

Sul Ross State University
Syllabus –Spring 2023:
Foundations of Science Education II
Science Education 3409_001

Class Time: M W 6:00-7:15
Th 6:00-7:40

Class Room: WSB 321

Instructors:

Physics & Astronomy

Dr. Anirban Bhattacharjee
Office: Warnock Science Building (WSB) – 317
Phone: (432) 837- 8249
Email: axb14ku@sulross.edu
Office hours: MW 9-11, T 3:30-5, or by appt.

Chemistry

Dr. Hong Young Chang
Office: Warnock Science Building (WSB) – 219
Phone: (432) 837- 8113
Email: hxc19tv@sulross.edu
Office hours: MW 3-5, T 10:30-12, or by appt.

Class Website: Supplement contents and materials will be uploaded on the website:

<http://sulross.blackboard.com>

Text Book: No physical textbook is required. Supplemental content and material will be available online from the following open-source resources.

Physics:

1. [CK-12 Physical Science for Middle School | CK-12 Foundation \(ck12.org\)](http://ck12.org)
2. [CK-12 Physics for High School | CK-12 Foundation \(ck12.org\)](http://ck12.org)
3. Libraries: The Bryan Wildenthal Memorial Library in Alpine. Offers FREE resources and services to the entire students.

Chemistry:

1. [OpenStax Chemistry](https://openstax.org)
2. [ACS \(American Chemical Society\) Middle School Chemistry](http://acs.org)
3. [CK-12 Physical Science for Middle School | CK-12 Foundation \(ck12.org\)](http://ck12.org)

Course Description: This is the Second in a series of two courses offered to education students, in which students will learn and explore the teaching of required science content outlined in the TEA science competencies related to Physical Sciences, toward their future roles as elementary and middle school science teachers. This course provides a broad introduction to Chemistry and Physics including: (1) Matter (2) State of Solid, Liquid, and Gas (3) Measurement of Physical and Chemical Properties (4) Periodic Table from Elements (5) Several Chemical Reactions (6) Electricity and Magnetism; (7) Temperature, heat and thermal properties of matter; (8) Optics; (9) Atomic Physics.

Inquiry and investigation are promoted in this class such that preservice teachers may do the same in their future science classrooms. The class emphasizes problem-solving as a pedagogical tool and explores assessment types and lesson plans appropriate to varied science content.

Student Learning Outcomes: The graduating education student graduating with a BS in Education should be able to:

1. Students will demonstrate effective lesson planning.
2. Students will demonstrate written and oral proficiency through a variety of instructional strategies.
3. Students will demonstrate effective evaluative processes for assessing student learning

Course Learning Objectives:

1. Students will be able to distinguish science from pseudoscience and skeptically evaluate claims based on strength of evidence.
2. Students will describe the organization and functioning of living things, including the human body.
3. Students will refine personal teaching philosophy through studying theories and methodologies of elementary instruction and science pedagogy.
4. Students will demonstrate understanding of basic chemistry principles.
5. Students will demonstrate understanding of basic physics principles.

Marketable Skills:

1. Students have the ability to teach diverse learners in an inclusive learning environment.
2. Students have the ability to assess student learning.
3. Students have the ability to critically think and creatively adapt instructional strategies to an instructional setting.
4. Students have the ability to construct a classroom management plan.
5. Student have the ability to effectively use technology to communicate

Grading: There will be a variety of graded assignments through the course, from discussion boards to concept sketches to lesson plans to presentations. The final exam is set to be a 200 point comprehensive exam over both topic fields. If you miss an assignment or graded activity and have a legitimate excuse, contact your current instructor within 24 hours of the due date and we will arrange a make-up or late submission. If you do not contact us within 24 hours, you will receive a zero on that exam.

Attendance Policy: Students missing 20% of lectures (6 lectures) OR labs (3 labs) may be dropped from the class per the SRSU catalog. Any student dropped for excessive absences will receive an F for the course grade. Please notify your instructor BEFORE missing class for authorized activities, death in the family, or illness. Assignments missed for any reason must be made up within one week of the originally scheduled date. **REGARDLESS OF WHY AN ABSENCE OCCURS, YOU MAY BE GIVEN AN F FOR THE COURSE GRADE IF YOU ACCUMULATE SIX ABSENCES.** If you are feeling ill, have a fever of 100 F, or am exhibiting any symptoms of COVID infection, please stay home and self-quarantine until you are either tested and cleared, or have been symptom free for over 10 days.

