# General Chemistry I: PHYS 1311

**Fall 2019 Syllabus**

**Lecture**

**Meeting Times:** Online — **Location:** WSB 307

**Instructor:** Anirban Bhattacharjee

**Office: WSB 317** — **Email:** axb14ku@l.sulross.edu

**MWF 10-11 AM W 3:30-5:30 PM or by appointment**

## Program Learning Objectives (PLO):

A student graduating with the chemistry major is expected to demonstrate that s(he) is able to:
1. Explain atomic and molecular structures, bonding, thermodynamics, chemical equilibria and kinetics, stoichiometry, and electrochemical processes;
2. Write and explain organic reactions, stereochemistry, and reactions in biological systems;
3. Use essential modern instruments to perform chemistry experiments in the laboratory;
4. Write a review on a topic of his/her choice using recent literatures; and
5. Summarize basic principles of research design and analyze experimental data using appropriate computer programs (e.g. Excel, Sigma-plot, etc.) in regards to the chemistry discipline.

## Program Student Learning Objectives (SLO):

At the end of this course, a student should have a good understanding of:
1. The basic concepts and terms used in chemistry
2. The electronic structures of atoms and the periodic table
3. The basic concepts of chemical bonding
4. Chemical reactions in aqueous solutions
5. The ideal gas equation

Core Objectives (CO):

1. Critical Thinking Skills –Students will gain/improve their critical thinking ability by solving real life chemistry problems through inquiry, analysis, and evaluation of available information. Students will be tested on their critical thinking ability in exams and through lab experiments.
2. Communication Skills –Students will have the opportunity of improving communication skills through oral discussion and writing reports (i.e. observation, explanation, and conclusion, etc.) on the experiments done in the lab sessions.
3. Empirical and Quantitative Skills– Students will use the mathematical skills needed to manipulate and analyze numerical data obtained through experimentation in order to form conclusions.
4. Teamwork –Students will use team-spirit and consider different points of view to work effectively while conducting experiments as a team working toward a shared purpose or goal.

## Resources:

**Required:**

General Chemistry(3rd Edition) by Raymond Chang (5th Edition or newer);
Lab Manual: Freshman Chemistry by Rangra and Houston
https://openstax.org/details/books/chemistry-2e

Loose-leaf paper – for in-class assignments
A simple scientific calculator

## Course Objectives:

The goals for this class are as follows:

- Appreciate the scientific process, how it works, the notion that physical laws are universal, the elements of scientific theories, what they do and do not tell us.
- Develop familiarity with the basic concept of Dynamics,Statics, Motion (translational and rotational), properties of matter and waves
- Describe how data is collected from experiments, and what quantities can be measured/inferred, and formulate conclusions from the results of those experiments.
- Understand basic - yet crucial - physical laws, and the processes that govern natural events
- Integrate concepts from maths and physics to explain relationships and able to converse with other students using proper scientific terminology.

## Instructional Philosophy of the Course:

The overarching goals of this course are for you to understand the nature of science through the eyes of physics; to understand the big ideas in physics; and to develop a lifelong interest in physics and current events surrounding physics. To meet these three goals, the course instructors have carefully designed a sequence of learning tasks and assessment procedures as outlined below.

-*Active engagement with nearly daily group activities.* It is a demonstrated fact that you can only learn a limited amount of information from lecture alone, no matter how clear or entertaining. Therefore, this course is composed of a series of mini-lectures posted as powerpoints online on Blackboard

–*Attendance at all classes is is expected and very strongly encouraged.* Because this course is built around daily activities to accompany the lecture, your attendance and full participation at each class period will be an essential component of your success in the course. Periodically we will administer unscheduled questionnaires in class that will be collected during class and used to establish a participation grade. These questionnaires will not be given a letter or numeric grade, rather you will be given credit for what you complete on an all or nothing basis.I will be keeping attendance throughout the course, not necessarily for grading purposes (though good attendance can help you in borderline grade cases) but mostly because it is helpful for me when evaluating myself to know what attendance was like.

-*Carefully studying the text is REQUIRED.* The course mini-lectures are designed to focus on the really difficult aspects of Physics or to provide structure for your out-of-class study. You are accountable for all material, concepts, and interrelationships presented in the mini-lectures and the text. Therefore, it is imperative to your success in this course that you complete the assigned readings prior to coming to class. Reading assignments should be completed BEFORE the date listed. Otherwise, the mini-lectures and tutorials will be less useful in helping you develop a deep understanding of the course topics. It is important to remember that the exams or questionnaires will cover material from the text readings that may or may not be discussed in class.

