I. COURSE DESCRIPTION

This is a science method course designed to introduce the prospective secondary school teacher to present day methodologies, materials technology concepts and principles used in the teaching of secondary school science.

II. COURSE RATIONALE AND OBJECTIVES

RATIONALE:
There is a growing concern at the state levels relative to students’ interest and performance in the sciences. Research studies seem to indicate that the United States students, when compared to students of the other nations, perform at lower levels on standardized tests, are exposed to curricula with fewer science courses and/or experiences and are less likely to select science as a career.

These deficiencies can be addressed, and possibly remedied, through an early and thorough exposure of students to science at the secondary school level. Subsequently, pre-service teachers will need up-dated preparation in the content and methodology of science teaching. Incorporation of integrative and hands-on activities, guided by the South Carolina Curriculum Standards will lure and retain students’ interest in science and provide them with a foundation that may encourage them to select science as a career.

These conceptualizations are consistent with the theme of the SOE conceptual framework: THE PROFESSIONAL EDUCATOR AS EFFECTIVE, REFLECTIVE, AND HUMANISTIC PRACTITIONER.

OBJECTIVES:
At the completion of their program all candidates should have a minimally a basic or proficient level of competency for each of the National Science Teacher Association’s Standards for Science Teacher Preparation. Upon completion of SCI 509, the successful candidate will be able to demonstrate basic/proficient competency in the standards that are in **italic and underlined**. All candidates will be required to provide evidence in an
electronic portfolio of, or a plan for, achieving basic or proficient competency (at minimum) for each of the dimensions for all ten standards:

**Standard 1: Content**  
Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they:

a. Understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.

b. Understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards.

c. Understand and can successfully convey to students important personal and technological applications of science in their fields of licensure.

d. Understand research and can successfully design, conduct, report and evaluate investigations in science.

e. Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.

**Standard 2: Nature of Science**  
Teachers of science engage students effectively in studies of the history, philosophy, and practice of science. They enable students to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science. To show they are prepared to teach the nature of science, teachers of science must demonstrate that they:

a. Understand the historical and cultural development of science and the evolution of knowledge in their discipline.

b. Understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world.

c. Engage students successfully in studies of the nature of science including, when possible, the critical analysis of false or doubtful assertions made in the name of science.

**Standard 3: Inquiry**  
Teachers of science engage students both in studies of various methods of scientific inquiry and in active learning through scientific inquiry. They encourage students, individually and collaboratively, to observe, ask questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. To show that they are prepared to teach through inquiry, teachers of science must demonstrate that they:

a. Understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge.

b. Engage students successfully in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

**Standard 4: Issues**  
Teachers of science recognize that informed citizens must be prepared to make decisions and take action on contemporary science- and technology-related issues of interest to the general society. They require students to conduct inquiries into the factual basis of such issues and to assess possible actions and outcomes based upon their goals and values.
To show that they are prepared to engage students in studies of issues related to science, teachers of science must demonstrate that they:

a. Understand socially important issues related to science and technology in their field of licensure, as well as processes used to analyze and make decisions on such issues.

b. Engage students successfully in the analysis of problems, including considerations of risks, costs, and benefits of alternative solutions; relating these to the knowledge, goals and values of the students.

**Standard 5: General Skills of Teaching**

Teachers of science create a community of diverse learners who construct meaning from their science experiences and possess a disposition for further exploration and learning. They use, and can justify, a variety of classroom arrangements, groupings, actions, strategies, and methodologies. To show that they are prepared to create a community of diverse learners, teachers of science must demonstrate that they:

a. **Vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding.**

b. **Successfully promote the learning of science by students with different abilities, needs, interests, and backgrounds.**

c. **Successfully organize and engage students in collaborative learning using different student group learning strategies.**

d. **Successfully use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate the learning of science.**

e. **Understand and build effectively upon the prior beliefs, knowledge, experiences, and interests of students.**

f. **Create and maintain a psychologically and socially safe and supportive learning environment.**

**Standard 6: Curriculum**

Teachers of science plan and implement an active, coherent, and effective curriculum that is consistent with the goals and recommendations of the National Science Education Standards. They begin with the end in mind and effectively incorporate contemporary practices and resources into their planning and teaching. To show that they are prepared to plan and implement an effective science curriculum, teachers of science must demonstrate that they:

a. **Understand the curricular recommendations of the National Science Education Standards, and can identify, access, and/or create resources and activities for science education that are consistent with the standards.**

b. **Plan and implement internally consistent units of study that address the diverse goals of the National Science Education Standards and the needs and abilities of students.**

