Biochemistry Laboratory II

CHEM 4582

Course Syllabus
General Information

COURSE OBJECTIVE
The primary objective of this course is for students to learn laboratory methods for characterizing biological macromolecules using biophysical approaches.

CLASS MEETINGS
Lectures: Mondays 1:05 – 1:55 pm Boggs 228
Labs: Wed, Thu 1:05 – 6:55 pm Boggs 246

PREREQUISITES
CHEM 4512 (Biochemistry II) and CHEM 4581 (Biochemistry Laboratory I)

TEXT
None – see T-Square for reading assignments

OTHER REQUIREMENTS
- Laboratory coat **NEW POLICY**
- Safety glasses or goggles
- Appropriate attire – no open-toed shoes, no shorts
- Bound laboratory notebook
- Use indelible ink for notebook entries

HONOR CODE
All students are expected to follow the Georgia Tech Honor Code.
http://honor.gatech.edu/dev/index.php

PLAGIARISM
Using the words of another as one's own is known as plagiarism. Plagiarism is inappropriate in this course and in all other situations, and constitutes a violation of the Georgia Tech Honor Code. Students should avoid the use of quotations in their own writing to develop mature independent thought and technical writing skills. Students are strongly encouraged to study in groups, but all assignments (including homework, laboratory report writing, and presentations) should be performed independently. Responses on examinations should be made independently. Any incidence of cheating on an exam will be reported to the Office of Student Integrity.

EQUIPMENT AND SUPPLIES REPLACEMENT
In the event that glassware or other equipment and supplies are damaged or broken by students, the student must pay for the replacement of those items with your Buzz card. Please exercise caution when working with electronic pipetting devices and electrophoresis equipment, among other delicate items in the Biochemistry Laboratory.
ATTENDANCE
Students are expected to attend all lectures and report to class on time. Lack of attendance and/or tardiness to lab, and tardy assignments will be excused only with prompt written documentation to the satisfaction of the instructor. Due to limitations in space and support personnel, opportunities to make up missed laboratory experiments will not be possible.

Grading

The overall grading scheme for this course is based on the following scheme.

- Laboratory Reports 30% (lowest report grade dropped from average)
- Laboratory Performance 30%
- Homework 10%
- Examinations 10%
- Notebook Maintenance 10%
- Experiment Presentation 10%

Final grades will be computed based on the grading scheme above. Final letter grades will be issued according to the following delineation:

A 90 – 100%
B 80 – 89%
C 70 – 79%
D 60 – 69%
F <60%

1. LABORATORY REPORTS
The purpose of the laboratory report is to communicate experimental work in writing. The educational goal is to help students learn and practice expressing their ideas and describing their work in a professional manner. With this in mind, the requirements for the structure of the laboratory report are similar to those for peer-reviewed scientific literature:

- Laboratory reports must be submitted in hard copy by 1 pm on the due date. No late lab reports will be accepted.

- Acceptable laboratory reports will be no longer than 10 double-spaced pages with writing on one side of the paper (title page not included). NOTE: Double-spacing allows graders to make comments near the relevant text. The project proposal can be as long as 15 double-spaced pages with word-processing on only one side of the paper.

- Reports should be written in grammatically correct English, and prepared using a clear font of size 12-point, with 1-inch margins on all sides.

- Each page should be numbered at the bottom.

- Laboratory reports should NOT be formatted with dual column text as seen in published journal articles.
• Figures should have figure legends describing the figure in sufficient detail underneath the figure. Tables should have headings at the top of the table. Font sizes of text for figure legends or tables may be 8-10 point in size and figure legends or table-heading text may be single-spaced.

Laboratory Report Components

• **Cover Page** (Required) – Each lab report should have a cover page that contains the title of the experiment, the name of the student, the name of any laboratory partner, the dates of the experimental work and the date submitted. Also include a signature stating compliance with the Georgia Tech Honor Code.

• **Introduction** (15 points) – Present background for the experimental work described. State relevant concepts and hypotheses and the objectives of the experiment. Refer to journal articles (not web sites) where you have read supportive background information. An introduction is only required for full-length lab reports.

