Michigan Technological University Chemistry Department’s Syllabus

1. Course Number, Title, Semester, and Year.

CH1160 University Chemistry II (4), Spring, 2014. This course is a second level course in the chemistry department’s listing of courses for the chemistry major certified by the American Chemical Society (ACS).

2. Instructors, Address, Telephone Number, and Office Hours.

Course Lecturer: Rudy Luck, 19-701b, (487-2309) rluck@mtu.edu
Office Hours: M,W,F 2:00 PM - 3:00 PM
Learning Center Coordinator: Lois Blau, 19-206A, (487-2297) lablau@mtu.edu
Supplemental Instructor: Eliot Nagler, ennagler@mtu.edu
Canvas Sentinel: Andrew LeSage, aclesage@mtu.edu
Recitation Coordinator: Laleh Vahtaght, lvahdat@mtu.edu
Recitation Instructor 1: Katrina Bulgielski, kmbugiel@mtu.edu
Recitation Instructor 2: Colina Dutta, ctdutta@mtu.edu

3. Purpose of this Syllabus.

Welcome to University Chemistry II. This syllabus outlines the content of the course and contains the rules and regulations by which your performance will be assessed. It is important that you spend some time reading this in order to understand how the course is graded and when assignments are due. Furthermore, by having this detailed description of the course, you are in a position to read the relevant chapters in advance of the discussion of material in the lectures. This is helpful for a thorough comprehension of the course and it also helps you to comprehend the material faster and not be lost during the lectures. You should also do the examples as they occur throughout each chapter. Use a sheet of paper to block out the solutions and then immediately verify your answer. Then try the practice exercises. If you have any difficulty with the problems these can be discussed at the study periods or with me during office hours or with any of the learning center’s coaches. Please take advantage of these opportunities.

4. Introduction.

This course completes an introduction to freshman chemistry, which was started in University Chemistry I, and includes studies on molecular orbitals, reaction rates, equilibrium and its relation to thermodynamics, chemistry of the environment, acid-base chemistry, electrochemistry, nuclear chemistry, inorganic and organic chemistry. The course builds a sound foundation of vocabulary and conceptual knowledge in chemistry and you will attain an understanding of equilibria, solubility, radiation, and, classical inorganic chemistry. This course should improve your quantitative and computing skills. The means of instruction for the course consists of three 50-minute lectures and weekly recitations. You are strongly advised to enroll in a recitation.

5. Short Course Description and Prerequisites.

A major objective of this course is to help students acquire knowledge of chemistry as the central, experimental natural science, which deals with the composition of materials, their structures and properties, and related energy conversions in inert and living systems. This second semester of a two-semester sequence of chemistry courses will provide students with an informed understanding of the nature of scientific reasoning, discovery, and invention through a systematic exploration of the basic concepts and
practices of chemistry. The course will also demonstrate the applicability of scientific concepts and thinking processes to significant current issues in science. These aims will be accomplished by a comprehensive understanding of approximately the second half of the required text.

Prerequisite: CH1150 University Chemistry I or AP chemistry with the required standing. Students in CH1160 are required to take the associated laboratory (CH1161) as a co-requisite.

6. Textbooks.

The book listed below should be available from the bookstore.

One iClicker device from the bookstore.

You should bring the iClicker device to every lecture and be certain to register your ID code on CANVAS. This device will allow for the quick taking of attendance and for obtaining your responses to various questions during the lectures. If you do not bring this, you will not receive a score for that lecture. A simple nonprogrammable calculator may also be helpful during the lectures.

Readynotes are not utilized in this course.

7. Course Objectives.

A. Philosophy.

This is the second course in Freshman Chemistry and this course will also consider scientific inquiry in historical and cultural contexts. Historical examples of scientific creativity will be provided as appropriate to the topic being covered. The course will also address the progress of physical and chemical discoveries and their impact on our way of life. In this way they should learn to develop a respect for limits on resources and responsibilities which face modern citizens.

