SYLLABUS
CHEM 396B - Biosensing, Spring 2022

Course Description	Theory and real-world applications of different sensing technologies, including enzymatic biosensors, field effect transistors, aptamer sensors, carbon-based sensors, paper-based sensors, and wearable sensors.
Modality Description	This course will be held in-person unless otherwise specified. Students attending lecture must obey strict social distancing requirements and other UVM policies as stipulated by the university's Green and Gold Promise. I will give students instructions on how to proceed in the event that the course switches to a remote or mixed format due to COVID-19 concerns.
Learning Outcomes	By the end of the course, students should be able to 1) qualitatively and quantitatively describe phenomena involved in electrochemical sensing, 2) explain how different measurements are made and the instrumentation required, 3) determine the utility of these devices in real-world applications, and 4) critically evaluate scientific literature in the field of sensing.
Core Competencies	Ethical Reasoning & Decision Making, Analytical & Critical Thinking, Quantitative Reasoning/Applied Data Interpretation, Creative Expression and Innovation, Teamwork, Collaboration & Leadership, Written, Visual, and Oral Communication, Information and Digital Literacy.
Instructor	Yangguang Ou
Office	E341 Innovation Hall
Instructor email	you@uvm.edu
Office hours	In-person: Mondays 9 – 10 am. Also available virtually and through appointments.
Credit	CHEM396B is worth 3 credit hours.
Pre-requisites	CHEM121 (exceptions possible)
Lecture	MWF 10:50-11:40 James Jeffords Hall 127; Powerpoints, chalk talks, and in-class discussions.

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Statement on Diversity and Inclusion

I strive to create a classroom environment that supports students from a diverse set of ethnic, socioeconomic, and educational backgrounds. I strongly believe that our best path forward to a stronger and more equitable society is to promote inclusiveness.
As a community, we should strive to uphold the ideals of Our Common Ground: http://www.uvm.edu/president/our-common-ground

Student Learning Accommodations

In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the Student Accessibility Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty discuss the accommodations they plan to use in each course.

Contact SAS:
A170 Living/Learning Center
802-656-7753
access@uvm.edu
https://www.uvm.edu/access

Blackboard, MS Teams

Blackboard will be used for course announcements, lecture materials, homework/test submissions, and grading. The instructor will use MS Teams for virtual office hours.

Technical Support

Students, please read this technology checklist to make sure you are ready for classes: https://www.uvm.edu/it/kb/student-technology-resources/

Students should contact Helpline (802-656-2604) for support with technical issues.

Homework

Homework will be assigned regularly and will be posted on Blackboard.

Attendance

Required. The best way to learn is to take notes during class and participate in the regular literature discussions. Attendance will be 20% of your overall grade. You can have 2 unexcused absence freebies but any more than that, I will deduct 1% per absence. For excused absences, I will need either prior notice or official notes (from doctors, university, student health services, etc).

http://catalogue.uvm.edu/
The University of Vermont reserves the right to make changes in the course offerings, mode of delivery, degree requirements, charges, regulations, and procedures contained herein as educational, financial, and health, safety, and welfare considerations require, or as necessary to be compliant with governmental, accreditation, or public health directives.

The Green and Gold Promise clearly articulates the expectations that UVM has for students, faculty, and staff to remain compliant with all COVID-19 recommendations from the federal CDC, the State of Vermont, and the City of Burlington. This include following all rules regarding facial coverings and social distancing when attending class. If you do not follow these guidelines, I will ask you to leave the class. If you forget your mask, you cannot enter the class and should go back and retrieve your mask. The Code of Student Conduct outlines policies related to violations of the Green and Gold Promise. Sanctions for violations include fines, educational sanctions, parent notification, probation, and suspension.

Attendance and illness/isolation/quarantine:
If you need to isolate or quarantine, please contact Student Health Services (802) 656-3350) and email me directly to make arrangements to discuss missed work. In these cases, arrangements will be made so you can continue your studies remotely.

