**BIO4344: Research Techniques in Biochemistry**  
**Spring 2017 Syllabus**

**Lecture:**  
Mon & Fri  
Sec 1 & 3 BioS 332 9:00 – 9:50 am  
Sec 2 & 4 BioS 332 10:00 – 10:50 am

**Lab:**  
Wed  
Sec 1 BioS 129 9:00 am – 10:50 am  
Sec 3 BioS 247 9:00 am – 11:50 am

**Instructors:**  
Vladi Wilent, PhD  
Gaetano Romano, PhD  
Angela Bricker, PhD

**Course Information.**  
The primary objective of this course is for students to learn, practice and apply research techniques in Biochemistry. This course includes a multidisciplinary approach in the study of various biological macromolecules using modern methods. The course covers the gamut of the scientific method: the plan, design and execution of experiments, data analysis and interpretation, and the written and oral presentation of scientific information.

**Course Goals.**  
- Understand and execute basic biochemical techniques including protein assays, spectroscopy, electrophoresis, enzyme kinetics and ligand binding, recombinant protein expression, purification and characterization
- Learn and practice valuable laboratory skills in experimental design, data analysis and interpretation
- Develop and enhance communication skills via scientific writing and oral presentation
- Provide foundation for more advanced courses in biochemistry, molecular biology and biophysics
- Provide foundation for success in gaining employment in the sciences and/or admission to post-graduate programs in health, biomedical and life sciences.

**Class Preparation.**  
*This course involves integrating theories you learned in Biochemistry I lecture with hands-on experiments you would use in a biochemistry research lab.* Because of the limited amount of time we spend in the lecture and lab, it is very important that you invest effort BEFORE and AFTER class and lab to maximize positive learning outcomes. You should spend ample hours each week in course preparation, which include reading and understanding the assigned material for that week, reviewing your lab notebooks, performing data analysis and interpreting experimental results and writing your lab reports.

**Course Grade Breakdown.**  
- Exams, 2 at 15% each  
- Post lab Quizzes, best 2 of 3 at 10% each  
- Results & Discussion reports, best 4 of 5 at 5% each  
- Lab notebook  
- Formal lab report

Your letter grade for the course will be based on the total points earned. Grading may be curved, depending on the overall class average. (*provided that all 3 quizzes are taken and all 5 R&D reports are submitted)

**Results and Discussion reports (R&D report).**  
Developing the ability to present, organize, analyze and interpret experimental results, and the ability to relate your results, data and observations to key biochemical concepts and theory are important components to your success in the course. On Assessment days (quizzes and exams), you will submit a mini lab report comprised of Results and Discussion of assigned Experiment(s). The Results section will include figures, tables and graphs of your group’s experimental results and the Discussion section will explain and interpret the results presented. You may use your R&D report to help you answer questions on the post lab quizzes and exams. Some R&D
reports are group submissions (designated as GR&D on the Schedule) and some R&D reports are individual submissions (designated as IR&D on the Schedule)

**Post-lab Quizzes.** Post-lab quizzes assess your ability to evaluate, interpret, analyze and apply material and concepts from each experiment. You are welcome to use your lab notebook and R&D reports during the quiz (but not the written protocols on Bb). To best prepare for the quizzes, have a well-written lab notebook. Furthermore, make sure that you clearly understand the reasoning/scientific theory behind the procedure and analysis for each lab.

**Exams.** Exams are similar to the post-lab quizzes but are more comprehensive in nature and assess your understanding of both theory and experimentation (lecture and lab material.) Exam 1 will cover material between Jan 18-Mar 6 and Exam 2 will cover material between Mar 20-Apr 24. You may use your R&D reports and lab notebooks to help you during Exam days. No other material is allowed.

**Oral presentation.** You and your group will present a Biochem research technique of your own choosing. This will allow students the opportunity to develop and practice oral scientific communication. It also provides the class an opportunity to discuss and learn about other relevant and interesting Biochem techniques that we may not otherwise have time to cover during normal lecture/lab time.

**Formal lab report.** You will submit at the end of the semester one complete lab report in the style of a peer reviewed Biochemistry journal article (e.g. JBC or ACS Biochemistry). Each section of the report is to be submitted at specified intervals, which will be peer-reviewed. You will then get the opportunity to revise and edit the paper as we progress through the peer-review process. The final comprehensive paper is due on the last day of class (May 1). Your active participation throughout the development of the paper, including the peer-review process, will be factored into the grading of the lab report.