Tests: 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). Your grade will be assigned based on the percentage of points you get out of a total possible 1000 points. **(400 pts Chemistry, 400 points Physics, 200 pts final exams)**. The first half of the course will be based on the Physics and Astronomy content material, or the Chemistry-based 4 material, depending on which section you are enrolled in. The second half of the course content and grades will be based on the other subject matter. For each of the two separate portions of the course, grades will be based

on the development of short question assessments for teaching competencies Tests: There will be a variety of graded assignments through the course, from discussion boards to concept sketches to lesson plans to presentations, and homework. **The final exam is set to be a 200 point comprehensive exam over both topic fields.** If you miss an assignment or graded activity and have a legitimate excuse, contact your current instructor within 24 hours of the due date and we will arrange a make-up or late submission. If you do not contact us within 24 hours, you will receive a zero on that exam.

Grading Scheme: According to the total point that students got

90---100	A
80---89.99	B
70---79.99	C
60---69.99	D
Below 59.99	F

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.

Lecture Courtesy: The general rules of classroom etiquette are below.

1. Please do not talk to others in class while the instructor is lecturing. If you have a question, ASK THE INSTRUCTOR! That's what we are here for.
2. No eating, chewing, dipping, etc.
3. Please turn cell phones to silent while in class. They are disruptive to the entire class, and detract from learning.
4. For remote connections, please attend class as professionally as one would do in person (i.e. Wearing proper clothes, not being disruptive or disrespectful to your peers, etc.)

SRSU Distance Education Statement: Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.

SRSU Disability Services: Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email rebecca.wren@sulross.edu. Our office is located on the first floor of Ferguson Hall (Suite 112), and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas, 79832.

Libraries: The Bryan Wildenthal Memorial Library in Alpine.

Offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library's website, library.sulross.edu. Off-campus access requires logging in with your Lobold and password. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or phone (432-837-8123).

Academic Integrity: Students in this class are expected to demonstrate scholarly behavior and academic honesty in the use of intellectual property. A scholar is expected to be punctual, prepared, and focused; meaningful and pertinent participation is appreciated. Examples of academic dishonesty include but are not limited to: Turning in work as original that was used in whole or part for another course and/or professor; turning in another person's work as one's own; copying from professional works or internet sites without citation; collaborating on a course assignment, examination, or quiz when collaboration is forbidden.

Classroom Climate of Respect: Importantly, this class will foster free expression, critical investigation, and the open discussion of ideas. This means that all of us must help create and sustain an atmosphere of tolerance, civility, and respect for the viewpoints of others. Similarly, we must all learn how to probe, oppose and disagree without resorting to tactics of intimidation, harassment, or personal attack. No one is entitled to harass, belittle, or discriminate against another on the basis of race, religion, ethnicity, age, gender, national origin, or sexual preference. Still we will not be silenced by the difficulty of fruitfully discussing politically sensitive issues.

Diversity Statement: We aim to create a learning environment for our students that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, socioeconomic class, age, nationality, etc.). We also understand that the crisis of COVID, economic disparity, and health concerns, or even unexpected life events could impact the conditions necessary for you to succeed. Our commitment is to be there for you and help you meet the learning objectives of this course. We do this to demonstrate our commitment to you and to the mission of Sul Ross State University to create an inclusive environment and care for the whole student as part of the Sul Ross Familia. If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with one of us. We want to be a resource for you.

TENTATIVE LECTURE OUTLINE

Note – This outline is subject to change for reasons of course interest, time constraint, or instructor whim. Assignments will be administered on the dates given, unless material relevant for a given assignment has not been covered as yet. Under such cases, a due date may be moved a class period or two to aid in the clarity and understanding of the material.

Date	Lecture #	Lesson Topics
Jan.18	Lecture 1	Understand safety regulations and guidelines for science facilities and science instruction.
Jan.19	Lecture 2	Know how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
Jan.23	Lecture 3	Know how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.
Jan.25	Lecture 4	Understand the historical development of science (e.g., cell theory, plate tectonics, laws of motion, universal gravity) and technology and the contributions that diverse cultures and individuals of both genders have made to scientific & technological knowledge.
Jan.26	Lecture 5	Understand safety regulations and guidelines for science facilities and science instruction.
Jan.30	Lecture 6	Understand concepts of precision, accuracy and error with regard to reading and recording numerical data from a scientific instrument.

