TENNESSEE STATE UNIVERSITY

**COLLEGE OF LIFE AND PHYSICAL SCIENCES**

**DEPARTMENT NAME**

**CHEM 1120: GENERAL CHEMISTRY II**

# SEMESTER: Fall 2019 INSTRUCTOR: Dr. Tasneem Ahmed Siddiquee

# TELEPHONE: 615-963-5337 EMAIL: tsiddiqu@tnstate.edu

# OFFICE: Boswell 218 OFFICE HOURS: M, 11:30-1:30 (office); W, 11:30-12:30 (office), 12:30-1:30 (Room 106); W, 4:25-5:25 (office); R, 4:25-5:25 (office)

1. **CATALOG COURSE DESCRIPTION:** Three (3) credit hours. A comprehensive study of chemical principles designed for students pursuing a career in chemistry or other scientific areas. Material to be covered includes introduction to metric system and scientific notation, structure of matter, nomenclature, composition and reaction stoichiometry, types of chemical reactions, atomic structure, chemical bonding, reactions in aqueous solutions, gases and kinetic molecular theory, and thermochemistry.

# COURSE OBJECTIVE: Upon successful completion of General Chemistry II, a student will continue to develop the analytical and critical thinking skills necessary to solve chemical problems, with special emphasis on solutions, kinetics, equilibrium, thermodynamics, and electrochemistry.

1. **STUDENT LEARNING OUTCOMES**
   1. Describe the various intermolecular forces and how they influence various properties of matter and changes of state
   2. Describe solution composition, concentration and how they form
   3. Explain, calculate and use the Colligative properties of solutions; the van’t Hoff factor in electrolyte solutions
   4. Describe the factors that affect kinetics (rate) of a reaction
   5. Explain how concentration affects reaction rate using rate laws and how time is involved in kinetics using integrated rate laws
   6. Describe a reaction mechanism and explain how a catalyst functions
   7. Explain the equilibrium condition and describe it in terms of the equilibrium constant
   8. Solve equilibrium problems using various strategies
   9. Apply LeChatelier’s principle to equilibrium systems
   10. and define acids and bases using the Arrhenius and Brönsted-Lowry theories
   11. acid strength, the pH scale and calculate the pH of strong and weak acid and/or base solutions
   12. Describe the pH properties of salt solutions
   13. Describe buffered solutions, buffer systems and the *Common Ion* effect
   14. Describe the equilibria involving slightly soluble salts and complex ion formation
   15. Explain and describe the three laws of thermodynamics; enthalpy and entropy
   16. Describe Gibbs free energy and reaction spontaneity; free energy and the equilibrium state
   17. Describe an electrochemical cell and know the difference between Galvanic and electrolytic cells
   18. Carry out various electrochemical calculations including cell potential and using the Nernst equation
2. **GENERAL INFORMATION**

**Number of Credit Hours:** 3.0

**Class Days:** M/W, 9:35 – 11:00 am, Boswell 12

**Required Text Book:** *“CHEMISTRY: An Atoms First Approach”* 2nd Ed. By Zumdahl and Zumdahl, Cengage Learning, ISBN 1-305-07924-8 (part of the university book bundle)

**Prerequisites:** CHEM 1110 and two years of high school algebra or MATH 1010.

1. **CLASS ATTENDANCE:** Students are expected to attend every lecture in its entirety. Students are expected to read and study the material to be discussedpriorto the lecture. This includes working on problems and exercises given in the text. Students should review the material discussed until comprehension is acquired and seek assistance when necessary. The Chemistry Department Tutorial Center is available to students needing help with chemistry. The Tutorial Center is in room 106 (Chem. Bldg.).
2. **GRADING POLICY:**