Overall, this course will explore the distinctive nature of scientific thinking, emphasizing:
* distillation of seemingly disparate data into unifying concepts derived from theoretical constructs having wide applicability.
* quantitative precision based on observation and experimental measurements; this requires the ability to do multiple, controlled laboratory experiments which can be replicated by other investigators.

Students will develop a critical appreciation of the ways that scientists develop concepts and methods with practical applications, which have direct implications for contemporary life.

B. Summary of Content

This course covers units on molecular orbitals, intermolecular forces, chemical kinetics and equilibria, acids and bases, complex ion formation, entropy and the second law of thermodynamics, electrochemistry, metals and coordination chemistry, inorganic, environmental, organic and nuclear chemistry.

8. Teaching Methodology.

Lecture

Lectures, accomplished by writing out notes on an overhead projector will constitute the major form of instruction for this course. Needless to say this is still the most effective way of communicating information. The reasons for this are complex and varied but the idea is that you have to learn how to listen and take good notes. Lectures in the form of Powerpoint slides and notes provided in advance do not facilitate the neuronal firings necessary for comprehension, remembering and learning. The guiding philosophy here is that “if you give a man (or woman) fish to eat, then they can eat for one day but teach
them how to fish and they can eat forever”. In any case you can always search for other chemistry lectures online (eg. [http://ocw.uci.edu/openchem/openchem.html](http://ocw.uci.edu/openchem/openchem.html)) and indeed many other people have prepared these notes, if you feel that you are missing something. Attendance at the lectures will be noted using iClickers as there is a direct correlation between attendance and course performance. From the outset, students will be advised to read and study the required text. In fact you should read the relevant chapter before coming to the lecture. There will be weekly on-line problem sets assigned. These have to be submitted on time and there are no reasons acceptable for not doing so. I also expect you to try problems at the back of the chapters in the text. To begin, try the first three questions given for each group of questions. If you experience difficulty with any of them do some more questions from that section. There will be three term exams and one final exam based on material covered in the lectures, the appropriate chapters in the text and from the problem sets.

**Please note that there are no resurrection points or make up exams.**

**CH0100, Development of Chemistry Skills**

CH0100 is associated with the Chemistry Learning Center. Students who would like an individual, weekly appointment are encouraged to enroll in CH0100. Stop by the CLC between 8:30 am – 5:00 pm during the first week of class to sign up for an appointment or team time with a coach. You must attend your first weekly appointment which begins the second week of class. Grades in CH0100 are satisfactory/unsatisfactory based on attendance. You are expected to attend every appointment. However, you are allowed to miss 1 appointment in case of an emergency and still receive a satisfactory grade. *Note: there is no tuition charge for CH0011 as it is a zero credit course.*

**Walk-in Hours**

In addition to CH0100, you are encouraged to make use of the Chemistry Learning Center for individual assistance during our walk-in hours.

Beginning on Monday, January 21st, the Chemistry Learning Center walk-in hours for Spring Semester are: Daytime: Monday–Thursday 10 a.m.–4 p.m. Evenings: Sunday–Wednesday 7–9 p.m.

There is no cost for using the walk-in hours. The Center is staffed by friendly, upper level undergraduate students who have a good background in chemistry and are familiar with the courses. The CLC is a relaxed, comfortable place to get help or to use as a study place. There are additional books and other resources available.

More information is available on the CLC web site: [http://www.mtu.edu/chemistry/learning-center/overview/](http://www.mtu.edu/chemistry/learning-center/overview/)

If you have questions about first year chemistry lecture courses, contact:

Lois Blau  lablau@mtu.edu  
Coordinator of the Chemistry Learning Center  
206/208 Chemical Sciences Building  
487-2297

**9. Academic Integrity Policy.**

**Course Policies - Lectures**

Please disrupt the lecture as much as possible to correct mistakes or ask questions. Cell phones, Blackberries, iPods, PDAs, laptops or any other electronic devices must be turned off and stowed for the duration of each class period. Computers, tablets and other handheld devices are not required for this class and therefore not permitted. Note “A study by Duncan, Hoekstra, and Wilcox (2012) demonstrated
that students who reported regular cell phone use in class showed an average negative grade difference of 0.36 ± 0.08 on a four-point scale.” If you cannot drive and text, then you certainly cannot listen to me and text and expect to understand what I am saying.


