Syllabus-R2.00: General Chemistry for Engineers (Chem 105), Semester II, 16-17

The Syllabus is subject to change. Any changes will be announced at least once during lecture and posted to D2L as Syllabus-R\(x\), where \(x\) will be greater than the previous value (for example, the version handed out the first day of class usually has \(x = 1.00\)).

This introductory college chemistry course is a one semester course with an emphasis on applications to engineering fields.

**Course Description:** Modern principles of chemistry with an emphasis on applications in engineering fields.

**Lecture:** MWF 8:00 – 8:50 AM in Chem 190

**Sections:** Discussions 601 – 605 and Labs 801 – 810

**Instructor:** Dr. Thomas Sorensen Phone: 229-4012

**Office Hours:** MWF 10:00 – 10:50 AM in Chem 109

**Course web-site:** d2l.uwm.edu (Spring 2017 Chem 105)

**Prerequisites:** A grade of C or better in Chemistry 100; or 1 year of high school Algebra and 1 year of high school Chemistry and a placement of 1 (score of 20) on the Chemistry Placement Test and a Math Placement score of 3 (old test) or 30 (new test) or a grade of C or better in Math 105]. Not open for credit to students who have had Chemistry 104 or 118.

In order for you to be successful in this course you will be required to set-up problems and solve linear and quadratic equations.

**Course Materials:** See D2L for additional details and options.

<table>
<thead>
<tr>
<th>Component</th>
<th>Estimated Cost</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALEKS 360 (available online)</td>
<td>$70 – $120</td>
<td>Required, includes ebook</td>
</tr>
<tr>
<td>Lab Manual/Notebook</td>
<td>$30 – $55</td>
<td>Required, in Bookstore</td>
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<tr>
<td>State Approved Safety Goggles</td>
<td>$5 – $10</td>
<td>Required by the first lab</td>
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<tr>
<td><strong>State approved Safety Goggles are absolutely mandatory.</strong></td>
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<tr>
<td>Non-graphing Calculator</td>
<td>$10 – $50</td>
<td>Required for exams and quizzes</td>
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<tr>
<td><strong>Graphing/programmable calculators will not be permitted for exam use.</strong></td>
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<tr>
<td>Burge and Overby, 2nd Ed.</td>
<td>$25 – $215</td>
<td>Recommended (printed version of ebook)</td>
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<tr>
<td>ACS General Chemistry Study Guide</td>
<td>$12 – $20</td>
<td>Recommended (same as for Chem 102/104)</td>
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**Policies:**

**UWM:** You must follow the policies and procedures outlined in the current Schedule of Classes. See: http://www.uwm.edu/Dept/SecU/SyllabusLink.pdf

**Department of Chemistry and Biochemistry:** You are expected to fully understand these policies including the limits placed on the maximum amount of material that can be missed, excused or otherwise, and still pass the course.

**Drop, Section Change:** These are done on PAWS. Make sure to follow all the rules established by UWM and the Department of Chemistry and Biochemistry.

**Incomplete:** An Incomplete can be given only to a student who has been doing satisfactory (C) work but who is unable to continue attending the course for a reason judged valid. The request for an Incomplete must be accompanied by documentation.

**Academic Dishonesty:** Cheating on an examination or other graded material will result in a grade of zero as a minimum consequence. Failure in the course and referral to the Dean may also occur. In short, academic dishonesty in any form will not be tolerated.

**Lecture:** You are responsible for all material presented in lecture. If you miss a lecture, you are responsible for obtaining the lecture material. Unannounced quizzes/attendance may be given/taken at any time during lecture; your average on these determines your lecture grade.

**Homework:** You will need to establish an ALEKS account and complete your Initial Assessment right away (see D2L for details). Your homework grade is based on your average for all the objectives and the total number of topics you have mastered/learned as of the last day of class. ALEKS is due each Sunday by 11:59 PM and generally includes material from the previous week and the start of the following week.
**Discussion:** There will be a quiz given in each of your scheduled Discussion meetings which will be graded based on such things as attendance, participation, and correctness of worked problems. Your quiz average constitutes your Discussion grade.

**Laboratory:** Labs will start January 30, 2017. Make sure that you have your lab manual, safety goggles, and have completed all pre-lab assignments before your scheduled lab period. You will not be allowed to participate in lab unless you have prepared for the correct lab and pass the lab quiz. **Experiments are done in the order listed in the current version of the syllabus, not in the order they appear in your manual.** Completed labs are due by the start of the next lab period. Proper attire must be worn at all times during laboratory.