3 Hourly Exams 45%

On Line/Module-Quizzes 25%

In Class Review Quizzes 10%

Final Exam 20%

TOTAL 100%

1. **GRADING SCALE**

**Grade Score Range Significance**

A 90 - 100% Excellent, work of exceptional quality

B 80 - 89% Good, work above average

C 70 - 79% Work of average quality

D 60 - 69% Poor, representing passing work

F 0 - 59% Failure, representing unacceptable performance

1. **EXAM POLICY:** Exam dates are listed in this syllabus (any changes to the schedule will be announced in class) and course coverage of the exams will be announced by the instructor at least one week prior to the exam. You must let the instructor know as soon as possible if you know you will miss an exam. There will be **NO** make-up exams. If you miss an exam AND you provide a VALID excuse, your score on the final exam will be used in place of the exam you missed. This will be allowed for only ONE missed midterm exam.
2. **READING ASSIGNMENTS & HOMEWORK:** Reading assignments will be given immediately prior to the beginning of the next chapter topics. We will begin with chapter 1 and proceed in the order as stated in the lecture schedule. After the first lecture it will be assumed that you have read the appropriate chapter before coming to class. The homework will be assigned on a regular basis. Homework will be assigned, tracked, and graded using the *OWLv2®* online system. There is a strong, positive correlation between actively practicing the concepts and problem-solving techniques discussed in lecture by completing the homework assignments and doing well in this course.
3. **ACADEMIC INTEGRITY:** In accordance with the university’s policy on academic and classroom misconduct found in the catalog, cheating will not be tolerated in this course and a zero-tolerance policy regarding cheating will be followed throughout the course. A student who is caught cheating or attempting to cheat will be given a zero (F) for that particular assignment/test/quiz for the first offense. If a student is caught cheating a second time, that student will be given an overall grade of “F” for the course. To this end, the following classroom policies will be in effect and enforced.
   * Cell phones and any other electronic devices (including smart watches) that connect to wireless networks will not be permitted during any exam or quiz. These devices may not be on your desk during an exam or quiz and must be stored in your bag or purse and/or turned off. Calculators may be used, only if the questions on the exam or quiz warrant their use.
   * Once an exam or quiz period has started, you will not be permitted to leave to go to the restroom during the exam period. Please be sure to use the restroom before coming to class. Exceptions will only be made for those with documented medical needs.
   * No outside materials may be used during an exam or quiz. Any necessary materials (*i.e.* periodic table, equations & constants, scratch paper, *etc.*) will be provided for you.
   * Sunglasses and hats may not be worn during an exam or quiz period.
   * The use of headphones and/or earbuds during an exam or quiz is strictly prohibited.
   * Duplication or copying of homework assignments will result in a score of zero (F) for each student submitting a copied homework assignment.
4. **DISABILITY ACCOMODATIONSTATEMENT**

TSU is committed to creating inclusive learning environments and providing all students with opportunities to learn and excel in their course of study. Any student with a disability or condition which might interfere with his/her class performance or attendance may arrange for reasonable accommodations by visiting the Office of Disability Services (ODS). ODS is located in Kean Hall, room 131 and can be reached at 963-7400 or [www.tnstate.edu/disabilityservices](http://www.tnstate.edu/disabilityservices) .  You will be required to speak with ODS staff and provide documentation of the need for an accommodation.  If you qualify for an accommodation you will be provided with a document stating what type of classroom accommodations are to be made by the instructor.  It is your responsibility to give a copy of this document to the instructor **as soon as you receive it**.  Accommodations will only be provided **AFTER** the instructor receives the accommodation instructions from ODS; accommodations are not retroactive.  You must follow this process for each semester that you require accommodations.

1. **SEXUAL MISCONDUCT, DOMESTIC/DATING VIOLENCE, STALKING**

TSU recognizes the importance of providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking.  If you (or someone you know) has experienced or is experiencing any of these incidents, there are resources to assist you in the areas of accessing health and counseling services, providing academic and housing accommodations, and making referrals for assistance with legal protective orders and more.

Please be aware that most TSU employees, including faculty and instructors, are “responsible employees”, meaning that they are required to report incidents of sexual violence, domestic/dating violence or stalking.   **This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking, I must report the information to the Title IX Coordinator.**  Although I have to report thesituation, you will still have options about how your situation will be handled, includingwhether or not you wish to pursue a formal complaint.  Our goal is to make sure you areaware of the range of options available to you and have access to the resources youneed.