Additional reference on cell phone usage in class

You have to have an iClicker device (available in the bookstore) during lectures and bring these to class each time. There are no excuses for not bringing the iClicker to class or, further, in not attending lectures (except for official university reasons). The lowest three scores will be deleted meaning that you can miss three lectures. If you are going to miss a lecture for an official university approved absence, it is your responsibility to obtain the required documentation and have them sent to me.

Categories of University excused absences:

- Off-campus events: Including intercollegiate athletics; fine arts performances; program-sponsored competitions and program-sponsored field trips; and similar official events where students represent the University in an official capacity.

The instructor or staff supervising students participating in these events must provide notice to the students’ instructors and the Dean of Students Office prior to the date of the activity. The notice must include the name of the activity, the date(s) of class absence, the name of the supervising instructor or staff, and the names of all participating students.

- Absences involving legitimate extenuating circumstances beyond a student’s control. These include student illness or injury that prevents a student from participating in class; death or critical illness of a family member; birth of a child; military duty; jury duty or subpoena for court appearances; and similar serious extenuating circumstances.

If a student’s absence causes the student to miss an assignment, examination or other graded requirement of the class, the instructor may require the student to provide documentation verifying the cause of the absence. The student may provide the documentation to the instructor or to the Dean of Students Office.

iClicker registration. The iClicker must be registered immediately.

1. Logon to Canvas
2. Click the iClicker link on the left part of the page.
3. Enter the code correctly from the back of the iClicker and press register.
4. Obtain a large gold chain for this, wear it as bling and bring it to class every session.

Questions regarding the course should be posted on Canvas in the discussion groups so that others can provide answers. If you know the answer, please feel free to provide it.
**Exams**

**ONLY A NON-PROGRAMMABLE CALCULATOR IS ALLOWED.** No other electronic device is allowed during exams. Those calculator used in math are not allowed. Buy a cheap $4 calculator that can do logs, cosine functions, exponents and cannot be programmed. **NO DICTIONARIES ARE ALLOWED EITHER.** During exams you have to bring the picture MTU ID and display this so that we can verify your identity. You will also sign an attendance sheet once your identity is verified.

**INSTRUCTIONS** (These instructions will suffice for all exams). **YOU NEED A NUMBER 2 PENCIL AND A GOOD ERASER.**

1. Remove the Answer Sheet from the exam booklet.

2. **Using a #2 pencil**, enter the following information on the left side of the General Purpose Answer Sheet:
   - **LAST NAME**: Write your last name and bubble in the letters
   - **First Initial (FI)**: Write and bubble in the first initial of your first name
   - **E-MAIL ID**: Write and bubble in your MTU email address without the @mtu.edu
   - **TECH ID**: Enter the eight digits of your Tech ID (M-number) column J is blank.
   - **KEY**: Write and bubble in the version number of the exam
   - **NAME**: Write your name

3. You have to bubble in the letter choices for the questions asked and all remaining fields should be left blank.

4. Be sure to fill in the circles completely and avoid stray marks on the form.

5. Please cover your Answer Sheet at all times.

6. This is a closed book exam.

7. Only non-programmable calculators are permitted.

8. Cell phones, all communication devices, and all music devices must be turned off and may not be used during the exam period.

9. If you have any questions during the exam, please raise your hand and wait for assistance.

10. Please turn in only your Answer Sheet. You may keep the exam booklet.

In order for you to gain experience in filling out the scantron sheet during exams, a blank copy is available for you to practice on CANVAS.