Recordings

Our class sessions may be audiovisually recorded for students in the class to refer back to, and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.

Exams

Exams, including the final, will be take-home. The goal of this format is to remove the pressures of "needing to get a good grade" and to shift the focus toward learning the materials and critically thinking about the subjects.

Presentation

You are required to do a 20-min presentation on a sensing paper (to be submitted to me for approval by **Feb 25 @11:59 pm**) – you will give your presentation during the week that we cover that topic (bolded in **Tentative Detailed Schedule**). The sign-up sheet will be posted on Blackboard and will be first-come, first serve. Each topic can have 2 presenters max. There will be a clear rubric for the presentation – see Bb. Students can select either biosensing papers or environmental sensing papers.

Textbook

Recommended not required: *Electrochemistry*, by Wesley R. Browne, Oxford University Press

I will supplement this book with materials from 3 other textbooks: *Electrochemical Methods, Fundamentals and Applications*, 2nd ed., by Bard and Faulkner, *Electrochemical Systems,* 3rd ed., by Newman, *Understanding Voltammetry*, 3rd ed., by Compton and Banks, and *Electrochemistry for Chemists*, 2nd ed, by Sawyer, Sobkowiak, and Roberts. These are great references should you want more information.

Intellectual Property

Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments(for example homework or a take-home examination). Violations will be handled under UVM's Intellectual Property policy and Code of Academic Integrity.

Diversity, Equity, and Inclusion Resources

The Division of Diversity, Equity, and Inclusion believes excellence should be inclusive of the entire University of Vermont (UVM) community and is steadfastly committed to this belief. Every day, our Division strives to make our work accessible, affirming, and action-oriented to help ensure excellence is inclusive of everyone.
https://www.uvm.edu/diversity

(If you email me the name of your favorite animal by 01/23/22 at 11:59 pm then I'll give you 5 bonus points on your first exam. Please put 'CHEM396B bonus' in the subject line.)

UVM Prism Center
The Prism Center serves the diverse queer and trans communities at the University of Vermont. We support and empower lesbian, gay, bisexual, transgender and queer students, as well as students whose identities fall in between or expand beyond those categories, and work to create a campus community where people of all sexual and gender identities can thrive. https://www.uvm.edu/prism

Interfaith Center
Each of us engages those questions differently, perhaps through a religious tradition, philosophy, or spiritual practice. No matter how you make meaning of your life, you are welcome at the Interfaith Center for reflection, spiritual practice, education, and community building.
https://www.uvm.edu/interfaithcenter

Mosaic Center for Students of Color
The Mosaic Center for Students of Color (MCSC) Vision is to create a diverse and rich community of empowered, engaged, and enthusiastic students of color at UVM. We fully support the holistic development of self-identified students of color so that they can obtain their goals for academic achievement, personal growth, identity formation, and cultural development.
https://www.uvm.edu/mcsc

Women & Gender Equity Center
The UVM Women & Gender Equity Center cultivates joyful community while advancing gender equity across identities. We envision a brave, diverse, and equitable learning environment for all members of the UVM community. We provide advocacy services for those in our community who have experienced sexual or intimate partner violence, and strive to provide programming, education, and events that ask our community to explore the intersections of their gender and other identities.
https://www.uvm.edu/wagecenter

Tips for Success

Students are encourage to attend class, do homework, come to office hours, work with peers, and ask questions to help them succeed in class. In case the course goes fully online, here are a few resources for students on remote/online learning:

• Checklist for success in https://learn.uvm.edu/about/support-for-students/checklist-online-credit-courses/

• Academic support for online courses: https://www.uvm.edu/academicsuccess/online- learning-student-resources-remote-instruction/

Helpful resources other than the instructor include the Undergraduate/Graduate Writing Center, Supplemental Instruction, Learning Co-op tutors, and supplemental course materials.)

