



**National Taiwan University of Science and Technology**

**2020 Summer Program**

**CHEM 101 Introduction to Chemistry with Lab**

**Course Outline**

**Term: July 06-August 07,2019**

**Class Hours: 10:00-11:50 (Monday through Friday)**

**Course Code: CHEM 101**

**Instructor: Todd A. Wells, Ph.D.**

**Home Institution: University of Denver**

**Office Hours: TBA & By Appointment**

**Email: todd.wells@du.edu**

**Credit: 4**

**Class Hours:** According to the regulations of Minister of Education, R.O.C, 18 class hours could be counted as 1 academic credit in all universities in Taiwan. This course will have 72 class hours, including 40 lecture hours, professor 10 office hours, 10-hour TA discussion sessions, 2-hour review sessions, 10 laboratory hours.

**Course Description:** This course is a study of the fundamentals of chemistry. A survey of atomic structure, periodicity, bonding, nomenclature, stoichiometry, gas laws, and solution chemistry is provided for those students with no background in these areas.

**Lecture:** The format of class meetings will be a combination of traditional lecture format, problem solving/group activities, group discussions, and laboratory exercises. I will summarize new material and present illustrations and examples. In lecture, I WILL NOT identify and describe every detail you will read in the text and any supplemental materials. I will, however, emphasize the important topics covered in the reading as well as problem solving strategies when appropriate. You should stop me at any time if you have

questions about the material being covered.

In the problem solving/group activities, material from the lecture will be explored in greater detail. We will work on specific "challenge problems" in small groups and any questions you have on the material covered in lecture or homework problems.

**Reading:** You are expected to complete the assigned reading prior to the class lecture. After lecture, you should reread the assigned text. I recommend that you understand the material and how to solve the sample problems before proceeding to the next section. At the end of each chapter, a summary of important equations and terms is provided that should prove helpful in the preparation for exams.

### Course Learning Outcomes:

1. Apply significant figures correctly in measurements and calculations.
2. Use dimensional analysis to solve a variety of problems.
3. Use the periodic table to assist in explaining chemical bonding, polarity, and physical and chemical properties of elements.
4. Calculate amounts of chemical species using information from chemical formulas and chemical equations.
5. Correlate information from balanced chemical equations to the microscopic scale.
6. Explain atomic structure using the quantum mechanical model of the atom
7. Calculate the mathematical relationship between variables after graphing the experimental data.
8. Apply knowledge of chemistry principles to real world situations.

**Required Textbooks:** We will also use an online textbook found at OpenStax Chemistry (open source e-book): <https://openstax.org/details/books/chemistry-atoms-first-2e>

**Homework:** Each lecture has a group of homework problems assigned to it. The problems are chosen to prepare you for the hour exams. If you understand and can do all the homework, you probably will do well on the exams. To get the most benefit from homework, you should **do the assignments on schedule**. It is important to keep up with these assignments!

**In-class Activities:** In-class activities will allow you to apply your knowledge. These activities may be more challenging than the assigned homework. You will work in small groups to complete these activities. The in-class activities will be graded.

**Exams:** There are two hour exams during the course, plus a cumulative final exam. Each exam counts 200 points. Exam problems will be similar to the problems assigned as homework and the problems worked in class.

### Grading & Evaluation:

Your final grade is based on a maximum of 1000 points, distributed as follows:

<b>Hour exams (200 points each)</b>	<b>400 points</b>
<b>Final exam</b>	<b>200 points</b>
<b>Homework</b>	<b>100 points</b>
<b>In-class Activities</b>	<b>100 points</b>
<b>Lab</b>	<b>200 points</b>

### Grade Ranges

A $\geq$ 94%	B- 80-83%	D+ 67-69%
A- 90-93%	C+ 77-79%	D 64-66%
B+ 87-89%	C 74-76%	D- 60-63%
B 84-86%	C- 70-73%	F $\leq$ 59

### Course Schedule:

#### Week1

1. Matter and Energy
  2. Atoms/elements
  3. Light, electrons and atomic theory
  4. Electronic configuration
  5. Periodic Table
- Lab1 - Lighting the way to atomic structure

#### Week2

6. Periodic Trends
  7. Compounds
  8. Chemical Bonds
  9. Lewis structures
  10. Molecules and shapes of molecules
- Lab2 - Periodic Trends and Electron Configuration

#### Week3

11. Problem solving
12. Grams, Moles and Mass percent
13. Chemical Reactions



14. Balanced Chemical reactions
  15. Solutions, Solubility and precipitation reactions
- Lab3 – A look at Chemical Formulas

#### Week4

16. Acids and Bases
  17. Acid Base reactions
  18. Oxidations and reductions
  19. Oxidation reduction reactions
  20. Balancing redox equations
- Lab4 – The reactions of Copper

#### Week5

21. Limiting reactant and yield
22. Intermolecular forces and water
23. Solutions-homogeneous and heterogeneous
24. mass percent, molarity
25. Dilutions