Labs cannot be rescheduled or taken late: you must attend your scheduled lab and personally collect your own data. If you are late for lab, or not allowed to participate for any reason, you will receive a grade of zero (0) for that lab. Failure to follow safety procedures will result in expulsion from laboratory and a grade of zero (0) for the lab. Labs turned in late will receive a score of zero (0). If you get a zero on more than two (2) labs or if your average is less than 60%, you fail laboratory and fail the course.

**Laboratory Practical:** The in-laboratory Laboratory Practical is graded as you execute various techniques while you complete your experiments. If you get less than 60%, you fail laboratory and fail the course.

**Early/Make-Up/Late Work:** There are no early, make-up, or late exams, homework, quizzes, or labs. For a scheduled absence (e.g. University athletics, music, etc.), the instructor must be notified at least 24 hours prior to the absence. If an exam or lab is missed for a non-medical reason not approved beforehand, a grade of zero (0) will be given. For medical absences, a written letter signed by your physician is required. For an excused absence the next lab or exam will count double.

**Approximate Lecture and Homework Schedule for General Chemistry for Engineers (Chem 105), Semester II, 16-17**

<table>
<thead>
<tr>
<th>Week of</th>
<th>Lecture</th>
<th>ALEKS&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 23</td>
<td>Ch 1, 2</td>
<td>Initial Assessment, Ch 1 &amp; 2</td>
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<tr>
<td>30</td>
<td>Ch 3, 4</td>
<td>Ch 3 &amp; 4</td>
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<tr>
<td>Feb 6</td>
<td>Ch 5, 6</td>
<td>Ch 5 &amp; 6</td>
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<tr>
<td>13</td>
<td>Ch 7</td>
<td>Ch 7&lt;sup&gt;b&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td>Exam I, Tuesday, 2-14-17, 5:30 – 6:30 PM through Ch 7</td>
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<tr>
<td></td>
<td>Ch 8</td>
<td>Ch 8</td>
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<tr>
<td>27</td>
<td>Ch 9</td>
<td>Ch 9</td>
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<tr>
<td></td>
<td>Ch 10</td>
<td>Ch 10&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>13</td>
<td>Ch 11</td>
<td>Ch 11&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td></td>
<td></td>
<td>Exam II, Tuesday, 3-14-17, 5:30 – 6:30 PM through Ch 10</td>
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<tr>
<td></td>
<td>No Classes</td>
<td>Spring Break</td>
</tr>
<tr>
<td>20</td>
<td>Ch 12, 13</td>
<td>Ch 12 &amp; 13</td>
</tr>
<tr>
<td>27</td>
<td>Ch 14, 15</td>
<td>Ch 14 &amp; 15</td>
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<tr>
<td></td>
<td>Ch 16</td>
<td>Ch 16&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Apr 10</td>
<td>Ch 17, 18</td>
<td>Ch 17</td>
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<tr>
<td></td>
<td></td>
<td>Exam III, Tuesday, 4-18-17, 5:30 – 6:30 PM through Ch 16</td>
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<tr>
<td></td>
<td>Ch 19</td>
<td>Ch 19</td>
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<tr>
<td>24</td>
<td>Ch 19</td>
<td>Ch 19</td>
</tr>
<tr>
<td>May 1</td>
<td>Ch 19</td>
<td>Ch 19</td>
</tr>
<tr>
<td>8</td>
<td>Ch 19</td>
<td>Ch 19</td>
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<tr>
<td></td>
<td></td>
<td>Redemption Exam, Tuesday, 5-9-17, 5:30 – 6:30 PM Covers lectures and the text</td>
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<tr>
<td></td>
<td></td>
<td>ACS Final Exam, See Schedule of Classes, covers all lectures and the text</td>
</tr>
</tbody>
</table>

<sup>a</sup> See ALEKS for exact due dates. Start assignments well before their due dates.

<sup>b</sup> An ALEKS assessment is required before you are allowed to start the next assignment.

You will find that your understanding of the material increases as you work more problems. Please get help when you need it. Sometimes 10 – 15 minutes spent in the TA or my office saves hours of confusion and frustration. I will attempt to remain on schedule as much as possible, but changes may be made with reasonable notice.

**Assessment:** Your course grade will be determined from the following elements:
Laboratory 100 pts
Laboratory Practical 100 pts
Homework 100 pts
Discussion 100 pts
Lecture 20 pts
Hour Exam I Tuesday, 2-14-17, 5:30 – 6:30 PM 100 pts
Hour Exam II Tuesday, 3-14-17, 5:30 – 6:30 PM 100 pts
Hour Exam III Tuesday, 4-18-17, 5:30 – 6:30 PM 100 pts
Redemption Exam Tuesday, 5-9-17, 5:30 – 6:30 PM Extra Credit
ACS Final Exam See Schedule of Classes 200 pts

If you fail laboratory, score less than the 35th percentile on the final exam, or miss the final exam for any reason other than a legitimate medical excuse, you cannot pass the course regardless of your other grades.