**Lab notebook.** At the end of each lab period, you will submit to your lab instructor carbon copies of your lab notebook pages. Please see Course guidelines for more information, but the following items will be assessed in the lab notebooks:
- All experimental data should be recorded in indelible ink (black or blue ink) in a bound laboratory notebook with pre-printed sequential page numbers.
- Students should sign the notebook on the first and last page of that day's experiment.
- Do not leave blank pages in a laboratory notebook. If you skip a page, mark the page with a line through it, sign and date.
- A lab notebook should include protocols, methods, and identification of samples, observations, and raw 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.

**University Code of Conduct.** Plagiarism and academic dishonesty are inappropriate in this course and in all other situations, and constitutes a violation of the Temple University policy. Students are encouraged to study in groups, but all assignments (including homework, data analysis, papers etc) should be performed independently. If the assignment is group related, then only these individual group members should contribute to the work. Responses on quizzes and exams should be made independently. Any incidence of cheating will be reported to the University Disciplinary Committee.

**Attendance.** Students are expected to attend all lectures and lab and report to class on time. Attendance is mandatory for all testing days. Late assignments will earn a grade of 0. Absences and/or tardiness to lecture and lab, and tardy assignments will be excused only with prompt written documentation from a validated health provider (within 36 hours). Due to limitations in space and support personnel, opportunities to make up missed laboratory experiments will not be possible. If you know you will miss a lab, an exam or a quiz, make sure you let your instructors know BEFORE the missed lab, exam or quiz so that proper arrangements can be made.
Miscellaneous.
- Cell phones are to be turned off during class and lab time. Texting **WILL NOT** be tolerated.
- No electronic devices other than a basic calculator (non-graphing) may be used during testing situations.
- During testing situations, you have completed the exam or quiz when you leave the room. Visit the restroom facilities **before** any testing situation. Promptness is required during testing situations. If you are more than 10 minutes late, you will earn zero points (unless a validated note from a health care provider is provided within 36 hours).

**OTHER IMPORTANT COURSE-RELATED INFORMATION:**
- Last day to add or drop the course: Mon Jan 30
- Last day to withdraw from the course (“W” assigned to transcript): Wed Mar 22
(Please consult the Academic Calendar for other semester dates & deadlines of importance)
- Alternate format policy: This course is open to all students who meet the academic requirements for participation. Any student who has a need for accommodation should contact the instructor privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities. [http://disabilityresources.temple.edu](http://disabilityresources.temple.edu)
- Statement on Academic Freedom: Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has adopted a policy on Student and Faculty Academic Rights and Responsibilities (Policy # 03.70.02) [http://policies.temple.edu/PDF/99.pdf](http://policies.temple.edu/PDF/99.pdf)
- Academic HONOR CODE: Temple University believes strongly in academic honesty and integrity. Plagiarism and cheating are strictly prohibited. Temple’s policy on academic dishonesty will be administered for any instances of academic dishonesty (Policy # 03.70.12). [http://policies.temple.edu/PDF/398.pdf](http://policies.temple.edu/PDF/398.pdf)

**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 reading assignments 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 instructor in cycling through the laboratory work.
- Students are expected to work with laboratory partner(s).
- Students are responsible for the upkeep of their assigned workstations.
- Be sure to clean all glassware and equipment **before** the end of the class period.
- Keep the balance, instrumentation and other common areas clean and free from clutter.
- Be sure to report any malfunctions in equipment to the instructor.
- All materials stored in the refrigerator, freezers, or at room temperature must be capped and clearly labeled with your names, section # 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 Lab!
- Wear suitable clothing in the lab. Sandals and shorts (unless covered by a full-length lab coat) are not permitted in the lab. Toes must be covered.
- Wear gloves when working with dangerous chemicals.
- Do not allow chemicals to enter your mouth or small cuts or scratches on your hands.
- 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
## BIO4344 Spring 2017: TENTATIVE* SCHEDULE

