Advanced Biochemistry I
Biochemical Methods
Chemistry 6700, Fall 2015

Time and location TBD
Dr. Nicholas Dickenson, Chemistry and Biochemistry
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Dr. Sean Johnson, Chemistry and Biochemistry
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This course will be team taught by Prof. Dickenson and Prof. Johnson and will be divided into two sections; the first 2/3 of the course will be taught by Prof. Dickenson and will cover concepts and applications of biochemical techniques and the final 1/3 of the course will be taught by Prof. Johnson and focus on aspects of structural biology. The points for the course are distributed based on this, however, you will ultimately receive a single letter grade for the course.

Office Hours: Office hours are by appointment with individual instructors.

Text: There is no required text for the course, but there will be required readings that will be made available by the instructor.

Lecture Overheads - Canvas We will be using Canvas for the management of Chem 6700. Copies of many required readings and some lecture overheads will be posted on Canvas (https://online.usu.edu/).

Course Withdrawal: Refer to the current academic year registration calendar for details and deadlines concerning withdrawal conditions and deadlines.

Provisions: The administration of Chem 6700 will adhere strictly to the academic policies outlined in the most recent USU General Catalog, which can be found here: http://catalog.usu.edu/index.php
Students not enrolled in the course may sit in only with instructor approval.

Course Content: Chemistry 6700 is a graduate course and a part of the Biochemistry graduate core curriculum. It will cover the theory and practical approaches for an array of biochemical and biophysical techniques and is designed to provide you with a level of understanding sufficient to guide you in the acquisition and interpretation of appropriate data sets.

Course Assessment: Students in this class are expected to develop an understanding of the techniques and ideas covered in the course. Some will be covered in much greater depth than others and this will be reflected in the testing of the material. While the instructors will guide the course, the students will be responsible for adequately preparing for lecture as well as presenting a significant amount of the material to their peers. Attendance and participation are vital for this type of course and while attendance is not graded, participation is mandatory. Regarding the first section of the course (taught by Prof. Dickenson), a total of 100 points will be assigned based on participation in presentations and class discussions. Again, attendance is not mandatory, but you cannot participate if you are absent. It is

the students' responsibility to communicate with the instructor concerning their standing with regard to this.

A minimum of 5 quizzes will be given throughout the section taught by Dr. Dickenson for a total of 50 points. Some will be announced ahead of time while others will not. This is why it is imperative to be prepared and attend class regularly.

2 exams worth 75 points each will be assigned throughout the first section of the course (Dickenson) (dates TBD with no less than one week notice prior to exam).

One of the goals of this course is to prepare you for graduate studies in Biochemistry/Chemistry at USU and to help facilitate your graduate research, you will compile a series of short reports detailing methods pertaining to the course. Specific requirements for the reports will be provided, but characteristics including the theory, necessary reagents, specificity, cost, time, and availability of equipment at USU are some of the key aspects to be included. The completed reports are worth a total of 100 points.

The point's breakdown for the final section of the course (Taught by Prof. Johnson) will be discussed at the onset of his section.

Grading:

Presentations and participation……..……..…..100 points
Quizzes……...50 points
Technique Short report portfolio.....……..100 points
Two hourly exams .....150 points
Structural Biology Section..……...200 points
The details of these points will be discussed at the beginning of this section
Total .....600 points

In terms of final assignment of grades, you are guaranteed the following grades if your final class percentage lies within the indicated ranges.

100-90% A through A-	89.9-78% B+ though B-
77.9-68% C+ through C-	67.9-59% D+ through D-

Based on the overall class average at the END of the semester, the percentage cutoffs may be adjusted to be lower than those above at the instructor's discretion. They will never, however, shift higher.

OBJECTIVE

In planning this course, 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)

Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated through the Disability Resource Center (DRC) in Room 101 of the University Inn, (435)797-2444. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print, digital, or audio) are available with advance notice.

Tentative Class Schedule Parts I and II

(August 31 – October 30)
Instructor: Nick Dickenson

Detection and quantification of proteins and/or nucleic acids

SDS PAGE
Native PAGE
1D vs. 2D
Protein Blots (discuss types)
UV-Vis/Extinction Coefficient (Beer's Law)
Colorimetric assays
Agarose Gel Electrophoresis
Tags (i.e. fluorescent labels and "click" chemistry)

How to Clone, express, and purify protein

General PCR mutagenesis, restriction enzymes, vectors, ligation, transformation
Cell types (codon usage, PTM, etc.)
Purification techniques, solubility tags

How do I characterize my protein?

Stability – 6 (Russ Middaugh Paper)
Cofactors
Gel Filtration
Mass Spec
Structure (i.e. CD, X-Ray, NMR
Sequencing
Is it an enzyme?
Is it modified?

How do I know two proteins interact/measure how well they interact?

Pull-down/immunoprecipitation
FRET
Yeast 2-hybrid
ITC (isothermal titration calorimetry)
SPR (Surface Plasmon Resonance)
Static/Dynamic Light Scattering
Anisotropy
Chemical crosslinking
Analytical ultracentrifugation

Protein/nucleic acid interactions

Measuring them (EMSA, FP, FRET, Microarray)
Interaction mimics (Aptamers)

Microscopy

Light microscopy
    Principles (Numerical aperture, Diffraction limit)
Fluorescence microscopy
    Principles (Jablonski Diagrams)
Electron Microscopy

Scanning techniques
Novel methodologies

Tentative Class Schedule Part III
(November 2 – December 11)
Instructor: Sean Johnson

The schedule for this section is included in the dedicated syllabus available on Canvas.