**SCI 420: History and Nature of Science**

*Central Connecticut State University: Spring 2014*

Professor: Dr. Jeff Thomas

Meetings: W 430 – 710 pm; 504 Copernicus

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# **Course Description:**

This course examines the development of science, mathematics, and technology in order to understand our natural world. The goal will be to understand the development and nature of scientific knowledge through empirical, theoretical, and practical applications. We will also link these understanding to how it applies to the science classroom.

# **Course Objectives:**

1. describe the historical development and evolution of science;
2. explain how the development of science is connected to the cultural, economic, and political development of our society;
3. describe the primary tenets, assumptions, goals, and values of scientific inquiry and how it is different from other ways of knowing the world;
4. compare and contrast the nature of science with those that claim to be scientific assertions (pseudoscience);
5. relate how science and technology has impacted one another as both have evolved over time;
6. describe controversial issues raised by scientific advancements and discoveries.
7. demonstrate the methods of science by eliciting the interrelationships among various science disciplines;
8. Create a science lesson that demonstrates the methods of science and the nature of science;
9. describe and explain how to conduct science in a safe and ethical manner.

# **Professional Conceptual Framework: NSTA Assessment 4 (Science Safety Manual & Practice)**

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| Professional Standards | NSTA: Assessment 4 |
| 1. The education professional as active learner    1. possesses strong content knowledge in the arts and sciences    2. communicates in multiple forms to diverse audiences,    3. possesses pedagogical knowledge for content to be taught, and    4. engages in habits of critical thinking and problem solving. | 4a, 4b, 4c |
| 1. The education professional as facilitator of learning for all students    1. applies knowledge of human development across the life span (including physical, cognitive, social, and emotional growth),    2. respects and values all learners,    3. addresses the diversity of learning environments, and    4. understands the learning process and applies instructional and assessment strategies and technologies to facilitate learning. | 4a, 4b, 4c |
| 1. 3. The education professional as reflective and collaborative practitioner    1. makes informed and ethical decisions,    2. accepts responsibility for student learning,    3. engages in opportunities for professional growth, and    4. collaborates with colleagues, families, and the school community. | 4a, 4b, 4c |

**NOTE:** Professional education programs are guided by the SEPS Conceptual Framework, which views the education professional as an active learner, as a facilitator of learning for all students, and as a reflective and collaborative practitioner. The full conceptual framework may be viewed at the following link: <http://www.education.ccsu.edu/SEPS_Conceptual_Framework.pdf>

# **Readings:**

Articles will be the main source of information. They will be distributed in class and/or on BB Learn.

# **Course Requirements and Grading:**

The nature of Scientific Discoveries—Presentation 30%

You will present a scientist and their discovery to the class—this includes an activity that aligns with the discovery and a formal presentation on the scientist/discovery. NOTE: You will be assigned a date for you presentation—if you are not prepared the day of your presentation, you will receive a zero for this assignment. However, you may switch presentations with another classmate if he or she chooses.

The nature of Scientific Discoveries—Paper 20%

Create a timeline that traces the development of science based on the discovery presentations conducted in class. A short one-page paper will be included as part of the project.

Geoscience Methods—Doing and Teaching Science: 30%

You will complete a module that emphasizes the methods of doing science. Although the context of the module is geoscience related, it demonstrates an interdisciplinary approach to science. This module also addresses the nature of science and how you can use these understanding to teach science. This module has three parts and three assessments:

**Part 1 Assessment: Methods of Science Essay 10% of grade**

**Part 2 Assessment: Climate Change Position Paper 10% of grade**

**Part 3: Curricular Resources & Interdisciplinary Lesson Plans 10% of grade**

Science Safety Manual: 20%

You will create a science safety manual that includes a) legal and ethical responsibilities, b) maintenance and disposal of chemical and hazardous materials, c) management plan for science classroom and labs, and d) safe, ethical, and humane treatment of living organisms.