• **Experimental Procedures** (15 points) – Summarize the specialized reagents and their sources and equipment used in the experiment. Generally describe methods used especially where deviations to the protocol were made. Describe the experimental procedures in the level of detail commonly found in published research articles and, only when necessary, add additional details. The experimental procedures should be described in both short and full-length lab reports, with more details in the full-length reports than in short reports.

• **Results** (30 points) – Describe the data generated from the experiment in words. Then, present figures (including graphs) or tables of your data for emphasis and clarity. Each figure should have a figure legend underneath the figure - a statement describing the figure itself. Each table should have a table heading above the table. All figures should be clearly labeled. Results sections with insufficient text describing the results and/or key illustrations of data will have severe point deductions. Results should be described in both short and full-length laboratory reports.

• **Discussion** (30 points) – State the overall conclusions from your experiment here. In cases where the work was hypothesis-based, the discussion should address the hypothesis directly. Discuss the significance, implications, comparisons of results to other work, etc. State and critically evaluate any assumptions that were made. Estimate the accuracy of your results. Discuss any observations that you found unusual or unexpected, and why they may have occurred. Note and discuss inconsistencies in your data that make drawing firm conclusions difficult. Discuss improvements that could be made to potentially improve your results. A discussion section is required for full-length laboratory reports, and a brief conclusion replaces the discussion section for short laboratory reports.

• **References** (10 points) – List the references made throughout the text of the research article in the order in which you refer to them in the text. References are required, not optional! Reputable resources should be used as references. **Web sites are not reputable resources for a professional laboratory report.** Avoid referencing your Biochemistry textbook since it contains general information.
2. LABORATORY PERFORMANCE/CONDUCT

- Students are expected to have read the laboratory protocol for the day prior to reporting to class. Note: Be sure to review all links associated with a laboratory protocol.

- Students are expected to follow written procedures for conducting assigned experiments. Due to limitations in equipment, students will be asked to work with the TA/instructor in cycling through the laboratory work.

- Students are expected to work independently (or when necessary, with laboratory partners).

- Students are responsible for the upkeep of their assigned workstations. Be sure to restock all pipette tip boxes at the end of each class period.

- Be sure to clean all glassware before the end of the class period.

- Keep the balance and instrumentation areas clean and free from clutter.

- Be sure to report any malfunctions in equipment to the TA or instructor.

- All materials stored in the refrigerator, freezers, or at room temperature must be capped and clearly labeled with your name and its contents.

- Follow all safety regulations and encourage others around you to work safely as well.

- Do not eat, drink, or chew gum in the laboratory. Do not bring food, including bottled water for drinking into the laboratory.

- Do not discard food trash in the laboratory. Do not bring food into the laboratory.

Laboratory Hazards

Some of the chemicals used in this laboratory are harmful if inhaled or ingested.

- **New Policy in Fall 2011**: Students must wear a laboratory coat at all time while working in the Biochemistry Teaching laboratory. The coat may be made of a 65%/35% polyester/cotton blend, 100% cotton, or any higher-grade safety fabric. Typical lab coats being sold on campus are full-length. Aprons will not suffice. Other requirements are described in detail in the Personal Protective Equipment and Laboratory Attire Policy (See T-Square→ Resources for PDF).

- Always wear safety glasses in the Biochemistry Laboratory! Reading glasses no longer suffice as suitable safety protection for the eyes.

- Wear suitable clothing in the Biochemistry Laboratory. Sandals and shorts are not permitted in the lab. Toes must be covered.

- Wear disposable latex or nitrile gloves when working with dangerous chemicals.

- Do not allow laboratory chemicals to enter your mouth or small cuts or scratches on your hands. Disposable gloves are available for daily use to avoid this problem and to prohibit contamination of laboratory experiments.
- Do not inhale powders or vapors. This is especially important when working with sodium dodecyl sulfate (SDS) powder, concentrated acids/bases, and mixtures of acrylamide and bisacrylamide solutions.

- It is good practice to wash your hands carefully before leaving the laboratory.

- Read and follow instructions.

Student performance will be graded each week for each student.

