# COURSE OUTLINE
## Chemistry 104
### General Chemistry II

**Spring 2018**  
**Instructor:** Fred King  
**Room:** P-459

| Time         | Lecture 001,501 | T Th     | Instructor: Dr. Yang  
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<tr>
<td>8:00 - 9:15 a.m.</td>
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<td>9:00 - 11:50 a.m.</td>
<td>311</td>
<td>P402</td>
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<td>1:00 - 3:50 p.m.</td>
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<td>5:00 – 7:50 pm</td>
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| Time         | Lab 104 311   | M | **Instructor:** Dr. Carney  
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<td>9:00 - 11:50 a.m.</td>
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Laboratory Text: Chemistry 104 Laboratory Manual, University of Wisconsin - Eau Claire (This will be given out at the first lab).

## COURSE OBJECTIVES:

Chemistry 104 is the second course in the freshman chemistry sequence. It establishes the foundations for following courses in chemistry, and therefore a **solid grasp** of the important concepts in 104 is essential for future studies in chemistry. Even for those not continuing in chemistry, this course offers an exposure to **scientific thinking**, a necessity for **all** educated people in the complex society of today. This course will build upon the chemistry that you have learned in Chemistry 103.

## BACKGROUND EXPECTED

I expect that each student has the following background:

1. A solid working vocabulary of chemical terms (as discussed in Chemistry 103). (The Glossary at the back of the textbook will be most helpful to you for reviewing).

2. Be familiar with the names of the elements and their chemical compounds and their symbolic representation and the common oxidation numbers. Be familiar with the periodic table.
3. The writing and interpretation of chemical equations. Be able to carry out quantitative calculations for chemical reactions. Be able to carry out calculations involving the molarity of solutions.

4. Have some ideas on the nature of the chemical bond and the resulting consequences.

5. Electronic configurations and shapes of molecules.

6. Be familiar with the ideas discussed in Chemistry 103 lab.

You may wish to review the following Chemistry 103 topics, and read the appropriate sections in Kotz et al., on the topics that you have not previously studied.

103 TOPICS

**Topic**

**Introduction (Chapter 1)**
- a. Units and Conversion Factors
- b. Significant Figures
- c. Graphs
- d. Physical and Chemical Properties
- e. Classification of Matter: Substance, Elements, Compounds, Mixtures. Analytical Methods
- f. Scientific Method

**Gas Laws (Chapter 10)**
- a. Boyle's and Charles' Laws. Avogadro's Hypothesis
- b. Ideal Gas Law and Evaluation of the Gas Constant R
- c. Dalton's Law of Partial Pressures
- d. Real Gases
- e. Kinetic Theory of Gases

**Atoms, Molecules, and Ions (Chapter 2)**
- a. Laws of Definite and Multiple Proportions
- b. Atoms: Protons, Neutrons, Electrons. Atomic Number
- c. Molecules and Ions. Molecular and Ionic Compounds
- d. Atomic Mass, Molecular Mass. Isotopes
- e. Avogadro's Number
- f. Inorganic Nomenclature
- g. Empirical and Molecular formulas

**Chemical Formulas and Equations (Chapter 3 and Chapter 4)**
- a. Stoichiometry
- b. The Mole
- c. Interpretation of Chemical Equations
- d. Limiting reagent
e. Molecular and Ionic Equations
f. Reactions Involving Gases

**Periodic Table (Chapter 2)**
a. Structure of the Periodic Table
b. Periodic chemical and physical properties in relation to the periodic table.
   Predictions

electronic structure of atoms (Chapter 6 and Chapter 7)
a. Energy levels of Atoms
b. Atomic Spectra
c. Quantum numbers, n, ℓ, m_ℓ, m_s
d. Atomic orbitals
e. Atomic electron configurations

**Chemical Bonding (Chapters 8 and 9)**
a. Ionic and covalent bonds
b. Electronegativity. Polarity. Bond Energies
c. Lewis Structures. Resonance
d. Molecular Geometry and its relation to polarity

**Liquids and Solids (Chapters 11 and 12)**
a. Types of Intermolecular Forces
b. Degrees of Molecular Order and Disorder
c. Vapor Pressure and Boiling Point. Critical Point
d. Sublimation. Fusion. Phase Diagrams
e. Solid Structure Types (Ionic, Molecular, etc.)
f. Crystal Structures

**Solutions (Chapter 13)**
a. Saturation, Unsaturation and Supersaturation
b. Concentration Units
c. Colligative Properties
d. Determination of Molar Mass in Solution. Effect of Ionization and Aggregation
e. Change of Solubility with Temperature

**Acids and Bases (Chapter 3)**
a. Arrhenius' Definitions of Acids and Bases
b. Ionization of Water and K_w
c. Calculation of pH in Strong Acids and Bases and their Mixtures
d. Nature of Weak Acids. Indicators.
e. Brønsted–Lowry and Lewis Definitions of Acids and Bases
This semester I want each student to master to the best of his/her ability, the following key topics:

1. Elementary thermodynamics applied to chemical systems.
2. Kinetics. Topics 1 and 2 provide answers to the two most central questions in chemistry: will a reaction go? (Thermodynamics). If it will, how fast? (Kinetics).
3. The nature of chemical equilibrium.
4. Electrochemistry
5. Basic organic chemistry – functional groups.