You are encouraged to contact TSU’s Title IX Coordinator to report any incidents of sexual harassment, sexual violence, domestic/dating violence or stalking.  The Title IX coordinator is located in the Office of Equity and Inclusion, General Services Building, Room 210 and can be reached at 963-7494 or 963-7438.  For more information about Title IX and TSU’s SART or policies and procedures regarding sexual, domestic/dating violence and stalking please visit:  [www.tnstate.edu/equity](http://www.tnstate.edu/equity).

If you wish to speak to someone confidentially, who is not required to report, you can contact the TSU Counseling Center, located in the basement of Wilson Hall, at 963-5611 or TSU Student Health Services, located in the Floyd Payne Campus Center room 304, at 963-5084.  You may also contact the following off campus resources:  Sexual Assault Center of Nashville at 1-800-879-1999 or [www.sacenter.org](http://www.sacenter.org) or the Tennessee Coalition to End Domestic & Sexual Violence at 615-386-9406 or [www.tncoalition.org](http://www.tncoalition.org).

1. **HARRASSMENT & DISCRIMINATION**

Tennessee State University is firmly committed to compliance with all federal, state and local laws that prohibit harassment and discrimination based on race, color, national origin, gender, age, disability, religion, retaliation, veteran status and other protected categories.  TSU will not subject any student to discrimination or harassment and no student shall be excluded from participation in nor denied the benefits of any educational program based on their protected class.  If a student believes they have been discriminated against or harassed because of a protected class, they are encouraged to contact the Office of Equity and Inclusion at General Services Building, Room 210, 615-963-7494 or 963-7438, [www.tnstate.edu/equity](http://www.tnstate.edu/equity).

1. **IMPORTANT DATES**

8/19/19: Classes begin

8/30/19: Campus Wide Assembly

9/2/19: Labor Day (no classes)

9/22-28/19: Student Study Week

9/27/19: Mid-term “Marathon Recitation” session

9/30/19-10/4/19: Mid-term exam week

10/11/19: Withdrawal deadline

1/22/19: Final exam “Marathon Recitation” session

11/25-29/19: Fall Break & Thanksgiving (no classes)

