FAIRLEIGH DICKINSON UNIVERSITY
TEANECK CAMPUS

PHYSICAL CHEMISTRY II LAB (CHEM 3244) (SPRING 2012)

Instructor: Dr. Arthur R. Murphy  Office: DH 4413
Office Hours: M W F 10:00 AM - 10:50 AM and by appointment
e-mail arthur_murphy@fdu.edu
Phone: (201)-692-2322
Day: Wednesday
Time: 5:25 PM – 8:50 PM
Rooms: Computer Lab 2nd floor Dickinson Hall,
Physical Chemistry Lab (fifth floor DH-5518, DH-5519)
Some experiments in Physics Lab Becton Hall (Teaneck) and computer lab (Room TBA)

Required text: None

Catalog Description: Physical Chemistry Laboratory II. Laboratory experiments demonstrating fundamental laws, concepts and mathematically derived relationships involving selected physico-chemical properties of matter and energy.
Corequisites: CHEM3242 Physical Chemistry II.

Introduction:
The Physical Chemistry II laboratory experiments are chosen so as to reinforce, augment, and amplify the material that is discussed in the Physical Chemistry II lecture course. Experiments involving the thermodynamics of solutions, phase equilibria, quantum chemistry, spectroscopy, kinetics, electrochemistry will be explored.

Expectations, Policies, Procedures

1) All cell phones, beepers, and pagers must be turned off during lecture.
2) Students are expected to arrive for lab on time so as not to disrupt the proceedings.
3) Late Lab reports will not be accepted. Usually, lab reports are usually due two weeks after an experiment is concluded. Exceptions to this rule will be stated in due course.
4) All safety procedures must be followed exactly. Details regarding safety will be discussed during the first lab period. No student will be permitted into laboratories wearing shorts, halter-tops, open toed sandals, undershirts, tank tops or any other inappropriate attire. All students must purchase a white laboratory coat that can be used for any Biology or Chemistry class that requires a lab. This rule applies to everyone taking the lab.
5) In addition to performing the experiments, students will be expected to become proficient in the use of scientific software packages (e.g. Mathcad )
6) Last Day for dropping the course with a grade of "W" is March 31st.

Grading Policy: Lab Reports: %100
The exact lab report format to be followed will be discussed during the first lab period. Lab reports will be graded on the basis of neatness, thoroughness, adherence to the
required lab report format, as well as on experimental accuracy and precision. A thorough discussion of errors must accompany each lab report.

**Academic Integrity Policy:**
Each student must submit his or her own laboratory report. Copying of reports in full or in part is strictly forbidden and such cheating will be dealt with harshly. Also note that the sharing of computer files in full or in part is strictly forbidden too.

A copy of the current Fairleigh Dickinson University Academic Integrity Policy is available on FDU’s web site, and is included as the end sections of this syllabus.

**Course Objectives and Outcomes:**

**Objective 1:** To promote proper laboratory practices and report preparation (Programmatic Outcomes #1, 2, 3, 5, 6)

**Outcome 1.1:** Know location of safety equipment, and be familiar with emergency procedures. Become aware of proper laboratory attire, and understand laboratory etiquette.

**Outcome 1.2:** Understand proper laboratory report format to be used, and grading criteria to be employed.

**Outcome 1.3:** Use Microcomputers to assist in report preparation.

**Outcome 1.4:** Learn/Review limitations associated with data and experimental uncertainties are handled.

**Objective 2:** Become proficient at handling chemicals and using laboratory equipment, and advanced computer programs. (Programmatic Outcomes #2, 3, 5, 6)

**Outcome 2.1:** Be trained in handling of various chemicals.

**Outcome 2.2:** Be trained in proper use of equipment found in standard Physical Chemistry Laboratories: analytical balances, heating units, GLX units, various spectrophotometers, various electronic and electrochemical devices, and use of molecular modeling programs for doing MM, semi-empirical, and ab initio calculations.