# **Grading:**

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| --- | --- | --- | --- |
| Final Scores (%) | Grade Awarded | Final Scores (%) | Grade Awarded |
| 94-100 | A | 80-82 | B- |
| 90-93 | A- | 76-79 | C+ |
| 87-89 | B+ | 70-75 | C |
| 83-86 | B | Below 70 | Fail |

* You will receive a 20% deduction for the first day and 50% for the second day for late assignments; assignments more than two days late will not be accepted. On rare occasion, there are legitimate reasons for being late. If informed prior to the due date, you may receive accommodations.
* *You will be deducted one letter grade for each missed class. However, this absence will be excused if you provide me a doctor’s note upon your return. If this is not possible, you may also complete an additional assignment not on the syllabus.*

# **Disability Statement:**

Please contact me privately to discuss your specific needs if you believe you need course accommodations based on the impact of a disability, medical condition, or if you have emergency medical information to share.  I will need a copy of the accommodation letter from Student Disability Services in order to arrange your class accommodations.  Contact Student Disability Services, Willard Hall, 101-04 if you are not already registered with them. Student Disability Services maintains the confidential documentation of your disability and assists you in coordinating reasonable accommodations with your faculty.

# **Plagiarism:**

Plagiarism, whether it entails passing of another person’s ideas as your own; submitting work for this class that has been previously submitted for another class (even if it is your own); or violating CCSU’s Code of Academic Integrity in some other form or fashion will not be tolerated (see the CCSU catalog). Judicial matters include, but are not limited to the loan or purchase of papers, the use of the same paper(s) for more than one course, plagiarism, fabrication, and facilitating academic dishonesty.

# Course Calendar: This is a preliminary outline; which may be modified, adjusted, deleted, or added.

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| **Week** | **Focus/Topics** | **Assignments** |
| Week 1:  JAN 15 | Introductions, Syllabus, and introductory assessments (NOS, SCI LIT, GLE) |  |
| Week 2:  JAN 22 | The Nature of Science | Selected Readings |
| Week 3:  JAN 26 | The Nature of Science: Scientific and Engineering Practices, and Scientific Inquiry | Selected Readings |
| Week 4:  FEB 5 | The Nature of Science: Crosscutting Concepts | Selected Readings |
| Week 5:  FEB 12 | The Nature of Scientific Discoveries—Plate Tectonics and Alfred Wegener |  |
| Week 6:  FEB 19 | Group work—student presentations |  |
| Week 7:  FEB 26 | The Nature of Scientific Discoveries—Student Presentation | Presentations 1 & 2 |
| Week 8:  MAR 5 | The Nature of Scientific Discoveries—Student Presentations | Presentations 3 & 4 |
| Week 9:  MAR 12 | The Nature of Scientific Discoveries—Student Presentations | Presentations 5 & 6 |
| Spring Break | No class |  |
| Week 10:  MAR 26 | *The Methods of Geoscience*: Part 1: How Do the Methods of Geoscience Compare with THE Scientific Method?  *The Methods of Geoscience*: Part 2: After the Storm (Climate Change) | History and Nature of Science Paper Due; Selected Readings (Part 1 Activity) |
| Week 11:  APR 2 | *The Methods of Geoscience*: Part 2: After the Storm (Climate Change) | Part 1 Methods of Science Essay Due |
| Week 12:  APR 9 | *The Methods of Geoscience*: Part 3: Discovering Curricular Resources and Teaching Interdisciplinary Lessons that Incorporate the Methods of Geoscience | Part 2 Position Paper Due (Climate Change) |
| Week 13:  APR 16 | *Methods of Geoscience* (Wrap-Up)  Science Safety | Part 3: Curricular Resources and Interdisciplinary Lesson Plan due |
| Week 14:  APR 23 | Science Safety |  |
| Week 15:  APR 30 | Course Wrap up, Final Assessments (NOS, SCI Literacy, GLE,) | Science Safety Manual Due |

Note: The syllabus may be modified as needed.