CHEM 535 - Physical Chemistry II
Spring 2016

Instructor     Prof. Marco Caricato
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               Office hours: TR 11 AM-12 PM or by appointment

GTA           Hossein Z. Jooya
               Email: jooya@ku.edu
               Office hours: MWF 11 AM-12 PM, MAL 1010

Lectures      TR 9.30-10.45 AM, MAL 2048

Discussion   Sessions
Tuesday 1-1.50 PM SMI 100
Tuesday 2-2.50 PM WES 4035
Tuesday 3-3.50 PM WES 4035

Course Description
This is the second half of a two-semester sequence in physical chemistry for
students in chemistry or chemical engineering. Building on the molecular-
level description of matter presented in CHEM 530 (Physical Chemistry
I), CHEM 535 focuses on the thermodynamics and kinetics of molecular
systems. Applications are made to the structure and properties of gases,
liquids, solids, materials, statistical thermodynamics, chemical kinetics,
and reaction dynamics.

Prerequisites
CHEM 530; MATH 290 or consent of instructor. These prerequisites are
important as the instructor will assume a working knowledge of basic
calculus, linear algebra, multivariate calculus, and quantum chemistry (at
the level of CHEM 530).

Textbook
D. McQuarrie and J. Simon, Physical Chemistry: a Molecular Approach
(University Science Books, Sausalito, CA, 1997). This is the same text
used for CHEM 530, so most of you should already have it.

Discussion Sessions
There are three discussion sessions for this course as listed above. Par-
ticipation in one of these sessions per week is a required activity for this
course. You should attend the discussion session in which you are enrolled.
These discussion sessions are informal periods in which we will have group
problem solving sessions, discuss special topics, and explore real world ap-
plications of the material presented in lecture. Also any questions that you
might have concerning the lecture material, readings, background material
or homework problems will be answered during this session.
Homework

Homework problems will be assigned periodically by the instructor and will be taken from the textbook as well as from additional sources. The assignments will be posted on the course Blackboard site. The problems will be discussed during the Discussion Sessions, and you are encouraged to ask questions. You are also encouraged to discuss problems and study with other class members. Solutions to the problems will be posted on Blackboard every week after the Discussion Sessions. Although the problem assignments will not be graded, they form the basis for the exams. So do them regularly or you will find yourself in trouble at the exams!

Clickers

Clickers will be used regularly during lectures. **You are responsible for bringing your clicker to class every single day.** You will receive 5% of your final grade if you answer more than 75% of the questions, independently on the exactness of the response. **No exceptions.** The purpose of clicker questions is twofold: to encourage you to actively participate in lectures (and therefore facilitate learning!), and also to provide the instructor with immediate feedback on your understanding of the material. For both reasons, please answer each question honestly and to the best of your ability even though you are not graded on the accuracy of your responses. **You will need to register your clicker in Blackboard in order to receive credit for your responses.** Access the iClicker registration page under the Student Tools tab in the course Blackboard site and follow the instructions.

Quizzes

At least 7 in-class quizzes, lasting 10-15 minutes, will be given at the beginning of the Tuesday class. The purpose of the quizzes is to assess your understanding of the material during the semester, and constitute 20% of your final grade. **No makeup quizzes will be offered. Calculators are not allowed.** Your lowest quiz score will be dropped. Given the short duration of a quiz, the questions asked will not be representative of the exercises given during regular exams. To prepare for the exams, you need to do the homework problems.

Exams

Three midterm exams and a comprehensive final exam will be used to evaluate your understanding of the material. **Calculators are not allowed.** If you know in advance that you must miss a midterm exam for a reason consistent with the University Policy, arrangements for an early exam can be made. If you miss a midterm exam for a medical or family emergency, the grade for this exam will be replaced by the average of the other two.

<table>
<thead>
<tr>
<th>Exam</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>Wed, Feb 17</td>
<td>5.50-7.50 PM</td>
<td>WES 3140</td>
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<td></td>
<td>Mar 23/Apr 20</td>
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<tr>
<td>Final</td>
<td>Tue, May 10</td>
<td>7.30-10.00 AM</td>
<td>MAL 2048</td>
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Grades

Final grades will be based on your cumulative performance in the class according to the following weighting scale:

- Clicker Participation 5%
- Quiz 20%
- Midterms 45%
- Final 30%

The final letter grade will be based (at a minimum) on the usual plus-minus scale (97-100% = A+, 93-96% = A, 90-92% = A-, 87-89 = B+, 83-86% = B, 80-82% = B-, 77-79% = C+, 73-76% = C, 70-72% = C-, 67-69% = D+, 63-67% = D, 60-62% = D, <60% = F).

Conduct

**Academic misconduct will not be tolerated.** All incidents will be reported, and students found in violation will be punished severely. Disruptions in the classroom constitute academic misconduct and will be dealt with accordingly.

Assistance

The course is designed to be challenging and getting a good grade will require a significant effort on your part. However, there are several ways to receive personal help in CHEM 535:

- Attend your required discussion session - here we will explore problem-solving strategies in a group learning environment as discuss current events as they relate to chemistry. Note: attendance will be taken at the discussion sessions.
- See the instructor or lecture GTA during office hours or by appointment.
- E-mail the instructor or lecture GTA with questions. Every effort will be made to answer your questions promptly.
- Study together with your fellow students.
- Students in physical chemistry lab courses can also seek help from the laboratory teaching assistants.

Special Needs

Students with disabilities are invited to contact me with any concerns and to be sure that the proper accommodations are made available.
### Tentative Lecture Schedule

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<tr>
<th>Topic</th>
<th>Chapters</th>
<th>Week</th>
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<tbody>
<tr>
<td><strong>I. Statistical Mechanics and Thermodynamics</strong></td>
<td>16-21</td>
<td>1-5</td>
</tr>
<tr>
<td>Boltzmann Distribution</td>
<td>17</td>
<td>1</td>
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<tr>
<td>Partition Functions and Property of Gases</td>
<td>18, 16</td>
<td>2</td>
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<tr>
<td>1st Law of Thermodynamics</td>
<td>19</td>
<td>3</td>
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<tr>
<td>2nd and 3rd Laws of Thermodynamics</td>
<td>20, 21</td>
<td>4-5</td>
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<tr>
<td><strong>II. Free Energy and Phase Equilibrium</strong></td>
<td>22-26</td>
<td>5-9</td>
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<tr>
<td>Free Energy</td>
<td>22</td>
<td>5-6</td>
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<tr>
<td>Phase Equilibria</td>
<td>23</td>
<td>7</td>
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<tr>
<td>Solutions and Chemical Equilibrium</td>
<td>24-26</td>
<td>8-9</td>
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<tr>
<td><strong>III. Kinetics</strong></td>
<td>27-29</td>
<td>10-13</td>
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<tr>
<td>Kinetic Theory of Gases</td>
<td>27</td>
<td>10</td>
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<tr>
<td>Rate Laws</td>
<td>28</td>
<td>11</td>
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<tr>
<td>Reaction Mechanisms</td>
<td>29</td>
<td>12-13</td>
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<tr>
<td><strong>IV. Reaction Dynamics and Solids</strong></td>
<td>30-31</td>
<td>13-15</td>
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<tr>
<td>Gas-Phase Reaction Dynamics</td>
<td>30</td>
<td>13-14</td>
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<tr>
<td>Solids and Surface Chemistry</td>
<td>31</td>
<td>15</td>
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Midterm Exam

Final Exam