**Standards 7: Science in the Community**

Teachers of science relate their discipline to their local and regional communities, involving stakeholders and using the individual, institutional, and natural resources of the community in their teaching. They actively engage students in science-related studies or activities related to locally important issues. To show that they are prepared to relate science to the community, teachers of science must demonstrate that they:

a. **Identify ways to relate science to the community, involve stakeholders, and use community resources to promote the learning of science.**

b. **Involve students successfully in activities that relate science to resources and stakeholders in the community or to the resolution of issues important to the community.**
Standards 8: Assessment
Teachers of science construct and use effective assessment strategies to determine the backgrounds and achievements of learners and facilitate their intellectual, social, and personal development. They assess students fairly and equitably, and require that students engage in ongoing self-assessment. To show that they are prepared to use assessment effectively, teachers of science must demonstrate that they:
  a. Use multiple assessment tools and strategies to achieve important goals for instruction that are aligned with methods of instruction and the needs of students.
  b. Use the results of multiple assessments to guide and modify instruction, the classroom environment, or the assessment process.
  c. Use the results of assessments as vehicles for students to analyze their own learning, engaging students in reflective self-analysis of their own work.

Standard 9: Safety and Welfare
Teachers of science organize safe and effective learning environments that promote the success of students and the welfare of all living things. They require and promote knowledge and respect for safety, and oversee the welfare of all living things used in the classroom or found in the field. To show that they are prepared, teachers of science must demonstrate that they:
  a. Understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials.
  b. Know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction.
  c. Know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students.
  d. Treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.

Standard 10: Professional Growth
Teachers of science strive continuously to grow and change, personally and professionally, to meet the diverse needs of their students, school, community, and profession. They have a desire and disposition for growth and betterment. To show their disposition for growth, teachers of science must demonstrate that they:
  a. Engage actively and continuously in opportunities for professional learning and leadership that reach beyond minimum job requirements.
  b. Reflect constantly upon their teaching and identify ways and means through which they may grow professionally.
  c. Use information from students, supervisors, colleagues and others to improve their teaching and facilitate their professional growth.
  d. Interact effectively with colleagues, parents, and students; mentor new colleagues; and foster positive relationships with the community.

III. COURSE COMPETENCIES

a. South Carolina Science Curricula Standards

b. The South Carolina System for Assisting Developing and Evaluating Professional Teaching (ADEPT)
c. Praxis II Standards  
d. Multi-Cultural Competencies  
e. Diversity Technological Competencies (ISTE)  
f. Critical Thinking (Process Skills)  
g. Writing Across the Curriculum  

IV. EXPECTED MEASURABLE OUTCOMES  
The method/content area science course develops effective performers capable of demonstrating instructional and pedagogical competencies in content areas, exercising reflective thinking, a depth of knowledge and understanding of reading content strategies and skills consistent with institutional, state, and national standards. Meaningful learning and assessing capabilities such as authentic assessment, performance-based assessment, and rubrics are fostered through diversity and technology skills and understanding of methods and strategies relevant to how candidates learn to meet students’ needs.  

Reflective decision makers are professional educators who demonstrate the ability to make informed science decisions and problem solve based on conscious consideration of their students’ needs and the technical, educational, and ethical consequences of their decisions. The centrality of reflection in the reading in the science content area course fosters pre-service teachers’ ability to utilize students’ background experiences, content and context knowledge, and research related to daily classroom community experiences. Teacher candidates draw upon a depth of knowledge and understanding and are capable of continually monitoring and evaluating the effects of their choices and actions related to subject area reading capabilities and student learning.  

Humanistic practitioners demonstrate cross-cultural understanding, open-mindedness, and appreciation of other peoples’ values, beliefs, and points of view. Teacher candidates are able to demonstrate the ability to understand and incorporate diverse issues related to sociopolitical, economic, and historical experiences of individuals or groups critical to reading instruction. Teacher candidates work effectively with all students regardless of their race, sex, age, socio-economic level or exceptionalities. Candidates provide learning opportunities in reading and content instruction that support intellectual, social and personal development. They demonstrate self-evaluation and sensitivity to all students reading needs.  

V. OUTLINE OF COURSE CONTENT  

Apply the theories of Piaget, Bruner, Gagne, Ausubel, and others in planning science instruction in the secondary school.
Formulated a philosophy, goal and objectives appropriate for the secondary science program and consistent with today’s social needs.

Construct lesson and unit plans appropriate for each high school level.

Identify, construct and use evaluation instruments appropriate for measuring learning outcomes in the high school science classroom.

