Course Syllabus
Fall 2008

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Please put “CHEM 4582” in the subject line of all emails to me.
Also include your name in the subject line.

Office: Boggs Room 2-14
Phone: 404-894-4001

Office Hours:
By appointment only
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 4:05 – 4:55 pm Boggs 2-28
Labs: T, W, or R 1:05 – 6:55 pm Boggs 2-10

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

TEXT
None – see T-Square for reading assignments

OTHER REQUIREMENTS
- Safety glasses or goggles
- Bound Lab Notebook

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. A list of commonly damaged items will be posted in the laboratory. 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. Attendance is mandatory for examinations.

Lack of attendance and/or tardiness to lab, and tardy assignments will be excused only with prompt written documentation. 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 as follows:

- 25% - Laboratory Reports
- 25% - Laboratory Performance
- 15% - Laboratory Notebook Maintenance
- 15% - Examinations (total of 3)
- 10% - Project Presentation
- 10% - Homework

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100</td>
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<tr>
<td>B</td>
<td>80-89</td>
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<tr>
<td>C</td>
<td>70-79</td>
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<tr>
<td>D</td>
<td>60-69</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60</td>
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</tbody>
</table>

There is no curving of grades in CHEM 4582.

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 either in hard copy or electronically in PDF format only by 1 pm on the due date. Upload your PDF file into T-Square. 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 final project report can be as long as 15 double-spaced pages with writing on 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) – Please complete a standard laboratory report Cover Page Form for each laboratory report. The form can be found on T-Square in the RESOURCES link.

- **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 lab 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 only required for full-length 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.

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 (unless covered by a full-length lab coat) 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. A copy of the student performance sheet and the information provided to the students for grading is included at the end of this syllabus.
3. 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.
- Do not leave blank pages in a laboratory notebook.
- A lab notebook should include protocols, identification of samples, observations, and data.
- 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.

4. EXAMINATIONS
Examinations will be given during the 50-minute lecture period and will be closed book. Students who fail to attend an examination will earn an automatic grade of “0” on that examination. Students will only be allowed to make up an examination with a satisfactory written justification for the absence. The justification needs to be in writing and will be acceptable at the discretion of the instructor. There will be no final examination for this course.

5. FINAL PROJECT PRESENTATIONS
Each student will be given a 30-min window in which to present his/her project in detail to the class. Students should allot time for questions. Guidelines for the presentation and the grading criteria will be given during the lecture period.

6. HOMEWORK
Students will be given homework assignments throughout the course of the term. Homework assignments will be posted on T-Square and should be submitted in hard copy to the instructor during the lecture period unless otherwise instructed. In most cases, homework will be graded on Fridays and made available for students to pick up on the following Monday in lecture. Students are expected to complete all homework assignments independently.
<table>
<thead>
<tr>
<th>Week #</th>
<th>Day</th>
<th>Date(s)</th>
<th>Topic</th>
<th>Assignment Due</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>Aug 18</td>
<td>Course Introduction</td>
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<tr>
<td></td>
<td>TWR</td>
<td>Aug 19-21</td>
<td>TA TRAINING WEEK – undergraduates do not report to class</td>
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<td>2</td>
<td>M</td>
<td>Aug 25</td>
<td>Circular Dichroism</td>
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<td>TWR</td>
<td>Aug 26-28</td>
<td>Estimation of Secondary Structure Composition in a Protein by Circular Dichroism Spectroscopy</td>
<td>HW 1</td>
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<td>3</td>
<td>M</td>
<td>Sep 1</td>
<td>SCHOOL HOLIDAY</td>
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<td>TWR</td>
<td>Sep 2-4</td>
<td>Protein Unfolding</td>
<td>HW 2 and Lab 1</td>
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<tr>
<td>4</td>
<td>M</td>
<td>Sep 8</td>
<td>Fluorescence</td>
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<td>TWR</td>
<td>Sep 9-11</td>
<td>Ligand Binding</td>
<td>Lab 2</td>
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<td>5</td>
<td>M</td>
<td>Sep 15</td>
<td>EXAM #1 (covering Weeks 1-4)</td>
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<td>TWR</td>
<td>Sep 16-18</td>
<td>Experimental Design Workshop</td>
<td>Lab 3</td>
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<td>Sep 22</td>
<td>Macromolecular Crystallography</td>
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<td>TWR</td>
<td>Sep 23-25</td>
<td>Protein Crystallization</td>
<td>Lab 4</td>
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<td>7</td>
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<td>Sep 29</td>
<td>Macromolecular Crystallography</td>
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<td>TWR</td>
<td>Sep 30-Oct 2</td>
<td>Protein Crystallization Analysis</td>
<td>HW 3</td>
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<td>Oct 6</td>
<td>Hydrodynamics</td>
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<td>TWR</td>
<td>Oct 7-9</td>
<td>DNA Bending Lab</td>
<td>Lab 5</td>
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<td>9</td>
<td>M</td>
<td>Oct 13</td>
<td>SCHOOL HOLIDAY extended</td>
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<td>TWR</td>
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<td>Oct 21-23</td>
<td>1- Individual Project</td>
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<td>Oct 27</td>
<td>Electrophoresis</td>
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<td>TWR</td>
<td>Oct 28-30</td>
<td>2- Individual Project</td>
<td>HW 4</td>
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<tr>
<td>12</td>
<td>M</td>
<td>Nov 3</td>
<td>Biocalorimetry</td>
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<td>TWR</td>
<td>Nov 4-6</td>
<td>3- Individual Project</td>
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<tr>
<td>13</td>
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<td>Nov 10</td>
<td>Light Scattering</td>
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<td>TWR</td>
<td>Nov 11-13</td>
<td>4- Individual Project</td>
<td>HW 5</td>
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<td>14</td>
<td>M</td>
<td>Nov 17</td>
<td>Guide to Project Presentations</td>
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<td>TWR</td>
<td>Nov 18-20</td>
<td>5- Individual Project</td>
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<td>Nov 24</td>
<td>EXAM #3 (covering Weeks 1-14)</td>
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<td>TWR</td>
<td>Nov 25-27</td>
<td>SCHOOL HOLIDAY extended</td>
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<tr>
<td>16</td>
<td>M</td>
<td>Dec 1</td>
<td>Brief Project Presentations (1 min)</td>
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<tr>
<td></td>
<td>TWR</td>
<td>Dec 2-4</td>
<td>Lab Check-out and Full Project Presentations</td>
<td>Submit NB, Report, Presentation</td>
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