Credit	This course is offered for 3 credits	
Textbook	There is no required textbook. Useful references (on-line and book) are provided below.	
On-line Refs. (library.wisc.edu)	Frontiers in Protein Structure, Function and Dynamics, Editors Singh and Tripathi (searchable e-book), 2020, SpringerLink Publications. Biochemistry_Online_(Jakubowski) Cell Biology, 3 rd Edition, Thomas D. Pollard, 2017	
Further references (books)	C. Branden & J. Tooze, Introduction to Protein Structure, 2 nd Ed. R. Phillips, J. Kondev and J. Theriot, <i>Physical Biology of the Cell</i> (2008) I. Tinoco, K. Sauer, J.C. Wang and J.D. Puglisi, <i>Physical Chemistry: Principles and Applications in Biological Sciences</i> , 4 th Ed. (2002) D. Voet, J.G. Voet, C.W. Pratt, <i>Fundamentals of biochemistry: life at the molecular level</i> (2007)	
Grading	Two team Projects (written & oral*)	30 percent
	Final Project (written & oral)	25
	Homework and class participation	20**
	Seminar reports (3)	15
	Interview report (1)	10
	85-100(A), 80-85 (AB), 70-80(B), 60-70(C), 50-60(D), <50 (F)	
	* Selected team projects (written) will be invited for 10min oral reports to the class.	
	** borderline (e.g., 80 = high B or low AB) course grades will depend on class participation	
	Detailed descriptions of projects and reports will be provided over the course of the term.	

COURSE AIMS. By the end of the course you should be able to:

1. apply principles of math, physics, chemistry, and engineering in the design, synthesis, analysis and characterization of biological systems at the molecular, cellular and tissue levels.
2. extract, understand and critique key idea(s) from any work of the primary technical and patent literature
3. communicate clearly and concisely through email, written reports & oral presentations
4. work effectively, either alone or as a member of a team.

SCHEDULE (tentative)

WEEK OF	TOPIC
Aug 31	Intro to Biological Engineering
Sept 7	Nucleic Acids and Proteins
Sept 14	Protein Expression Systems
Sept 21	Protein Engineering: Rational Design
Sept 28	Sept 24 <u>DUE: Team Project 1</u> Protein Engineering: Directed Evolution
Oct 5	Kinetics and Thermodynamics of Protein-Protein Interactions <u>Selected in-class presentations</u> : Team Project 1
Oct 12	Models of Receptor-Ligand Binding
Oct 19	Signal Transduction Pathways
Oct 26	Oct 22 <u>DUE: Team Project 2</u> Genetic Networks
Nov 2	Cellular Engineering Tools <u>Selected in-class presentations</u> : Team Project 2
Nov 9	Metabolic Engineering/Synthetic Biology
Nov 16	Tissue Engineering and Cell-Material Interactions
Nov 23	Nov 19 <u>DUE: Interview Report</u> Constructing Functional Tissues
Nov 30	Nov 26 BREAK for Thanksgiving (no class) Regenerative Medicine
Dec 7	Dec 3 <u>DUE: Final Project Reports</u> <u>In-class presentations: Final Project</u>

BYOL Bring your own lunch. Take an opportunity to get to know your instructor outside of class and for him to get to know you. Email dates and times when two or three (max) of you could BYOL with Prof. Yin for 45 min on Canvas.

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 <https://conduct.students.wisc.edu/academic-integrity/>

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES 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 should inform Prof. Yin of their need for instructional accommodations by the end of the first week of the semester, or as soon as possible after a disability has been incurred or recognized. I will work either directly with the 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. For more information, refer to <https://mcburney.wisc.edu/>

DIVERSITY AND INCLUSION 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, background, culture, 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. For more information, refer to <https://diversity.wisc.edu/>