**Additional Outcomes:**
Students who have successfully completed this course should have reinforced their knowledge of the material covered in the Physical Chemistry II lecture course. Specifically, students should have an understanding of the behavior of both ideal and non-ideal solutions, of the application of quantum chemistry to both molecular structure and spectroscopy, of introductory kinetics and electrochemistry. If time permits students will also receive an introduction to statistical mechanics.
Students who successfully complete this course should have deepened their knowledge of the theoretical material discussed in Physical Chemistry I lecture. The topics discussed are all fundamental, and they should serve as a basis for taking additional chemistry courses such as Physical Chemistry II, Inorganic Chemistry, Biochemistry etc.

**Core Competencies**
As part of FDU’s “Writing Across the Curriculum” initiative, all students will be required to write formal laboratory reports. Standard English and standard grammar must be employed. Students should use computers (Word Processors, Spreadsheets, MathCad) as much as possible to prepare reports, graphs etc.

**Teaching Methodologies / Activities**
Laboratory experimentation is, by its nature, a hands-on activity requiring a structured approach to the exploration and analysis of various scientific problems. Students should learn to appreciate how meaningful answers are obtained to these problems. Laboratory experimentation requires that the student pay attention to detail, have the ability to carry out multi-step procedures so as to acquire meaningful data, and also have the ability to analyze the experimental results by a variety of means. All of these are important attributes in many fields.

In addition to supervising the performance of experiments, your Instructor will use computer and web resources where applicable.

**Possible Experiments**
Experiments will be chosen from the following list

- Determination of Partial Molar volumes
- Determination of $pK_a$ of a Dye
- Determination of activities (Freezing Point Method)
- Determination of Fugacities
- Determination of a Binary Phase Diagram
- Conductivity Experiment
- Determination of Planck’s Constant
- The Franck Hertz Experiment
- Visible Spectra of Cyanine Dyes
- Analysis of Vibrational/Rotational Spectra
- Molecular Mechanics Investigation (Hyperchem)
- Huckel Theory and Applications (MathCad)
- Ab Initio Quantum Methods (Hyperchem)
- Kinetics I
- Kinetics II
- Powder Diffraction Analysis
During the first lab session, students will be divided into groups, and a weekly schedule of experiment for each group be developed.

### TENTATIVE LABORATORY SCHEDULE

<table>
<thead>
<tr>
<th>Week #</th>
<th>Date</th>
<th>Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan. 25</td>
<td>Safety Review. Introduction to the Experiments.</td>
</tr>
<tr>
<td>2</td>
<td>Feb. 1</td>
<td>Partial Molar Volume</td>
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<tr>
<td>3</td>
<td>Feb. 8</td>
<td>Activity coefficients</td>
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<tr>
<td>4</td>
<td>Feb. 15</td>
<td>Determination of pKₐ</td>
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<tr>
<td>5</td>
<td>Feb. 22</td>
<td>Fugacities</td>
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<tr>
<td>6</td>
<td>Feb. 29</td>
<td>Photoelectric effect and Planck’s Constant</td>
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<tr>
<td>7</td>
<td>Mar. 7</td>
<td>Frank Hertz experiment.</td>
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<tr>
<td>8</td>
<td>Mar. 14</td>
<td>Quantum Dots and Cyanine Dye Experiment</td>
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<tr>
<td>9</td>
<td>Mar. 21</td>
<td>Spring Recess</td>
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<tr>
<td>10</td>
<td>Mar. 28</td>
<td>Analysis of Rotational-vibrational Spectra</td>
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<tr>
<td>11</td>
<td>Apr. 4</td>
<td>Molecular Modeling I – Using HyperChem to explore Molecular Mechanics</td>
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<tr>
<td>12</td>
<td>Apr. 11</td>
<td>Molecular Modeling II - Using Mathcad and Hyperchem to explore Huckel Theory and Ab Initio Methods.</td>
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<tr>
<td>13</td>
<td>Apr. 18</td>
<td>Reaction Kinetics I</td>
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<tr>
<td>14</td>
<td>Apr. 25</td>
<td>TBA</td>
</tr>
<tr>
<td>15</td>
<td>May 2</td>
<td>Clean Up and check out</td>
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April 2\textsuperscript{nd} is the last day to withdraw from the course with a grade of “W”.