**Assessment and Grading:**

In order to promote an active and collaborative learning environment, there will be no curve to assess grades. Each student will only be competing against themselves, and will be responsible for gaining the declarative knowledge and conceptual understanding for performance. This is a three credit class with three credits in the primary lecture section (§1).

The portion of the grade in the lecture section will come from two sources sources: (1) midterm exams, (2) final exam, and (3) homework . Midterm exams will account for 50% of the final grade. There will be at least three midterm exams. **The lowest score will be dropped.** There will be no make ups for the midterm exams. **Your Midterms will be timed**

The exams will test your understanding of key concepts in physics. A list of these concepts can be found in this syllabus. Along with each exam, we will also ask for opinions regarding what you like, dislike, and ask for suggestions for improving the class.

**Homework will be 25% of the final grade. Final will be 25% of the final grade. Midterm exams will be 50% of the final grade**

As mentioned above in the **Instructional Philosophy of the Course** section, I will periodically ask you to write a short paragraph on loose-leaf paper in class on a topic of our choosing. The topic may be related to the assigned reading, to a current event in physics, or to a key concept covered in that class period. These will be collected and perused by the instructors. Answers demonstrating a command of the assigned reading or concepts will be given full credit. No numerical or letter grade will be assigned to these questionnaires. In cases of university-sanctioned excused absences (e.g., university athletics, religious holidays), it is up to you to inform the me of the absence **well in advance of the date**, supplying both the dates and your name. If have done so and there are quizzes on those dates, you will not be penalized for missing them.

The final grade will be computed using the scores from the top three midterm exams and homeworks in the following manner:

Grading Scheme

| Total Points | Grade |
|---|---|
| 90–100 | A |
| 80–89.999... | B |
| 70–79.999... | C |
| 60.–69.999... | D |
| <59.9999 | F |

From the total points, letter grades will be assigned according to the table on the right. There will be no plus or minus grades assigned.

Students with disabilities: If you require any special accommodations to participate in the class or complete assignments, please contact the instructor as soon as possible. The university is committed to equal access in compliance with the Americans with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. The ADA coordinator has the responsibility to assist students with disabilities in gaining opportunities for full participation in programs, services and activities. The Counseling Center is located in Ferguson Hall room 112 and is open Monday - Friday from 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m.

## Academic Honesty:

Academic Dishonesty is defined as:

"The University expects all students to engage in all academic pursuits in a manner that is beyond reproach and to maintain complete honesty and integrity in the academic experiences both in and out of their classroom. The University may initiate disciplinary proceedings against a student accused of any form of academic dishonesty, including but not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials. 1. Cheating includes:

- a. Copying from another students test paper, laboratory report, other report, or computer files, data listings, and/or programs, or allowing another student to copy from same.
- b. Using, during a test, materials not authorized by the person giving the test.
- c. Collaborating, without authorization, with another person during an examination or in preparing academic work.
- d. Knowingly, and without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the contents of an unadministered test.
- e. Substituting for another student; permitting any other person, or otherwise assisting any other person to substitute for oneself or for another student in the taking of an examination or test or the preparation of academic work to be submitted for academic credit.
- f. Bribing another person to obtain an unadministered test or information about an unadministered test.
- g. Purchasing, or otherwise acquiring and submitting as ones own work any research paper or other writing assignment prepared by an individual or firm. This section does not apply to the typing of the rough and/or final versions of an assignment by a professional typist.
- h. "Plagiarism" means the appropriation and the unacknowledged incorporation of anothers work or idea in ones own written work offered for credit.
- i. "Collusion" means the unauthorized collaboration with another person in preparing written work offered for credit.

- j. "Abuse of resource materials" means the mutilation, destruction, concealment, theft or alteration of materials provided to assist students in the mastery of course materials.
- k. "Academic work" means the preparation of an essay, dissertation, thesis, report,problem, assignment, or other project that the student submits as a course requirement or for a grade.

Procedures for discipline due to academic dishonesty shall be the same as in other disciplinary actions, except that all academic dishonesty cases shall be first considered and reviewed by the faculty member. If, after reviewing the case, the faculty member believes that disciplinary action is necessary, he/she may recommend a penalty but must notify the student of his/her right to appeal to the academic department chair and, eventually, to the dean before imposition of the penalty. If the student does not accept the decision of the academic department chair or dean, the student may then follow the normal disciplinary procedures. No disciplinary action shall become effective against the student until the student has received substantive and procedural due process except as provided under Interim Disciplinary Action.

