Physical Chemistry II / CHM 358

College/Department: Chemistry
Semester: Spring 2018
Instructor: Dr. Scott Day
Email: day17@marshall.edu
Phone: (304) 696-7054
Office: Science Building, 479
Location: Lecture: Science Building 473
          Laboratory: Science Building 470
          9:30 – 10:45 AM, TR Lecture
          1:00 – 2:50 PM, W  Lab Section 201
          3:00 – 4:50 PM, W  Lab Section 202
Office Hours: 1:00 – 3:00 TR and 11:00-12:00 W

Information for drop or withdraw is available on the Academic Calendar
http://www.marshall.edu/calendar/academic/

COURSE MATERIALS
1. Physical Chemistry: Thermodynamics, Structure, and Change, 10th Edition by Atkins and de Paula
   (either full textbook or Volume 1 will suffice)
2. Applied Mathematics for Physical Chemistry, 3rd Edition by Barrante (recommended)
3. Access to MU Online and a Marshall email account
4. Bound notebook (not spiral) for lab
5. Indirectly vented chemical safety goggles for lab
6. Calculator
7. ACS academic lab safety guide (volumes I and II)
   http://www.acs.org/content/acs/en/about/governance/committees/chemicalsafety/chemical-safety-in-the-
   classroom.html

COURSE DETAILS
Description: A systematic study of physical chemistry, including the topics of energy transfer, statistical thermodynamics, equilibrium, and kinetics. 4.00 credits. Prerequisites: grade of C or higher in all of the following: CHM 212, PHY 211 or 201, MTH 230 or consent of instructor.

Objectives:
1. To apply concepts of thermodynamics, kinetics, chemical equilibrium, and properties of gases to problems of chemical significance.
2. To learn how to apply general chemical knowledge to solve basic chemistry problems and to implement these logical strategies to solve complex, multistep problems.
3. To understand and interpret scientific literature.
4. To refine oral communication skills.
5. To enhance writing skills and strategies.
COURSE OUTCOMES

Student Learning Outcomes  How students will practice each outcome in this course  How student achievement of each outcome will be assessed in this course

Students will use the laws of thermodynamics to understand energy transfer among matter and to derive relationships relating energy transfer and physical observables.
- lectures and readings on thermodynamics
- homework
- tests
- lab reports

Students will understand how statistics and the energy of a system governs the rate and extent of chemical reactions.
- lectures and readings on statistical mechanics, equilibrium, and reaction kinetics
- homework
- tests

Students will apply algebra and calculus to solving problems of chemical and thermodynamic significance.
- homework
- tests

Students will understand, interpret and discuss scientific literature.
- journal clubs
- students will write critical evaluations of journal articles

Students will enhance writing skills and strategies.
- low-stakes short essays in homework sets, quizzes, and exams
- editing conferences with Dr. Day
- lab reports
- lab notebook
- tests
- journal critiques

Students will refine oral communication skills.
- journal club discussions
- group presentations
- group presentations

GRADING

<table>
<thead>
<tr>
<th></th>
<th>Percent of Grade</th>
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<tbody>
<tr>
<td>Homework</td>
<td>15</td>
</tr>
<tr>
<td>Lab Notebook</td>
<td>5</td>
</tr>
<tr>
<td>Lab Reports</td>
<td>20</td>
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<tr>
<td>Journal Article Critiques</td>
<td>10</td>
</tr>
<tr>
<td>In-Class Exams (3)</td>
<td>30</td>
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<tr>
<td>Final Presentation</td>
<td>5</td>
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<tr>
<td>Final Exam</td>
<td>15</td>
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A 90 -100 %, B 80 -89 %, C 70 - 79%, D 60 - 69 %, F 0 - 59 %
COURSE SCHEDULE AND ACTIVITIES