Some Advice: We will cover a large amount of material in this course. The amount of time you need to spend reading and solving problems is significant. You are expected to read the material before each lecture and should not expect all assigned material to be explicitly covered in class. Write down questions that you have and note things that you don’t understand; bring your questions to me or your TA for discussion. If you are having trouble with the material, you must seek help fast or the rapid pace of the course will leave you far behind. The TAs and I are available and eager to help you.

How to do well in the course:

• Read the appropriate section(s) of the book before the material is presented in lecture — that is, come prepared for class.

• Attend lecture, discussion and laboratory sessions — and take them seriously. Be punctual and take notes.

• Do problems as they are assigned — don’t wait until right before an exam when they may seem overwhelming.

• Form a study group with others in the class and work on homework questions together. Teaching one another is perhaps the best way to learn.

• Try to make your own connections between material presented during different lectures. Don’t just assume because we say that something is connected that you understand the connections.

• If you have problems, see me and/or your TA and find out the ways that we can help you.

D2L Resources include:

• Information on ALEKS.

• Important News items.

• Your grades.
Approximate Laboratory Schedule for General Chemistry for Engineers (Chem 105), Semester II, 16-17

<table>
<thead>
<tr>
<th>Week of</th>
<th>Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 23</td>
<td>No Labs</td>
</tr>
<tr>
<td>30</td>
<td>Skill Inventory</td>
</tr>
<tr>
<td>Feb 6</td>
<td>Paper Chromatography</td>
</tr>
<tr>
<td>13</td>
<td>Bohr’s Model†</td>
</tr>
<tr>
<td>20</td>
<td>Physical Properties of Water†</td>
</tr>
<tr>
<td>27</td>
<td>MgO: Pooled Data Statistics</td>
</tr>
</tbody>
</table>

Second lab of the week: Nomenclature I (on D2L)

| Mar 6   | Standardization of Solutions† |
| 13      | Hess’s Law                    |
| 20      | No Classes – Spring Break     |
| 27      | Gas Laws                      |
| Apr 3   | Molecular Weight from Freezing Point Depression† |
| 10      | pH Titrations†                |
| 17      | Handout (Avogadro’s Number)   |
| 24      | Handout (Thermodynamic Properties of Ca(OH)₂) |
| May 1   | Handout (Electrochemistry)    |
| 8       | No Labs                       |

† Includes one or more graded Techniques for the Laboratory Practical.

Laboratory Reports: Your notebook should contain all the information needed to perform the experiment and your data, observations, and results. All entries must be done in ink (use a black ballpoint pen). The goal is to effectively and efficiently communicate what was done during laboratory. Expect that your instructor will check your notebook for completeness before you are allowed to start the experiment. When writing your laboratory reports you may to refer to any part of the bound portion of your laboratory notebook by citing the page number(s).

For each experiment include:

1. Print your name, laboratory section number, and the date on the top of each page of your notebook. Carbon-less copies are best as you must retain a copy of all work you submit for grading. Record everything in ink (use a black ballpoint pen). Page numbers must be sequential and your writing legible or the report will be graded as a zero (0).

2. Title of the experiment (as given in the manual).

3. Answers to all pre-laboratory questions (can omit all but the ‘practical application’ question IF there was a quiz on D2L).

4. A brief statement of the objectives of the experiment.

5. The experimental procedure in outline form. Essentially, this will be the procedure given in the manual with any additional information you need to complete the experiment.

6. Data and observations. Data is best recorded in tables. Think about the best way to construct these as you prepare for the experiment. As a general rule, you should expect to perform triplicate analysis. Record observations such as color changes, the formation of a precipitate, or a change in the temperature of the reaction vessel as you preform the experiment.

7. Calculations and results. Make sure to include all equations. If the same calculation must be performed a number of times, only one of them should be recorded in detail. Use a spreadsheet program such as OpenOffice calc for plotting and repeated calculations.

8. Conclusions and final results.

9. References (if not included as footnotes).
Typically, your Calculations and Conclusions account for at least 50% of a lab. Note: Attending lab and turning ‘something’ in is not enough for you to get a passing grade in lab.

Laboratory Grading Rubric

1. (2 points) Name, laboratory section number, and date on each page.

2. (2 points) Title (from the manual).