In addition, during the course of the semester, each student will be asked to carry out exercises in collaboration with other students. To nurture such an environment, we will consider any disruptive or disrespectful acts (such talking on a cell phone, or texting during class) to be a form of cheating. We consider academic dishonesty to be a serious offense and the maximum punishments allowed will be pursued in all scenarios. This includes completing any quizzes, or scantron forms with the help of another student or for scantron forms completed by another student who is not you. If similar work is submitted, all parties involved will receive a zero for their assignment. Make your work your own, be original.

**ADA Statement**

SRSU is committed to equal access in compliance with the Americans with Disabilities act of 1973. It is the student's responsibility to initiate a request for accessibility services. Student seeking accessibility services must contact ADA coordinator in Counseling and Accessibility Services, Ferguson Hall 112 . Ph: (432) 837-8203.

Course Calendar (Section 1)

Lecture 1 (August 26): Discussion on Syllabus, importance of chemistry

Lecture 2 (August 28): Classifications of matter, overview of states and properties of matter, physicals and chemical changes, units of measurements (length, volume, density, and temperature etc)

Lecture 3 (August 30): Scientific notation and significant figures, precision and accuracy

Lecture 4 (September 4): Discussion on selective questions and problems on chapter 1; Homework 1 due

Lecture 5 (September 6): Dalton?s atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford?s atomic model

Lecture 6 (September 9): Atomic number, mass number, isotopes, molecules, compounds, ions, molecular formula, empirical formula

Lecture 7 (September 11): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids

Lecture 8 (September 13): Discussion on selective questions and problems on chapter 2; Homework 2 due

Lecture 9 (September 16): Review on chapter 1 and 2

Lecture 10 (September 18): Exam I, Syllabus ? Chapters 1 and 2

Lecture 11 (September 20): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations

Lecture 12 (September 23): Chemical equations and balancing chemical equations

Lecture 13 (September 25): Calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields

Lecture 14 (September 27): Discussion on selective questions and problems on chapter 3; Homework 3 due

Lecture 15 (September 30): Terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions, writing balanced ionic equations

Lecture 16 (October 2): Acid-base reactions and oxidation numbers; oxidation-reduction reactions ? types with examples

Lecture 17 (October 4): Solution stoichiometry, concentration units, and gravimetric analysis; discussion on selective questions and problems on chapter 4

Lecture 18 (October 7): Physical properties of gases-relation between temperature, pressure, volume and amount of gases; Ideal gas law and its applications; Homework 4 due

Lecture 19 (October 9): Gas stoichiometry ? calculation of reactant/product amounts in gaseous reactions using ideal gas equation; Kinetic theory of ideal gases, deviation of ideal gas properties, modification ideal gas law for real gases

Lecture 20 (October 11): Discussion on selective questions and problems on chapter 5; Homework 5 due

Lecture 21 (October 14): Exam II; Syllabus ? Chapter 3, 4, and 5

Lecture 22 (October 16): Properties of light, black-body radiation and photo-electric effect

Lecture 23 (October 18): Atomic spectra and Bohr atomic theory

Lecture 24 (October 21): De Broglie equation, dual nature of particles, Schrodinger wave equation and orbital concept

Lecture 25 (October 23): Electronic configuration-Aufbau principle, Hund?s rule, paramagnetism

Lecture 26 (October 25): Discussion on selective questions and problems on chapter 7; Homework 6 due

Lecture 27 (October 28): Introductory discussion on periodic table, classification of elements and electronic configuration of ions

Lecture 28 (October 30): Periodic variation of properties of elements, Group properties of elements

Lecture 29 (November 1): Discussion on selective questions and problems on chapter 8; Homework 7 due

Lecture 30 (November 6): Review on chapters 7 and 8

Lecture 31 (November 8): Exam III; Syllabus ? Chapter 7 and 8

Lecture 32 (November 11): Basic concepts of chemical bonding, ionic bonds, lattice energy, and calculation of lattice energy, covalent bonds, polar covalent bonds and polarity

Lecture 33 (November 13): Lewis structures of molecules, formal charge calculation, Resonance structures and bond energy

Lecture 34 (November 15): Discussion on selective questions and problems on chapter 9; Homework 8 due

Lecture 35 (November 18): Molecular geometry ? Valence shell electron repulsion theory

Lecture 36 (November 20): Prediction of molecular geometry and polarity

Lecture 37 (November 22): Molecular geometry ? Valence bond and molecular orbital theories

Lecture 38 (November 25): Discussion on selective questions and problems on chapter 10; Homework 9 due

Lecture 39 (December 2): Review on chapters 9 and 10

Lecture 40 (December 4): Review on Final Exam