11/30/19: Last day of classes

12/2-6/19: Final Exams

12/7/19: Commencement

## DETAILED TENTATIVE COURSE OUTLINE

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| Week | Topics Covered | Chapter/Sections |
| 1 | Intermolecular Forces: Effects  Identify Intermolecular Forces: Inorganic  Hydrogen Bonding: Organic  Identify Intermolecular Forces: Organic  Evaporation and Vapor Pressure  Intermolecular Forces and Vapor Pressure  ΔHvap, Vapor Pressure and Temperature Calculations  Vapor Pressure Plots: Boiling Point | Chapter 9 |
| 2 | Heating Curves: Interpret  Vapor Pressure Plots: Intermolecular Forces  Phase Diagrams: Interpret  Phase Changes and Energy Flow: Particulate  ΔHvap: Energy to Vaporize/Condense  Enthalpy of Fusion/Freezing  Mass Percent  Mole Fraction and Mass Percent | Chapter 9 and 10 |
| 3 | Molality  Molality and Mass Percent  Molarity: Mass Percent and Density  Solution Terminology  Solution Formation  Intermolecular Forces and Solubility  Raoult’s Law Calculations  Nonelectrolyte Solutions: Boiling/Freezing Point Calculations | Chapter 10 |
| 4 | Molar Mass from Boiling Elevation/Freezing Depression  Osmotic Pressure Calculations  Osmotic Pressure: Calculate Molar Mass  Reaction Coordinate Diagrams  **Exam 1 (9/11/2019)** (1 hour; 9:35-10:35 AM) and  Class (25 minutes; 10:35-11:00 AM):  Average Rate from Concentration |  |
| 5 | Reaction Rate and Stoichiometry  Ea or k from Arrhenius Plot Information  Arrhenius Equation Calculations  Rate Law: Write and Apply  Determinine Rate Law: Initial Rates  Integrated Rate Law Calculations: 1st Order  Integrated Rate Law Calculations: 0 or 2nd Order  Half-Life and Order from Concentration | Chapter 11 |
| 6 | Microscopic Reversibility  Writing Equilibrium Expressions  Calculate K: From Equilibrium Concentrations  Calculate K for Rearranged Equation  Calculate K: From Initial + One Final Concentration  Writing Equilibrium Expressions: Kp  Kp and Equilibrium Pressures  Kp and Kc | Chapter 12 |
| 7 | Kp with Initial and Equilibrium Pressures  Writing Equilibrium Expressions: (Aqueous)  Equilibrium Constant: Magnitude  Reaction Quotient: Qualitative  Reaction Quotient: Calculate  Le Châtelier Principle: Concentration Effect  Le Châtelier Principle: Volume Effect  NIE: Brønsted Acid or Base in Water | Chapter 12 and 13 |
| 8 | Identify Conjugate Pairs in Reactions  Choose Brønsted–Lowry Acids  Conjugate Acid/Base Strength from Ka  Autoionization Reactions Exam 2 (10/16/2019) (1 hour; 9:35-10:35 AM) and Class (25 minutes; 10:35-11:00 AM):  The pH Scale |  |
| 9 | Strong Acid pH and pOH  Ka: Calculate from pH  Ka: Weak Acid Calculations (5% rule)  Strong Base pH and pOH  Kb: Weak Base Calculations (5% rule)  Choose Brønsted–Lowry Bases  Strength of Binary Acids  Strength of Oxo Acids | Chapter 13 |
| 10 | Lewis Acids and Bases  Buffers: Identify  Buffers: Calculate pH, Acidic (5% rule)  Buffers: Calculate pH, Basic (5% rule)  Buffers: Calculate pH (Henderson–Hasselbalch)  Buffers: Calculate Acid/Base Ratio (Henderson–Hasselbalch)  Buffer + Acid/Base: Write Equation  Buffer + Acid/Base: Calculate pH (5% rule) | Chapter 13 and 14 |
| 11 | Buffer + Acid/Base: Calculate pH (Henderson–Hasselbalch)  Buffer Preparation: Choose Reagents  Writing Ksp Expressions  Ksp: Interpret Magnitude and Solubility  Ksp: Calculate from Solubility (mol/L)  Writing Dissolution and Precipitation Equation  Ksp: Calculate from Solubility (g/L)  Solubility: Calculations | Chapter 14 and 15 |
| 12 | Solubility: Calculate Mass or Volume  Solubility: Compare  Common Ion Effect: Compare Solubility  Common Ion Effect: Calculate Solubility  Compare Absolute Entropies  ΔS(surroundings): Calculate  ΔS: Phase Change  ΔG: Predict Signs | Chapter 15 and 16 |
| 13 | ΔG: Enthalpy, Entropy and Temperature  ΔG: Calculate Temperature Limit  Predict the Sign of ΔS  Standard Entropy of Reaction Exam 3 (11/13/2019) (1 hour; 9:35-10:35 AM) andClass (25 minutes; 10:35-11:00 AM): ΔGo = ΔHo – TΔSo  Calculate K from ΔGo |  |
| 14 | Fall Break – No Classes |  |
| 15 | Half Reactions  Half Reaction: Write and Balance Given Reaction Skeleton (acid)  Half Reaction: Write and Balance Given Reaction Skeleton (base)  Half Reaction: Balance, H2O, H+ in Skeleton (acid)  Half Reaction: Balance, H2O, OH- in Skeleton (base)  Combining Half Reactions  Full Reactions: Balance, Identify Agents (acid)  Full Reactions: Balance, Identify Agents (base)  Electrochemical Cells: Components and Reactions and Cell Potential (*Ec-Ea*) | Chapter 17 |
| Final Exam (Schedule not yet published) | | |