### Academic Integrity Policy

Students enrolled at Fairleigh Dickinson University are expected to maintain the highest standards of academic honesty. Students have the responsibility to each other to make known the existence of academic dishonesty to their course instructor, and then, if necessary, the department chair, or the academic dean of their College. Course instructors have the added responsibility to state in advance in their syllabi any special policies and procedures concerning examinations and other academic exercises specific to their courses. Students should request this information if not distributed by the instructor.
Academic dishonesty includes, but is not necessarily limited to, the following:

1. **Cheating**—Giving or receiving unauthorized assistance in any academic exercise or examination. Using or attempting to use any unauthorized materials, information, or study aids in an examination or academic exercise.

2. **Plagiarism**—Representing the ideas or language of others as one's own. A more complete description is listed below in the section titled “Plagiarism Described.”

3. **Falsification**—Falsifying or inventing any information, data, or citation in an academic exercise.

4. **Multiple Submission**—Submitting substantial portions of any academic exercise more than once for credit without the prior authorization and approval of the current instructor.

5. **Complicity**—Facilitating any of the above actions or performing work that another student then presents as his or her assignments.

6. **Interference**—Interfering with the ability of a student to perform his or her assignments.

**Plagiarism Described**

As defined by the Council of Writing Program Administrators, plagiarism “occurs when a writer deliberately uses someone else’s language, ideas, or other original (not common-knowledge) material without acknowledging its source.” (“Defining and Avoiding Plagiarism: The WPA Statement on Best Practices.”<http://www.wpacouncil.org/positions/WPAplagiarism.pdf>)

Plagiarism can occur in the following ways:*

- Using text from another source (e.g. websites, books, journals, newspapers, etc.) without documenting the source;
- Using direct quotation from a text without quotation marks, even if the source has been cited correctly;
- Paraphrasing or summarizing the ideas or text of another work without documenting the source;
- Substituting a word or phrase for the original while maintaining the original sentence structure or intent of the passage;
- Using graphics, visual imagery, video or audio without permission of the author or acknowledgment of the source;
- Translating text from one language to another without citing the original work;
- Obtaining packaged information, foreign language translation or a completed paper from an online source and submitting it as one’s own work without acknowledgment of the source; and
- Presenting the work of another student as one’s own.

Fairleigh Dickinson students are responsible for authenticating any assignment submitted to an instructor should the instructor request it. Students must be able to
produce proof that the assignment they submit is actually their own work. Therefore, students must engage in a verifiable work process on all assignments:

- Keeping copies of all drafts of work;
- Making photocopies of research materials (including downloads from websites);
- Writing summaries of research materials;
- Keeping Writing Center receipts;
- Keeping logs or journals of their work on assignments and papers; and
- Saving drafts or versions of assignments under individual file names on a computer, external drive or other source.

In addition to requiring students to authenticate their work, Fairleigh Dickinson University instructors may employ various other means of ascertaining authenticity—such as using search engines to detect plagiarism, using external plagiarism detection services, creating quizzes based on student work, and requiring students to explain their work and/or process orally. The inability to authenticate work is sufficient grounds for a charge of plagiarism.

If subsequent evidence of plagiarism should be found after a grade has already been assigned, instructors have the right to lower the grade and/or apply one of the sanctions listed below.

**Sanctions:** Any student violating academic integrity will, for the first offense, receive one or a combination of the following penalties imposed by the faculty member:

1. **No credit (0) or Failure** for the academic exercise.
2. **Reduced grade** for the course.
3. **Failure** in the course.
4. Recommendation for **Academic Probation** to the dean of the college in which the student is registered.

The instructor shall file a notice of the penalty in the student’s file maintained in the campus Office of Enrollment Services.

In cases of interference and complicity, whether or not the student is registered in the affected course, the incident and penalty shall be recorded in the student's file maintained in the campus Office of Enrollment Services.