<table>
<thead>
<tr>
<th>Mon</th>
<th>Lecture</th>
<th>Wed</th>
<th>Lab</th>
<th>Fri</th>
<th>Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 16</td>
<td>MLK Day</td>
<td>Jan 18</td>
<td>Welcome to the course!</td>
<td>Jan 20</td>
<td>DNA techniques</td>
</tr>
<tr>
<td>Jan 23</td>
<td>What is GFP?</td>
<td>Jan 25</td>
<td>1: GFP transformation</td>
<td>Jan 27</td>
<td>Reading primary literature</td>
</tr>
<tr>
<td>Jan 30</td>
<td>Overexpression</td>
<td>Feb 1*</td>
<td>2: GFP inoculation, expression, extraction</td>
<td>Feb 3</td>
<td>PDB files &amp; what they mean</td>
</tr>
<tr>
<td>Feb 6</td>
<td>Separation Techniques</td>
<td>Feb 8</td>
<td>3: GFP purification</td>
<td>Feb 10</td>
<td>Crystallography</td>
</tr>
<tr>
<td>Feb 13</td>
<td>Electrophoretic techniques</td>
<td>Feb 15</td>
<td>4: GFP SDS-PAGE</td>
<td>Feb 17</td>
<td>Post lab quiz 1-3, GR&amp;D 1-3</td>
</tr>
<tr>
<td>Feb 20</td>
<td>Methods in protein concentration determination</td>
<td>Feb 22</td>
<td>5: GFP Bradford Assay + GelDoc</td>
<td>Feb 24</td>
<td>Peer review</td>
</tr>
<tr>
<td>Feb 27</td>
<td>Post lab quiz 4 + 5, IR&amp;D 4</td>
<td>Mar 1</td>
<td>BioORA / Chimera (or catch up)</td>
<td>Mar 3</td>
<td>Group discussion</td>
</tr>
<tr>
<td>Mar 6</td>
<td>Methods in protein concentration determination</td>
<td>Mar 8</td>
<td>Exam 1, IR&amp;D 5</td>
<td>Mar 10</td>
<td>Peer review</td>
</tr>
<tr>
<td>Mar 13</td>
<td>Spring break</td>
<td>Mar 15</td>
<td>Spring break</td>
<td>Mar 17</td>
<td>Spring break</td>
</tr>
<tr>
<td>Mar 20</td>
<td>Enzyme kinetics</td>
<td>Mar 22</td>
<td>6: Kinetics: steady state</td>
<td>Mar 24</td>
<td>Peer review</td>
</tr>
<tr>
<td>Mar 27</td>
<td>Reversible inhibitors</td>
<td>Mar 29</td>
<td>7: Kinetics: inhibition</td>
<td>Mar 31</td>
<td>Advanced kinetic techniques</td>
</tr>
<tr>
<td>Apr 3</td>
<td>Binding isotherm</td>
<td>Apr 5</td>
<td>8: Ligand binding</td>
<td>Apr 7</td>
<td>Peer review</td>
</tr>
<tr>
<td>Apr 10</td>
<td>SPR, ITC and DSC</td>
<td>Apr 12</td>
<td>Catchup week</td>
<td>Apr 14</td>
<td>Post lab quiz 6-7, GR&amp;D 6-7</td>
</tr>
<tr>
<td>Apr 17</td>
<td>Grp Presentations</td>
<td>Apr 19</td>
<td>BioORA / Chimera</td>
<td>Apr 21</td>
<td>Grp Presentations</td>
</tr>
<tr>
<td>Apr 24</td>
<td>Review</td>
<td>Apr 26</td>
<td>Exam 2, IR&amp;D 8</td>
<td>Apr 28</td>
<td>Grp Presentations</td>
</tr>
<tr>
<td>May 1</td>
<td>Grp Presentations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Mon Paper section due dates | Fri Peer review dates
---|---|---|---|---|---|---|
Feb 20 | Methods and Materials due | Feb 24 | Review of Methods and Materials |
Mar 20 | Introduction due | Mar 24 | Review of Introduction |
Apr 3 | Results and discussion due | Apr 7 | Review of Results and discussion |
Apr 17 | Abstract due, results/discussion draft 2 due | Apr 21 | hand out papers, review due Mon Apr 24 |
Apr 24 | Review of results/discussion due | | | |

*Subject to change