Observe quantitatively and qualitatively.

Use the metric system in making measurements.

Plot data in tabular and graphic forms.

Interpret data from table, charts, and graphs.

Formulate conclusions and make predictions for a given body of data.

Experiment with ideas.

Formulate models depicting ideas.

Distinguish between living and non-living things.

Classify living things.

Recognize examples of and explain interactions between and among living and non-living things and their physical environment.

Recognize and explain kinds of sexual and asexual reproduction.

Explain how the human bodies function.

Recognize and explain the inheritance of certain genetic traits.

Differentiate between atoms, elements, molecules and compounds.

Identify and use physical and chemical properties of matter to solve simple everyday problems.

Explain and demonstrate basic concepts of magnetism. graviton, sound, light, heat, mechanical, electrical, and chemical energy.

Identify, differentiate, and explain the origin of common rocks and minerals.

Use models to demonstrate the effects of constructive and destructive forces upon the crust of the earth.

Use meteorological concepts, principles, and instruments to predict the weather.

**TENTATIVE SCHEDULE**

You may have weekly reading, writing, lesson, lab and unit planning assignments.

The Week of:

1st week

- Introduction
- Review of class syllabus; other topics you’d like covered?
- What qualities does an effective science teacher possess?
- Why do you want to teach science?
- Why is teaching the science you have chosen important to you? To your students?
- How will you know if you are an effective teacher?
- What are the characteristics of an effective science curriculum?
- What does good classroom management look like and how is it achieved in a science classroom?
Assignment:
• What is your philosophy of teaching specifically science course?
• How students learn.

2nd week
• Inquiry/Piaget/Vygotsky {how students learn/:
• What is your philosophy of teaching specifically science?

Assignment:
• Select Unit Topic

3rd week
• Learning Cycle/ Buttons and Tootsie Rolls
• Unit Topic

4th week
• Purpose of lesson plans
• CSR Model Title
• Demographics
• Goals
• Objectives-Bloom
• Rationale: State/National Standards, diversity, pedagogy
• Procedure
• Anticipatory set
• Focus question
• Questioning
• Closure
• Student evaluation/assessment
• Teacher evaluation/reflective practice
• Materials: to include trade books, websites, software, local
• Resources (museums, field sites, industries, universities and colleges, etc.)
• Unit Planning

• Assignment: Choose your laboratory topic

5th week
• Lesson/Unit planning Part II
• Due today: Your Laboratory topic
• Assignment: Lesson plan #1 Exploration

6th week
• 8th Grade Skills Test Administration to class.
• Discuss test and rubrics
• Due today: LP #1
• **Assignment:** LP #2

7th week
• Unit Plan Rubrics and Unit Plan Lab
• Due today: Lesson plan 2
• **Assignment:** Lesson plan 3 and corrections for LP #1, if you wish

8th week
• Bulbs, Batteries and Bulbs
• Due today: LP #3
• **Assignment:** Corrections #2; Unit lab

9th week
• Discrepant events/Inquiry
• Websites
• Standards, national and state
• The latest from the Federal Government
• Due today: Corrections #2, Unit Lab
• **Assignment:** Corrections LP#3.

10th week
• ADEPT
• Due today: Corrections LP#3
• **Assignment** Work on Unit Plan,

11th week
• Discipline
• How to survive and thrive in your first year of teaching
• Working with parents for student achievement
• Working with investigations and inquiry science
• Working with your peers in a school community Questions and discussion
• Due today: Unit Plan
• **Assignment:** Student Presentations of self designed investigations with peer participation and a final fieldwork

12th week Student presentations

13th week Student Presentations
VI. LIBRARY ASSIGNMENTS

Reflective Research Paper:

For this assignment, you will choose from a list of "scenarios." The scenarios will relate to important topics connected to the teaching of science. In order to prepare an appropriate response to your scenario, you will need to research your topic to learn more about it. Once you have researched your topic, you should prepare a 7 page double-spaced, written response to your scenario. Be sure your response discusses the important issues related to your topic and be sure to REFERENCE ALL YOUR SOURCES. The intent of this assignment is for you to demonstrate your ability to read and review educational research, accurately interpret evidence and issues, analyze the evidence, and draw conclusions. Papers must meet high writing standards. References must be cited using APA. This paper is worth 10% of your final grade.

VII. SPECIAL COURSE REQUIREMENTS

1. A. 20 hours of Pre-Step (Field experiences)

2. Plan, and then teach a 45 MINUTES science lesson with demonstration that will give students hands-on experiences using at least three science process skills, a lesson plan and a student activity sheet must be developed along the learning cycle approach will accompany the teaching of the lesson.