**Collaboration/Plagiarism Rules**

**University Policies**

Academic regulations and procedures are governed by University policy. Academic dishonesty cases will be handled in accordance the University's policies. **Student work products (exams, essays, projects, etc.) may be used for purposes of university, program, or course assessment.** All work used for assessment purposes will not include any individual student identification.
If you have a disability that could affect your performance in this class or that requires an accommodation under the Americans with Disabilities Act, please see me as soon as possible so that we can make appropriate arrangements. The Affirmative Action Office has asked that you be made aware of the following:

*Michigan Technological University complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disabilities Act of 1990. If you have a disability and need a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office at 487-2212. For other concerns about discrimination, you may contact your advisor, Chair/Dean of your academic unit, or the Affirmative Programs Office at 487-3310.*

Standards of academic conduct are set forth in the University's Academic Integrity Policy, which can be found at [http://www.mtu.edu/dean/conduct/policy/pdfs/AI%20Policy%202010-11%20Combined.pdf](http://www.mtu.edu/dean/conduct/policy/pdfs/AI%20Policy%202010-11%20Combined.pdf). By registering for this course, you have acknowledged your awareness of the Academic Integrity Policy, and you are obliged to become familiar with your rights and responsibilities as defined by the Policy. Violations of the Academic Integrity Policy will not be treated lightly, and disciplinary actions will be taken should such violations occur. This includes plagiarism or receiving inappropriate assistance on the online quizzes, examinations and laboratory assignments. Cheating is an extremely serious academic offense. Allegations of cheating will be referred to Student Conduct Services for appropriate action. Please see me if you have any questions about the academic violations described in the Policy or as they relate to particular requirements of this course.

**10. Grading Policy.**

The course will be assessed on the basis of three 50-minute exams (45% of the total grade), online problem sets in Canvas (18%), lecture attendance (12%) and one 2-hour final exam (25% of the total grade).

<table>
<thead>
<tr>
<th>Lecture part of the course</th>
<th>% of the final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three 50 minute term exams (all required)</td>
<td>45</td>
</tr>
<tr>
<td>Lecture quizzes (requires iClicker) (total score)</td>
<td>12</td>
</tr>
<tr>
<td>Canvas weekly online assignments (all required)</td>
<td>18</td>
</tr>
<tr>
<td>One 2 hour final exam (required)</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

- A grade of A and AB, (AB 85-89%, A 90-100%) in this course will imply that the student has mastered the full range of topics covered in the lectures and can very successfully apply these to solve the problems presented. The student can derive the important factors that lead to the best solution and makes particularly insightful contributions to recitations and class discussions.

- A grade of B or BC (BC, 75-79%; B, 80-84%) would imply that the student has a thorough understanding of the subject. The student can think things through and makes helpful contributions to recitations and class discussions.

- A grade of C or CD (CD, 55-64%, C, 65-74%) would suggest that the student understands the subject matter but there are gaps in the scope of understanding. Some topics need more work. The student takes part in recitations and class discussions and listens carefully when not actively participating.

- A grade of D (D, 50-54%) implies that the student has only partial knowledge of the subject. The student is unable to make effective use of this knowledge and does not understand what is going on in the classroom. Makes little or no contribution to the discussions in recitations sessions or in the class.

- The F grade (F, <50%) suggests that the student wasted a semester (i.e., four months) at MTU.
11. Description of Types of Examinations.

The three 50 minute exams will be a mixture of multiple choice and short answer questions. The exact ratios will be determined later. The final exam will also follow the same format. Examples of these questions are:

1/ What kind of isomerism is exhibited by the following pair of complexes: red [Co(NH₃)₅SO₄]Br and violet [Co(NH₃)₅Br]SO₄
a. optical isomerism  
b. geometrical isomerism  
c. structural isomerism  
d. stereoisomerism

2/ What is the pH of a 0.50 M sodium benzoate solution?
Kᵦ for benzoic acid = 6.0 x 10⁻⁵.
a. 18.74  
b. 3.92  
c. 8.96  
d. 5.04  
e. 2.26  
f. 10.08

A possible long answer type question would be as follows:

1/ Sketch the standard hydrogen electrode and explain how it is used to determine reduction potentials.
12. Detailed Schedule of Lectures and Examinations.

The lectures will be held in Fischer 135 at 11:05 – 11:55 AM on Mondays, Wednesdays and Fridays.

