

Chem 7770 Nature-inspired Biosensors

Fall 2015

Section 001, Time TBA

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Many of the lab tools/devices/techniques we use in the research laboratory or in the health clinic started off as the bright idea of Mother Nature. This course will look at a breadth of naturally occurring biological units that have been exploited to create the sensors/detection methods we use today. Some of the subjects that will be covered include: the use of RNA-based aptamers for the detection of metabolites in patients, live cells in culture and samples in the research lab, protein complementation techniques to provide real-time analysis of protein interactions in cells, identification of biomarkers for disease and infection, DNA-based sensing, and PCR-based mutation detection. In general we will start each section by studying how the naturally occurring unit works, then move to how it has been exploited and how the designed sensing system works. This class is meant to introduce you to state-of-the-art techniques and the fundamental biochemistry that served as a precursor to their design.

Target audience: This course is suitable for any graduate student who has a solid command of fundamental biochemistry or for undergraduate science majors who have taken the prerequisite biochemistry.

Office Hours : by appointment joanie.hevel@usu.edu

Text: *Principles of Biochemistry* 2005 (ISBN 0-7167-4339-6) by Lehninger **as a reference**

Other: You will need computer access to read scientific articles and access CANVAS

Prerequisites: A grade of B- or better in Chem 5700/5710 or equivalent

Grading:

Class participation during discussions	100pts
Presentation	100pts
Short exams/quizzes (4 @ 25pt each)	100pts
	300pts

Exams: Make-up exams are possible only for excused absences as specified in the USU General Catalog.

What to Expect

1. I expect that you already understand the basic biochemistry concepts that are presented in Lehninger. If something sounds unfamiliar to you, you should use a Biochemistry text to refresh yourself on the topic.
2. I will be introducing you to a wide breadth of signaling/sensing molecules and mechanisms through a combination of lecture and the primary literature.
3. You will be expected to read a considerable amount of peer-reviewed articles and take notes. The articles I pick are either to provide you with factual information about a particular sensor/detection system, to introduce you to different approaches to solving health/lab problems, or to introduce an application of a sensor/detection system. We will have at least 4 formal class discussions about particular papers. During these discussions I expect everyone to participate in the conversation. This means you will have to have read the paper, taken notes, and have THOUGHT about it BEFORE class. There are **100 points** in the syllabus devoted to class participation.
4. You will be asked to present (a 25 minute Power Point presentation) on a sensor/detection system of your choice that is not covered in class. You need to critically think about the system (for this you need to understand the techniques that were used to produce the data) and be able to communicate to the class why the system is important/needed, how it works, what are its advantages and disadvantages, and is there anything out there that is similar. The presentation is worth **100 points**.
5. There will be **four 25 pt** short exams/quizzes during the semester.
6. There is no final for this class.
7. My goal is to meet twice a week during September for a total of 6 lectures/discussions; most of October we will not meet (this will give you time to prepare your presentations); we will finish up with the rest of the lectures/discussions (a total of 15 lecture periods) in the last week of October and through November and December as needed.

OBJECTIVES: Using the new IDEA evaluation system, I have identified three main course objectives:

1. *Gaining factual knowledge (terminology, classifications, methods, trends)*
2. *Learning fundamental principles, generalizations, or theories*
3. *Learning to apply course materials (to improve rational thinking, problem solving and decisions)*

Specific Objectives:

1. Be able to discuss several ways in which naturally occurring biological units have been exploited for the advancement of research or human health.
2. Be able to describe how individual sensor/detection systems work, why they are advantageous and what the limitations are.
3. Be able to analyze data obtained from the sensor/detection systems.

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in Chem 6740. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.