<table>
<thead>
<tr>
<th>Week of</th>
<th>Topic/Chapter(s)</th>
<th>Lab</th>
</tr>
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<tbody>
<tr>
<td>1/8</td>
<td>Foundations / Math Review</td>
<td>Intro</td>
</tr>
<tr>
<td>1/15</td>
<td>Gas Properties / Chapter 1</td>
<td>No Lab</td>
</tr>
<tr>
<td>1/22</td>
<td>1st Law of Thermodynamics / Chapter 2</td>
<td>2nd Virial Coefficient</td>
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<tr>
<td>1/29</td>
<td>1st Law of Thermodynamics / Chapter 2</td>
<td>Journal Club</td>
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<tr>
<td>2/5</td>
<td>2nd Law of Thermodynamics / Chapter 3; Exam 1</td>
<td>Adiabatic Expansion</td>
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<tr>
<td>2/12</td>
<td>Entropy and 3rd Law / Chapter 3</td>
<td>Adiabatic Expansion</td>
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<tr>
<td>2/19</td>
<td>Helmholtz and Gibbs Energies/ Chapter 3</td>
<td>Journal Club</td>
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<tr>
<td>2/26</td>
<td>Phase Equilibria / Chapter 4</td>
<td>Bomb Calorimetry</td>
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<tr>
<td>3/5</td>
<td>Mixtures &amp; Solutions / Chapter 5</td>
<td>Bomb Calorimetry</td>
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<tr>
<td>3/12</td>
<td>Mixtures &amp; Solutions / Chapter 5; Exam 2</td>
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<tr>
<td>3/19</td>
<td>Spring Break</td>
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<tr>
<td>3/26</td>
<td>Chemical Equilibrium/ Chapter 6</td>
<td>No Lab</td>
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<tr>
<td>4/2</td>
<td>Chemical Kinetics / Chapter 20</td>
<td>Clock Reactions</td>
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<tr>
<td>4/9</td>
<td>Chemical Kinetics / Chapter 20</td>
<td>Clock Reactions</td>
</tr>
<tr>
<td>4/16</td>
<td>Reaction Dynamics / Chapter 21; Exam 3</td>
<td>Journal Club</td>
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<tr>
<td>4/23</td>
<td>Group Projects</td>
<td>Review</td>
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<tr>
<td>5/1</td>
<td>8:00 – 10:00 FINAL EXAM</td>
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Writing-Across-the-Curriculum Designation
This course has been designated “WI,” or writing-intensive. Throughout the course, students will develop the ability to comprehend the concepts of physical chemistry and interpret them for others through written communication. The following course activities are examples of how students will develop their writing skills this semester.

- Homework sets- each will include at least one qualitative, short-response question
- Exams- approximately 20% of exam content will require written responses (without calculations)
- Lab notebook- standards of industry and academia will be reinforced
- Journal club- written responses to analytical critique questions
- Lab reports- written in the style of research manuscripts
- Group projects- PowerPoint slides will be written to effectively complement the presentations

You are required to upload the final, revised version of your 2nd Virial Coefficient report from this class into Blackboard. Detailed instructions will be given. Your grade for this assignment will not be counted in your final grade until you complete the upload.

COURSE POLICIES

Attendance Policy
Attendance for the lecture portion of this class is not mandatory, but highly recommended. However, attendance for the laboratory is mandatory. Absences from exams and laboratories can only be made-up if the absence falls within one of the categories outlined in the undergraduate catalog as an excused absence. To make-up an exam or lab, you will need to follow the process for securing an excused absence. All excused absences must be obtained as soon as possible.
Laboratory Policies  
1. Students must complete the lab safety training on MU Online prior to entering the laboratory.
2. Goggles are required at all times during lab.
3. Open-toed shoes, shorts, bare midriffs, etc. are not allowed
4. Blatant disregard for standard safety practices will result in dismissal from lab

Other Course Policies  
1. Homework and lab reports will not be accepted after their due dates.
2. Cell phones cannot be used, or out, during exams.
3. Sharing calculators during exams is prohibited.
4. During exams, all materials necessary will be provided to you except a pencil and calculator. You may NOT use your own paper, etc.
5. Please turn off cell phones during class, failure to do so may result in dismissal from lecture.
6. Class announcements may be made via email to your university email address and it is your responsibility to check that account on a regular basis.

UNIVERSITY POLICIES
Academic Dishonesty
All students should be familiar with the university’s policy concerning academic dishonesty. This policy can be found on pp. 66 - 68 of the undergraduate catalog http://www.marshall.edu/catalog/undergraduate/ug_10-11_published.pdf, or on pp. 61 – 63 in the 2009 online graduate catalog http://www.marshall.edu/catalog/graduate/S2009/gr_sp09_published.pdf. (Faculty are encouraged to add any additional information specific to their expectations and/or rules regarding academic dishonesty in their class).

Policy for Students with Disabilities
Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone 304 696-2271 to provide documentation of their disability. Following this, the DSS Coordinator will send a letter to each of the student’s instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit http://www.marshall.edu/disabled or contact Disabled Student Services Office at Prichard Hall 11, phone 304-696-2271.

University Computing Services’ Acceptable Use Policy:
All students are responsible for knowing this policy, which can be found on the web at http://www.marshall.edu/ucs/CS/accptuse.asp.

Affirmative Action Policy:
This course will follow Marshall University’s policy on Affirmative Action, which can be found on p. 63 of the undergraduate catalog http://www.marshall.edu/catalog/undergraduate/ug_10-11_published.pdf, or on pp. 16-17 of the 2008 graduate catalog http://www.marshall.edu/catalog/graduate/S2009/gr_sp09_published.pdf. Specifically, all students will be afforded equal opportunity without regard to race, color, sex, religion, age, disability, national origin, or sexual orientation.