3. (20 points) Pre-Lab questions. A good answer for the ‘practical application’ question could result in the addition of up to five points (making the lab worth up to 105 points). The remaining questions are worth fifteen points, if there was a pre-lab quiz on D2L the points are assigned here and removed based on the score on D2L:

   25 points Outstanding ‘practical application’ answer (see below).
   20 points ‘Practical application’ question answered.
   15 points ‘Practical application’ question not answered.

   If there was not a pre-lab quiz on D2L:

   20 - 25 points All questions answered correctly and the ‘practical application’ question was answered to an additional depth (including detail beyond one or two sentences and possibly including secondary information).
   15 - 20 points All questions answered correctly.
   10 - 15 points All questions answered correctly with 1 or 2 incorrect answers, depending on the number of pre-lab questions (i.e. for pre-labs with 3 or 4 questions one incorrect answer constitutes 15 points; for pre-labs with five or more questions, two incorrect answers constitutes 15 points).
   5 - 10 points All questions answered, but there were multiple incorrect answers.
   0 - 5 points Most questions answered incorrectly or not attempted.
   0 points All questions answered incorrectly or not attempted.

4. (3 points) Objective.

5. (7 points) Procedure. The procedure is outlined in individual steps that identifies:
   • what the student is to do
   • when to record data
   • safety issues or disposal directions
   • time(s) involved

   7 points Procedure is complete and not missing individual steps or components listed above.
   4 – 7 points Procedure is missing individual steps or one component listed above.
   2 – 4 points Procedure is missing individual steps and/or one or two components listed above.
   0 – 2 points Procedure is missing individual steps and/or two or three components listed above.
   0 points Procedure is missing or inaccurate.

6. (20 points) Data and Observations. These must be recorded in real time, not added later. Sometimes observations are contrary to predictions, it is critical that they be recorded anyway.

   10 – 20 points Includes actual amounts of materials used and complete observations detailing any color change, gas evolution, temperature change, etc. To receive maximum points these must be written in such a way that another chemist could use them as a reference.

   5 – 10 points A complete report, but not terribly detailed would earn 20 points. This grade indicates that an important observation or a very small amount of data was missing.
0 – 5 points A report with very little detail. Missing data and observations.

0 points The section is missing or shows a gross lack of effort by the student.

7. (2 point) Names and signatures of all members of the assigned group (if applicable, otherwise added to the base).

8. (2 point) Serial numbers of equipment used (if applicable, otherwise added to the base).

9. (20 point) Calculations and Results.

20 points Calculations are correct and all results are presented with proper units.

10 – 20 points One of the follow possibilities occurs:

- Calculations are correct and all results are presented but missing units (1 point per missing unit).
- Calculations are incorrect with only one mistake in the process (even if it effects more than one calculation) but all results are presented.
- All results are not presented, but calculations are correct for those presented.

5 – 10 points Two of the above occur.

0 – 5 points Calculations are incorrect, all results are not presented, units are missing or incorrect, or calculations are missing.

0 points Section is missing or all calculations are incorrect and all units are missing or incorrect.

10. (20 points) Conclusions.

15 – 20 points The conclusion: is related to the original problem, is supported by the data, and the implications are completely discussed with little or no error.

10 – 15 points The conclusion: is related to the original problem, is supported by the data, and the implications are partially discussed with some errors and omissions.

5 – 10 points The conclusion: draws upon the language of the experiment and presents scientific terms, but does not define or discuss the relevance to the original problem; is in conflict with the experimental results; is related to the problem but is supported by the data to a limited extent.

0 – 5 points The conclusion: is missing, illustrates inaccurate understanding of the scientific concepts underlying the experiment, is not related to the stated problem, or most implications are missing.

0 points The conclusion: is missing or the the conclusion is unrelated to the experiment and not supported by the results.

11. (2 point) References (if applicable, otherwise this is added to the base).

A few things take points right off the top. Write the penalty and reason right on their lab.

-10 points If the lab was not legibly written in ink, double the points off if it happens a second time, and grade as zero (0) if it happens more than twice.

-10 points If they fail to clean up or put equipment away.

-10 points The first time they miss any portion of the pre-lab talk or come in late. Record their grade as zero (0) if it happens again, and record all labs as zero (0) until you get a written note from the instructor stating they are allowed back in lab.

-100 points If you catch a student without safety goggles write `-100 goggles’ on their lab and have them leave laboratory. Record all labs as zero (0) until you get a written note from the instructor stating they are allowed back in lab.

-100 points Late labs are graded as zero (0). Put ‘-100 Late’ on the first page. Completed labs are due by the start of their next scheduled lab period.