Feb.1	Lecture 7	Demonstrate an understanding of the properties of universal forces (e.g., gravitational, electrical, magnetic).
Feb.2	Lecture 8	Understand how to measure, graph and describe changes in motion by using concepts of position, direction of motion and speed.
Feb.6	Lecture 9	Analyze the ways unbalanced forces acting on an object cause changes in the position or motion of the object.
Feb.8	Lecture 10	Analyze the relationship between force and motion in a variety of situations (e.g., simple machines, geologic processes).
Feb.9	Lecture 11	Understand conservation of energy and energy transformations and analyze how energy is transform from one form to another (e.g., potential, kinetic, mechanical, sound, heat, light, chemical, electrician a variety of everyday situations and how increasing or decreasing amounts affect objects.
Feb.13	Lecture 12	Understand the basic concepts of heat energy and related processes (e.g., melting, evaporation, boil, condensation, conduction, convection, and radiation).
Feb.15	Lecture 13	Online Quiz
Feb.16	Lecture 14	Understand the principles of electricity and magnetism and their applications (e.g., electric circuits, electromagnetic fields, motors, audio speakers, and lightning).
Feb.20	Lecture 15	Apply knowledge of properties of light (e.g., reflection, refraction) to describe the functioning of optical systems and phenomena (e.g., camera, microscope, rainbow, eye).
Feb.22	Lecture 16	Demonstrate an understanding of the properties, production, and transmission of sound.
Feb.23	Lecture 17	Online Quiz
Feb.27	Lecture 18	Describe sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants).
Mar.1	Lecture 19	Apply knowledge of transfer of energy in a variety of situations (e.g., the production of heat, light, sound and magnetic effects by electrical energy; the process of photo-synthesis; weather processes; food webs; food and energy pyramids).
Mar.2	Lecture 20	Understand applications of energy transformations
Mar.6	Lecture 21	The conservation of matter and energy in life and in earth and space science.
Mar.8	Lecture 22	Revision on all Chapters about Physics
Mar.9	Lecture 23	Online Exam
Mar.20	Lecture 24	Introduction of Matter, Composition of Matters Chemistry in context, Phases, Classification of Matter
Mar.22	Lecture 25	Introduction of Inquiry Action and Class Activity (IACA)
Mar.23	Lecture 26	Physical and Chemical Properties & Measurements, Units (SI Units), Measurements on Uncertainty
Mar.27	Lecture 27	Atoms and Law of Conservation of Matter, & Law of Definite Proportions
Mar.29	Lecture 28	IACA 1: Molecules Matter & IACA 2: Density
Mar.30	Lecture 29	Electrons, Nucleus, Atomic Structure, Neutral Atoms, Mass Number (A), Atomic Number (Z)
Apr.3	Lecture 30	Ions, Cations & Anions, Chemical Symbols, Atomic Mass, Chemical Formulas
Apr.5	Lecture 31	IACA 3: Protons, Neutrons, and Electrons

Apr.6	Lecture 32	Periodic Table, Classification of Elements, Type of Chemical Bonds, Molecular & Ionic Compounds, Monoatomic ions, Polyatomic ions
Apr.10	Lecture 33	Formula Mass, Moles, Avogadro's Number, Molar Mass, Solutions, Dilutions
Apr.12	Lecture 34	IACA 4: Periodic Table
Apr.13	Lecture 35	Online Quiz
Apr.17	Lecture 36	Energy Basics, Law of Conservation of Energy, Thermal Energy, Heat, and Temperature
Apr.19	Lecture 37	IACA5: Heat, Temperature, and Conduction
Apr.20	Lecture 38	Writing Chemical Equations, Balancing Chemical Equations,
Apr.24	Lecture 39	Classification Chemical Reactions, Acid & Base Reactions
Apr.26	Lecture 40	IACA 6: What is a Chemical Reaction?
Apr.27	Lecture 41	Energy Changes in Chemical Reactions
May.1	Lecture 42	Online Quiz
May.3	Lecture 43	Revision on all Chapters about Chemistry
May.4	Lecture 44	IACA 7: Energy Changes in Chemical Reactions & IACA 8: pH and color changes
May.8	Lecture 45	Online Exam about IACA
May.10	Lecture 46	Review on the Final Exam
May.12	Final Exam	Comprehensive Style Final Exam, Friday, May 12th, Online, 6:00PM to 8:00PM