**Student Performance Evaluation Criteria**

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<tr>
<th>Criteria</th>
<th>Level 3 (Top) Performance</th>
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<tr>
<td>Punctuality</td>
<td>Arrives on time to class.</td>
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| Preparedness   | Shows evidence of having read the protocol and comprehended the work to be done before coming to class.  
                 | Notebook is set up for the work for the day.                                               |
                 | Has safety glasses, appropriate attire, and notebook upon entering class.                  |
                 | Turns in lab reports at the beginning of lab.                                             |
                 | Has questions ready at the beginning of class for clarification.                          |
| Industriousness| Works energetically throughout class period, making the most of the time allotted.        |
                 | Shows perseverance throughout the class.                                                   |
                 | Overall attitude was enthusiastic and positive.                                            |
                 | Shows a strong work ethic through his/her attentiveness to generating quality work, even the to expense of time. |
                 | Willingly participates in pre-lab discussions or other scholarly discussions in the lab period for the benefit of learning (i.e. with pure motives). |
                 | Goes out of his/her way to help others with no immediate, tangible personal reward.       |
| Intellect      | Correctly answers pre-lab questions, if any given or thinks analytically, even if "incorrect" in some details. |
                 | Asks questions that are not overtly obvious or makes intuitive comments that show deep of understanding. |
                 | Exhibits constructive criticism of the experimentation, with pure motives.                |
| Reliability    | Exercises wisdom in judgment.                                                             |
                 | Displays honesty.                                                                        |
                 | Works meticulously.                                                                      |
                 | Demonstrates conscientious attitude when working.                                        |
                 | Works competently to accomplish goals for the day.                                       |
                 | Recognizes mistakes on his/her own.                                                      |
                 | Deduces how to rectify experimental problems.                                             |
                 | Works in an organized/orderly manner.                                                    |
| Cooperation    | Works/interacts well with others and is agreeable, peaceful, tactful, and prudent.       |
                 | Does not cause or engage in conflict with anyone in class and works to facilitate cooperation amongst others in difficult situations (i.e. manage conflict). |
                 | Adapts to changes in procedure gracefully and is sensitive and respectful when sharing equipment. |
                 | Respects authority – approaches and interacts with TA and instructor with respect, politeness, and trust. |
3. HOMEWORK
There will be 5 homework assignments over the course of the term. Homework assignments will be posted on T-Square and will typically be due in hard-copy format at the beginning of the lecture period. Homework due dates are provided in the schedule.

4. EXAMINATIONS
There will be two midterm examinations given this semester. Attendance is mandatory on those dates. The examinations will be closed book (unless otherwise specified). Students may use a standard calculator, if necessary. Calculators may not be shared. Examinations will cover material from lecture and the laboratory sessions covered prior to each examination. Exam #2 is essentially cumulative!

5. LABORATORY NOTEBOOK MAINTENANCE
- All experimental data, except instrument output, should be recorded in indelible ink in a bound laboratory notebook with pre-printed sequential page numbers.
- Students should sign the notebook on the last page of that day’s experiment (minimally). It is best to sign each notebook page, though.
- Do not leave blank pages in a laboratory notebook.
- A lab notebook should include:
  - Experiment title
  - Date on which work was conducted
  - Goal – what is the purpose of the experiment
  - Materials used, identification of samples, sources of key reagents, manufacturers of specialized equipment
  - Experimental procedures performed in sufficient detail to reproduce results
  - Experimental results and observations
  - Relevant data analysis (optional and highly useful, but not rigorously required)
  - Preferably a conclusion statement – For example, “Experiment was successful” or “FAILED: Do not repeat as written”
  - Signature with date
- Record data and observations as you obtain or make them. Do not write on scraps of paper with the intention of transferring information to the lab notebook later.
- Do not worry if your notebook is a little messy.
- The recording and organization of a permanent record of laboratory observations is as important a technique to master as any of the experimental methods you learn. The research notebook is a day-by-day record of the progress of experimental work. It should reflect the integrity and honesty of the experimenter as well as the clarity of his or her thought.

6. PRESENTATION
Student will give a short presentation on one of the last experiments conducted in the course. More details about this assignment will be given later in the term. Presentations and their evaluation will be similar to those given in CHEM 4581 for the GMO project.