We will cover other topics in addition to these, but a great deal of chemical thinking is based on the above topics.

OFFICE HOURS

These are T (10-11:30 am), W (2-3:00 pm), Th (10-11:30 am), and F (2-3:00 pm). If these times change, I will post the changes on my office door (the yellow card).

I can meet at some other times, but you will need an appointment. If you have only one or two short questions, you might get help quicker by sending me an email. My office hours are not intended to be tutor sessions. If you think you need tutor help, see the end of this handout.

STUDY SUGGESTIONS

In any course, it is particularly advantageous to keep up with the material as it's presented. If you need help with your questions – seek help as soon as possible. The sooner your questions are answered, the easier it will be for you to move on and master the next section of material.

You will find it particularly valuable to read assigned material before it is covered in lecture.

It is necessary to read each lab experiment in advance of the scheduled lab.

REQUIRED ITEMS

(i) Safety goggles. These must be worn at ALL times when in the lab, unless the instructor gives other directions. You need these for the second lab period.

(ii) Electronic calculator. A device that can text message or send email, or otherwise connect to the internet, will not be allowed for exams or quizzes to serve as your calculator.

OPTIONAL ITEM
**OWLv2 software.** This is not required, but many students will find this very valuable. It gives access to an electronic copy of the textbook, and it also provides several other features. One of these is that it provides detailed solutions to the end-of-chapter problems, which can be particularly valuable. I intend to use this as an optional item this semester.

**ATTENDANCE POLICY**

I will record attendance in class as required by university regulations. I reserve the right to take poor attendance into consideration when assigning final grades. It is particularly important that every effort be made to attend each scheduled lab. **ALL laboratory experiments must be completed to receive a passing grade in the course.** If you miss a lab for good cause (e.g. you were sick), you need to complete the missed lab as soon as possible. Equipment and reagents do not remain in the lab for several weeks. If you are absent from lab, contact your lab instructor by email as soon as possible and he will try to arrange a time for you to make up a missed lab.

**WORK DUE**

A penalty of -20% may be assessed for late work. No work will be accepted once solutions are posted or papers returned. I grade problem sets with amazing speed, so you should plan to get your work completed by the assigned deadline.

**EXAMS**

There will be three exams plus a final exam. The tentative dates for the exams will be February 15, March 15, and April 19. Each exam (including the final) will be comprehensive.

There will be 5 lecture quizzes during the semester. If no quizzes are missed, the lowest quiz score will be dropped. Quizzes will be announced in lecture and will be given in the second half of the course.

**GRADES**

The grade obtained in this course will be a composite of your efforts in exams, quizzes, assignments, and laboratory work. You must give a satisfactory performance in both the laboratory and lecture components of the class, to receive a passing grade in the course. The instructor reserves the option of rewarding classroom participation.

+ and - grades will be given.
Grading breakdown of points

<table>
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<tr>
<th>Category</th>
<th>Points</th>
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<tbody>
<tr>
<td>Exams (lecture)</td>
<td>300</td>
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<tr>
<td>Quizzes (lecture)</td>
<td>100</td>
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<tr>
<td>Assignments (Lecture)</td>
<td>130</td>
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<tr>
<td>Laboratory work</td>
<td>220</td>
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<tr>
<td>Final Exam (comprehensive)</td>
<td>250</td>
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<tr>
<td>Course Total</td>
<td>1000</td>
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The lecture assignments will be worth ten points each.

I plan to “grade on the curve”. If you are not sure what that means, ask me in lab or lecture.

There are no set percentages assigned for a student to receive a particular grade. You will be able to keep track of how you are doing “on the curve” during the semester, since I have an open view electronic gradebook.