VIII. METHODS OF EVALUATION

1. Three Lecture examinations or their equivalents will be given during the semester. Students will be made aware of the content of each examination at least one week prior to their administering.

2. Grade for Lesson Plans

3. Various assignments through the internet will also be graded

4. A COMPREHENSIVE FINAL EXAMINATION WILL BE ADMINISTERED AT THE CONCLUSION OF THE SEMESTER’S WORK.

FINAL GRADE ASSIGNMENT WILL CONFORM TO THE GRADING POLICY AS STATED IN THE SOUTH CAROLINA STATE UNIVERSITY CATALOG.
IX. REFERENCES


**Research and Response Paper**

**Scenarios** You are to choose a scenario from the list below. Research the topic related to your scenario. Prepare an appropriate, 6-7 page, double-spaced, written response to the scenario you choose. Remember to CITE ALL REFERENCES in your written response. You should have AT LEAST five references for this paper. You may use course texts for references, but you should have AT LEAST four references from outside sources. All citations should be in APA form.

**Scenario 1:** You are a recent graduate of SCSU with a major in Biology/chemistry education. You would love to land a teaching job in your home town. You land an interview with the building principal of your old elementary school. Yahoo! You do a little research and find out this principal, who is new to the district, is a big supporter of environmental issues and would like to see more integration of environmental issues in the teaching of math and science. You realize you know little about this topic. Why would anyone integrate environmental issues into math and science teaching? Is it possible to do? How would a teacher do this? What are the pros and cons of doing such integration? Since the district asks for a writing sample at all interviews, you decide to prepare a paper on the integration of environmental issues in the teaching of math and science.

**Scenario 2** Missing

**Scenario 3:** You are a new teacher in a small, rural district in South Carolina who specializes in the teaching science. Basically, you help all the other elementary school teachers teach science in their classrooms. You LOVE this job as it lets you focus on one area that you are interested in. However, your school district is facing budget cuts. A proposal has been made that the positions of science specialist and math specialist be merged into one position. The new position would be a math/science specialist. The teacher in this position would help the other secondary school teachers integrate the teaching of science to better support the SC Science Standards. You are asked to
appear before the school board to make a presentation regarding the integration of math and science education. The school board members need to know what are the pros and cons of integrated teaching, how might this type of teaching effect student performance on standardized tests, and what kinds of activities might teachers use in integrated teaching.

**Scenario 4:** You are a new teacher in a secondary school in Charleston. Your school has the opportunity to apply for a grant from Texas Instruments to purchase calculators for every student and teacher in the school. Because of the location of your school, there is a very good possibility the school would get the grant if your principal applied for it. Your principal is always interested in getting new resources for the school, but she admits that she doesn't know much about the use of calculators in the classroom. She asks you to investigate the use of calculators in the classroom to see if it is worth applying for this grant. What is the purpose of buying each student a calculator? What are the pros and cons of using calculators in the teaching of mathematics? Won't students become dependent on the calculators and just use them as a crutch? Prepare a report for the principal discussing the pros and cons of using calculators in the classroom and making a recommendation about whether she should apply for the grant or not.

**Scenario 5:** As a new teacher, you are asked to serve on a committee to look at appropriate ways to assess student understanding in science. Your first committee assignment is to do some research and report on the different ways to assess such learning. Prepare a report outlining the different means of assessment and discussing the pros and cons of each. Make a recommendation for the assessment measures in math and science which you feel your district should use.

**Scenario 6:** You will soon graduate from South Carolina State University with a major in Biology/Chemistry education. You are interested in going for your master's degree in Special Education. The application for admission to the masters program in which you hope to be accepted asks you to prepare a written statement on a topic pertaining to special education. Because of your experiences in, you decide to prepare a statement on addressing the needs of learners with special needs in science education.

**Scenario 7:** Missing

**Scenario 8:** You are a recent graduate of South Carolina State University with a major in Biology/Chemistry education. You have landed an interview for a unique position in an secondary school close to where you'd like to live. The position is that of science specialist. In this position, you would prepare science lessons for students in all the different classes. You do some research and find out that this school has just upgraded all its technology. There is a new computer lab and four or five new computers in each
classroom. You know the school is interested in hiring someone who knows how to integrate the use of computers in his/her teaching. You decide to prepare for this interview by researching how computers are integrated in the teaching of science. Does such integration make sense? What are the pros and cons in using computer technology for teaching science? What are the possibilities?