Important University Policies

Academic Integrity

Offenses against the Code of Academic Integrity are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code are taken very seriously and will be forwarded to the Center for Student Ethics and Standards for further investigation. Violations of the Code of Academic Integrity – including any inappropriate collaboration, collusion, cheating, corroboration, plagiarism, or any other related offense–will be fully investigated according to the rules set by the UVM Academic Integrity Office and may be punishable with a score of zero for the assignment in question. Details can be found at http://www.uvm.edu/policies/student/acadintegrity.pdf.

Grade Appeals

If you would like to contest a grade, please follow the procedures outlined in this policy: https://www.uvm.edu/policies/student/gradeappeals.pdf

Code of Student Conduct

http://www.uvm.edu/policies/student/studentcode.pdf

FERPA Rights Disclosure

The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and Privacy Act (FERPA) of 1974. http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/

Promoting Health and Safety

The University of Vermont's number one priority is to support a healthy and safe community:

Center for Health and Wellbeing: http://www.uvm.edu/health

Counseling & **Psychiatry Services (CAPS):** Please call 802-656-3340 for assistance.

C.A.R.E. If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at https://www.uvm.edu/studentaffairs

Alcohol and Cannabis Statement
As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. In addition, alcohol and cannabis can:
• Cause issues with attention, memory and concentration
• Negatively impact the quality of how information is processed and ultimately stored
• Affect sleep patterns, which interferes with long-term memory formation

It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.

Final Exam Policy The University final exam policy outlines expectations during final exams and explains timing and process of examination period. https://www.uvm.edu/registrar/final-exams

Course evaluation All students are expected to complete an evaluation of the course at the end of the semester. Evaluations will be anonymous and confidential, and the information gained, including constructive criticisms, will be used to improve the course.

G**RADING**

Participation (literature discussion)	20%
Exams I, II, III	15% each
Homework	15%
Presentation	20%
TOTAL	100%

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Academic Calendar and Exam Schedule (subject to change)

Mon	***Jan 17***	*Martin Luther King Jr. Holiday*
Wed	**Jan 19**	First day of classes for this course
Mon	**Jan 24**	Last day to add class without instructor permission
Mon	**Jan 31**	Add/drop, pass/no pass, audit deadline
Fri	**Feb 18**	**Exam 1**
Mon	***Feb 21***	*President's day holiday*
Tues	***Mar 1***	*Town meeting day recess*
M-F	***Mar 7-11***	*Spring recess*
Fri	**Mar 25**	**Exam 2**
Mon	**April 4**	Last day to withdraw
Fri	***April 22***	*Honors day*
Fri	**May 6**	Last day of classes
Sat,Sun,Wed	***May 7, 8, 11***	*Reading days*
Mon	**May 9**	**Exam 3**

Tentative Detailed Schedule (subject to change)

Week	Subject
01/19, 01/21	Go through syllabus. Literature discussion – Parkinson's disease.
01/24-01/28	What is biosensing? Introduction to electrochemistry
01/31-02/04	Introduction to electrochemistry The electrochemical cell
02/07-02/11	The electrochemical cell
02/14, 02/16	The electrochemical cell
02/18	***Exam 1***
02/21	***President's day holiday – no class***
02/23, 02/25	Potentials, interfaces, electrodes, and mass transport.
02/25	*Deadline for signing up for presentations.*
02/28-03/04	Potentials, interfaces, electrodes, and mass transport.
03/07-03/11	***Spring recess – no class***
03/14-03/18	Potentials, interfaces, electrodes, and mass transport. **Potentiometric** sensing and applications.
03/21, 03/23	General concepts in dynamic electrochemistry.
03/25	***Exam 2***
03/28-04/01	**Voltammetric** sensing and applications.
04/04-04/08	**Electrochemical impedance** sensing and applications.
04/11-04/15	**Aptamer-based** sensing and applications.
04/18, 04/20	**Amperometric** sensing (traditional biosensors) and applications.
04/22	***Honors day – no class***
04/25-04/29	**Field effect transistors** and applications.
05/02-05/06	**Wearable** sensors and applications.
05/09	***Exam 3***