030.306 "Physical Chemistry Instrumentation Lab II" | Handbook

1. Instructor Information:
   Prof. Thomas J. Kempa  NCB 111  
   email: tkempa@jhu.edu  
   office hrs: Thu 2–3 pm

2. Teaching Assistants:
   Ryan Brady  Remsen 231  
   email: rbrady10@jhu.edu  
   office hrs: Thu 4–5 pm
   Tylar Clark-Winters  Remsen 231  
   email: tclark60@jhu.edu  
   office hrs: Thu 3–4 pm
   Rachel Dziatko  Remsen 231  
   email: rdziatk1@jhu.edu  
   office hrs: Thu 4–5 pm
   Marta Sliwa  NCB 133  
   email: msliwa1@jhu.edu  
   office hrs: Wed 5–6 pm
   Dara Weiss  NCB 135  
   email: dweiss16@jhu.edu  
   office hrs: Fri 3–4 pm

3. Time and Location:
   Lecture (section 1):  
   Mon 1:30 pm – 2:20 pm in Remsen 233
   Lab (section 1):  
   Mon 2:30 pm – 6:30 pm in UTL G86
   Lab (section 2):  
   Tue 2:30 pm – 6:30 pm in UTL G86

4. Description:
   This second installment of the Physical Chemistry Instrumentation Lab will focus on both classical and modern experiments in the spectroscopy of chemical compounds. Lab experiments will focus on using optical, magnetic, and electronic methods to probe the properties of matter. The last experiment of the semester will harken back to the electronic circuits you were exposed to in PChem Lab I, and you will have the opportunity to build an optical amplifier from circuit components and to do real-world tests with it! Lectures will focus on introducing modern and state-of-the-art spectroscopic techniques that are beyond the scope of the course, but nevertheless build on classical tools conceived decades ago. Also, knowing about these modern techniques may be of direct use to you in your future careers.

5. Materials:
   Lecture notes, pre-lab reading materials, and additional references will be provided via Blackboard. Supplementary reading materials may be drawn from the following online and print sources:
   
   - Sheridan Libraries (JHU) – http://www.library.jhu.edu/
   - Web of Science – http://databases.library.jhu.edu/databases/proxy/
6. Grading Policy:

Pre-Lab Quiz (15%) – Before each lab, you will take a ~10 min written quiz testing your knowledge of the pre-lab materials you have been assigned to read before your lab. The quiz will consist of several short-answer questions and you will be allowed to use any notes you’ve taken during your readings.

Day of Lab Performance (10%) – The Prof. and TAs will assess your performance on the day of the lab on the basis of several criteria, including: (1) how well you problem solve and troubleshoot during the setup or execution of the experiment, (2) how well you distribute and rotate the work load (experimental execution or record keeping) during the lab session, (3) quality of your record keeping, and (4) quality of your responses to verbal questions.

Lab Report (75%) – You are expected to prepare a lab report consisting of two key parts. The first of these is a 1 page summary of the lab containing sections for (i) key theoretical principles tested in the lab, (ii) principal features of the instrumentation used, (iii) key data obtained, (iv) discussion of how reliable these data are, how these data relate to the theoretical principles outlined in ‘i’, and what additional experiments or modifications you would perform to improve your understanding of the theoretical principles in ‘i.’ Note that you must be succinct in your reasoning and writing. This is a vital skill to develop as you go forth and pursue your careers. The second part of the lab report consists of your short answers to the questions highlighted in yellow throughout the lab handout. Each part is worth 50% of the lab report grade. See Section 10 for an example lab report. The hardcopy of the lab report is due at 6:30 pm 2 weeks after the conclusion of the lab. You should leave the report in the mailbox of the TA(s) responsible for the lab. Your TAs will inform you of the location of their mailbox.

You can expect that your lab reports will be graded and returned to you within 1 week.
7. Lecture Schedule:

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<th>Date</th>
<th>Lecture Topic</th>
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<td>28 Jan</td>
<td>Lecture 1: Introduction to Course</td>
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<td>04 Feb</td>
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<td>11 Feb</td>
<td>Lecture 2: Time-Resolved Optical Spectroscopies</td>
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<td>18 Feb</td>
<td>Lecture 3: Non-Linear Optical Spectroscopies</td>
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<td>04 Mar</td>
<td>Lecture 4: Solid-State and Multi-Dimensional NMR Spectroscopies</td>
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<td>18 Mar</td>
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<td>25 Mar</td>
<td>Lecture 5: Electronic Spectroscopy of Low-Dimensional Systems</td>
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<td>01 Apr</td>
<td>Lecture 6: Refresh of Electronic Circuit Essentials</td>
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<td>08 Apr</td>
<td>Lecture 7: Amplifiers and Preparation for Lab 7</td>
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