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapter</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 / 15 / 17 (Jan.)</td>
<td>10</td>
<td>Molecular Orbital Theory</td>
</tr>
<tr>
<td>22 / 24 / 27</td>
<td>24</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>29 / 31 / 3 (Feb)</td>
<td>23</td>
<td>TMC &amp; Coordination Compounds</td>
</tr>
<tr>
<td>5 / 10 / 12</td>
<td>13</td>
<td>Chemical Kinetics</td>
</tr>
<tr>
<td>14 (Feb.)</td>
<td></td>
<td>First term exam (Chapters 10, 24, 23)</td>
</tr>
<tr>
<td>17 / 19 / 21</td>
<td>19</td>
<td>Nuclear Chemistry</td>
</tr>
<tr>
<td>24 / 26 / 28</td>
<td>14</td>
<td>Chemical Equilibrium</td>
</tr>
<tr>
<td>3 (Mar.) / 5 / 7</td>
<td>15</td>
<td>Acids and Bases</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>Second term exam (Chapters 13, 19, 14)</td>
</tr>
<tr>
<td>19 / 21 / 24</td>
<td>16</td>
<td>Acid-Base Equilibria</td>
</tr>
<tr>
<td>26 / 28 / 31</td>
<td>20</td>
<td>Chemistry in the Atmosphere</td>
</tr>
<tr>
<td>2 (Apr.) / 4 / 7</td>
<td>17</td>
<td>Entropy</td>
</tr>
<tr>
<td>9</td>
<td>18</td>
<td>Electrochemistry</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Third term exam (Chapters 15, 16, 20)</td>
</tr>
<tr>
<td>14 / 16</td>
<td>18</td>
<td>Electrochemistry</td>
</tr>
<tr>
<td>18 / 21 / 23</td>
<td>22</td>
<td>Nonmetallic Elements…</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>Review</td>
</tr>
<tr>
<td>30 (Apr.)</td>
<td></td>
<td>Final Examination on all chapters in Fisher 135</td>
</tr>
</tbody>
</table>
13. **Detailed Schedule of Recitations.**

The recitations will be held at various times on Tuesdays and Thursdays.

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapter</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>14 / 16 (Jan.)</td>
<td></td>
<td>Intro to the recitations</td>
</tr>
<tr>
<td>21 / 23</td>
<td>10</td>
<td>Molecular Orbital Theory</td>
</tr>
<tr>
<td>28 / 30</td>
<td>24</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>4 / 6 (Feb)</td>
<td></td>
<td>Winter Carnival (no recitations.)</td>
</tr>
<tr>
<td>11 / 13</td>
<td>23</td>
<td>TMC &amp; Coordination Compounds</td>
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<tr>
<td><strong>14 (Feb.)</strong></td>
<td><strong>First term exam (Chapters 10, 24, 23)</strong></td>
<td></td>
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<tr>
<td>18 / 20</td>
<td>13</td>
<td>Chemical Kinetics</td>
</tr>
<tr>
<td>25 / 27</td>
<td>19</td>
<td>Nuclear Chemistry</td>
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<tr>
<td>4 (Mar.) / 6</td>
<td>14</td>
<td>Chemical Equilibrium</td>
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<tr>
<td>10-16</td>
<td></td>
<td>Spring Break</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td></td>
<td><strong>Second term exam (Chapters 13, 19, 14)</strong></td>
</tr>
<tr>
<td>18 / 20</td>
<td>15</td>
<td>Acids and Bases</td>
</tr>
<tr>
<td>25 / 27</td>
<td>16</td>
<td>Acid-Base Equilibria</td>
</tr>
<tr>
<td>1 (Apr.) / 3</td>
<td>20</td>
<td>Chemistry in the Atmosphere</td>
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<tr>
<td>8 / 10</td>
<td></td>
<td><strong>Recitation Practice Exam</strong></td>
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<tr>
<td><strong>11</strong></td>
<td></td>
<td><strong>Third term exam (Chapters 15, 16, 20)</strong></td>
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<tr>
<td>15 / 17</td>
<td>17</td>
<td>Entropy</td>
</tr>
<tr>
<td>22 / 24</td>
<td>18</td>
<td>Electrochemistry</td>
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<tr>
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<td></td>
<td><strong>Final Examination on all chapters in Fisher 135</strong></td>
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