For a subsequent violation of academic integrity, a student will be subject to any combination of the above sanctions, and, after due review by the academic dean according to the procedure below, one of the following:

1. **Suspension** from the University for one year. Readmission will be contingent upon the approval of the academic dean.
2. **Dismissal** from the University.
3. Dismissal from the University identified on the student's academic transcript as a result of a violation of the Academic Integrity Policy.

**Procedure:** When a faculty member believes that a student has violated the Academic Integrity Policy, the faculty member shall discuss the incident with the student as soon as possible. If after the conference, the faculty member determines that an act of academic dishonesty has occurred, the faculty member may impose the appropriate sanctions. Within five days of the faculty member’s action, the faculty member shall notify his or her department chair/school director in writing of the circumstances of the violation and the imposed sanctions. Within five days the academic department/school shall notify the student via certified mail/return receipt of the sanctions and the appeals’ procedures. Copies of the notice shall be sent to the chair of the department or director of the school of the student's major, the dean of the college in which the course is offered and the campus Office of Enrollment Services. The student may appeal the instructor’s decision as outlined below. Upon completion of the appeals process, the dean shall notify the student of the final disposition of the matter and the sanctions to be imposed, if any, via certified mail with copies to the faculty member, the department chair/school director and the campus director of enrollment services.

**Appeals Process:** A student who is charged with violating the Academic Integrity Policy by an instructor may appeal in writing to the chair of the department or the director of the school in which the alleged incident took place. The letter must state the specific grounds for the appeal. The student must submit a written appeal to the department chair or school director within 14 days of the receipt of the notification of the imposed sanctions. Failure to make an appeal within this 14-day period shall constitute a waiver of the appeal right. Within 10 working days of the receipt of the student’s appeal, the chair/director will review the circumstances of the alleged violation with the student and the instructor and recommend upholding, modifying, or dismissing the sanctions imposed by the instructor. The chair/director, within five working days, shall notify the student in writing via certified mail of the outcome, with copies to the instructor, the chair/director of the student’s major, the academic dean of the college in which the course is taught and the campus director of enrollment services. If it is determined that a violation of academic integrity did not occur, the student’s final grade in the course cannot be based on the assumption of such violation. If the differences between the instructor and the student are not resolved by this review, the student may appeal the outcome to the dean of the college in which the course is offered.

Within 10 working days of the department chair/school director’s notification, the student may submit a written appeal to the dean of the college in which the alleged dishonesty took place. The letter must state the specific grounds for the appeal. Upon receipt of the student’s appeal, the dean shall provide the faculty member and his or her chair/director with a copy of the student’s appeal. Within 10 working days the dean shall convene a five-person hearing committee consisting of a faculty member at large from the college in which the course is offered, the dean or his or her designee, the campus dean of students or his or her designee, a faculty member from the department or school of the student’s major, and a student, selected by the campus dean of students, from the college in which the alleged dishonesty took place. The hearing will be chaired by the
college dean or his or her designee. The role of the appeals committee is to review the record of the matter and determine whether a finding of academic dishonesty is founded and whether a sanction is consistent with the terms of this policy. The committee shall base its decision upon a review of the record but may meet with the student and the faculty member to secure additional information to help it in making a determination about the merits of the appeal. The committee can uphold, modify or dismiss the sanction imposed by the instructor. The college dean shall notify the student of the committee’s decision within five working days of the hearing. For a second offense of academic dishonesty, the academic dean can suspend or dismiss the student as indicated above.

For a sanction of suspension or dismissal imposed by the academic dean, the student may file a written appeal to the University Provost/Senior Vice President for Academic Affairs within 10 working days of receiving the notification of the dean's decision. The University Provost, or his or her designee, shall review the case within 10 working days of the receipt of the appeal. The University Provost shall make the final decision, using any appropriate resource to assist in deciding the appeal. The University Provost shall then notify all parties in writing of his or her final decision within five working days of his or her decision.

Reviewed: August 2011