TENTATIVE LECTURE SCHEDULE

<table>
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<tr>
<th>WEEK</th>
<th>TOPIC</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction and Thermochemistry (Chapter 5)</td>
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<td>2</td>
<td>Thermochemistry (Chapter 5)</td>
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<tr>
<td>3</td>
<td>Kinetics - rates of reactions (Chapter 14)</td>
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<td>4</td>
<td>Kinetics continued (Chapter 14)</td>
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<td>5</td>
<td>Chemical equilibrium (Chapter 15)</td>
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<tr>
<td>6</td>
<td>Chemical equilibrium (Chapter 15): Acid-base equilibrium (Chapters 16 &amp; 17)</td>
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<tr>
<td>7</td>
<td>Acid-base equilibrium continued (Chapter 17)</td>
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<td>8</td>
<td>Other aspects of aqueous equilibrium (Chapter 17)</td>
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<tr>
<td>9</td>
<td>Thermodynamics (Chapter 18)</td>
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<td>10</td>
<td>Thermodynamics (Chapter 18)</td>
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<tr>
<td>11</td>
<td>Electrochemistry: oxidation reduction (Chapter 19)</td>
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<tr>
<td>12</td>
<td>Electrochemistry: cells (Chapter 19)</td>
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<tr>
<td>13</td>
<td>Organic compounds (Chapter 23)</td>
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<tr>
<td>14</td>
<td>Organic compounds (Chapter 23); Coordination chemistry (Chapter 22)</td>
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<tr>
<td>15</td>
<td>Transition metal chemistry (if time permits)</td>
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The University suggests that course outlines include the following information that may be of value to students in the class.

Services for Students with Disabilities Office

Any student who has a disability and is in need of classroom accommodations, please contact the instructor and the Services for Students with Disabilities Office at the beginning of the semester.
Students who are non-native speakers of English may request extended test-taking time (time and a half). To determine eligibility, English proficiency is evaluated by the Academic Skills Center (for U. S. permanent residents/citizens) or by the Department of Foreign Languages (for international students). Students approved for the accommodation are given a verification form to present to their course instructors. Students must provide verification during each semester at least one week before the test for which accommodation is needed. Verification is valid for one semester. The accommodation policy does not apply to other forms of evaluation (e.g., papers, projects, group presentations) or to situations in which students must demonstrate clinical or similar skills.

**Supplemental Instruction Program.**

In the past several years UWEC has started a supplemental instruction program. This semester Ms. Sara Lavalley will be serving this class as a supplemental instruction program leader. She will be running help sessions on a regular basis for members of this class. Her principal objective will be to help students learn how to help themselves in problem solving and learning in general. Her purpose will not be to do your homework for you. If you are struggling early on or think you will need extra help, take advantage of this extra opportunity. There is no cost associated with this. The times for meetings will be announced in class.

**Tutor help**

If you start to struggle early on, get help quickly. The Academic Skills Center provides help for students in small groups (usually around three in number). There is no charge for this service. This can be effective if you strike a very good tutor. The American Chemical Society Student Affiliate Group runs tutors at different times during the week in P426. I will provide a list when I get one. If the first tutor in this group you encounter cannot help you, try a different tutor at a different time. There are often tutors with very different skill sets. There is no cost to get help from these tutors.

**Study Groups**

Chem 104 is concept rich and has a very heavy emphasis on problem solving, much more so than Chem 103. Because of the number of students with high profile career objectives, the class can seem intense. In my opinion, the class works best when you make an effort to help less able students in the class. For the stronger student, this should help reinforce the material as you explain concepts to someone less able. Study groups can be an effective way to help yourself and others. My suggestion is that a group of around 3 to 5 people works best. Remember, it is primarily not a social group, but rather a way to help you with the class content.
My principal course objectives

To get those of you who are science majors, well prepared for any chemistry course you may need to take in the future. To ensure that the general education folks leave the course with an appreciation for the scientific approach to problem solving. For all students: to **think more critically**, to **work harder**, and to **use time wisely**.

Academic integrity

I expect each student will do the work of the class with academic integrity.

Classroom behavior

a. Turn **off** cell phones when you come to class. This includes both lecture and lab.

b. Computer use in class should be connected with the class, and **not** other outside work.

c. If you need to leave the lecture early for good cause, sit at the front of the class, and as a courtesy to the instructor, explain your need to leave early.

d. **Constantly coming late to class is a sign of bad manners.** If you miss the safety instructions at the start of a lab, you may be asked to come to lab at another time.

e. The class this semester will be very large. Carrying out conversations in the middle of the lecture shows a lack of respect to other students in the class.

f. If you are showing signs of the flu, stay home and get some rest. Send me an email to let me know your situation.

g. Addressing instructors directly by their surname is regarded by many older folks as a sign of bad manners. While this might be okay on a sports team, it is not appropriate for the general academic setting.

h. Show respect for other people in the class, and expect the same from others. Include the instructor in this group.