Northern Illinois University

Learning Today, Leading Tomorrow

The Nature of Science Across Time and Culture
The Processes and Practices of Science

Biology 484x/684, Chemistry 490x, Geology 475x, and Physics 490x

This course is an examination of major concepts of science and how they evolved. This course compares and contrasts of the role and practice of science in various cultures and examination of the interaction between science, technology and culture. CREQ: ILAS 201, 301 or 401; Instructor Permission.

Instructor Information - Fall 2015

- **Instructor Name:** Dr. Jon S. Miller
- **Office Location:** Montgomery Hall 452
- **Office Hours:** Monday, Wednesday, Friday 9:00 AM -11:00 AM
  - **Send an email to schedule an appointment**
- **Telephone:** 815-753-7828
- **Email:** jsmiller@niu.edu

Meeting Days/Times/Location
Class meetings will be held in **Montgomery Hall 324** from **4:00-6:00 PM**.

Course Website
Blackboard. Note that you will need to use your Z-ID and because this course is cross-listed, each one of you will be put into BIOS 484x Master (undergraduate or graduate). You will need to test whether you have access twenty-four hours after the first class. If you do not, it will be your responsibility to contact Dr. Miller.

Teaching Learning Standards Addressed by This Course

- **NSTA Teaching Standards:** 1.c., 1.d., 2.a., 2.b., 3.a., 3.b., 4.a., 4.b., 7.b. and 10.d.
- **Illinois Professional Teaching Standards:** 1B., 1D., 1H., 1L., 3C., 3F., 3G., 3I., 3J., 7B., 7C., 9H., 9J., 10F. and 10H.

Materials
Book required for the course:

- *Just a Theory: Exploring the Nature of Science*, by Moti Ben-Ari (ISBN-10: 1591022851/ISBN-13: 978-1591022855)

Suggested Reading (not required):

- *Galileo's Daughter: a Historical Memoir of Science, Faith, and Love*, by Dava Sobel.
- *The Mismeasure of Man*, Stephen Jay Gould

Goals

1. To enhance our understanding of the nature of science and appreciation for some of the significant scientists and their discoveries;
2. To analyze the influence of science on society and society on science;
3. To help our students see the mutual impact of science and society;
4. To consider how the interplay of science and society affects our students and their families.
5. To develop an understanding of the Next Generation Science Standards and how they impact science education in United States of America.

Expectations
We will set a standard of professional comportment, in which professional behavior, including attendance, dress, participation, courtesy, and the submission of assignments by the due date are both expected and required. Professional demeanor, of the type that we expect in the educational workplace, is required at all times in this course. Please silence your cell phone and other electronic devises during class.

Attendance
Should you need to be late, leave early, or miss a class, please notify me in writing (email is fine) as much in advance as possible. Failure to notify me in writing of an absence will be regarded as an unexcused absence and there will be no make-up assignments, quizzes or tests. Due to the nature of the course and the work involved, attendance is very important. If you must miss class it is your responsibility to get the notes from a classmate and to find out what went on in class during your absence.

In addition, 10 attendance points will be given for each class period that you fully attend and participate in. If you are late or have to leave early, only 5 points will be awarded for the period. If you are absent, 0 points will be awarded for that period. There will be no make-up for lost attendance points.

Assignments
You will be expected to complete a number of assignments throughout the semester. There will be clear deadlines when these assignments must be handed in. Late assignments will receive half credit. Assignments that are one week or more late will not be accepted and a zero will be recorded in the grade book.

Tests and Quizzes
Tests will be given by way of Blackboard. It is your responsibility to make sure your computer works with Blackboard technology.

Project and Presentations
There will be opportunities to conduct laboratory exercises during the semester. You may work with a partner for these projects and both parties will receive the same grade for project produced. In addition, you will be expected to give a presentation on a famous scientist. You will be able to use the technology that is available in the room for your presentation.

If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.

Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

Course Schedule

Module 1 *What is Science?*

Aug 26/Session 1

I. Introduction to the course
   a. Course expectations
   b. Blackboard, email, attendance
II. Activity 1: Science Knowledge Survey, Discuss responses
III. Discussion: The Nature of Science
   a. What is science? Write a definition of science.
IV. Discussion: Scientific Method or The Process of Science
V. Discussion: Making Observations
VI. Activity: Observation assignment
VII. Assignment: Amazon Fly Scenario (due on Sept 2)
VIII. Grad Students (BIOS 684) research article assignment (due Oct 28)
IX. Reading: Text, Chapters 1 through 6

Sept 2/Session 2

I. Announcements: ISTA Conference at Tinley Park
II. Discussion: Developing Hypotheses
III. Activity: Hypothesis Game activity
IV. Discussion: How to conduct an investigation
   a. Data collection and data analysis
   b. Graphing and statistics
   c. Formulating conclusions
V. Assignment: Prediction and Measurement in Science Lab Activity (due Sept 16)
   a. Create groups
   b. Start work on lab
VI. Reading: Text, Chapters 7 & 8

Sept 9/Session 3

I. Announcements
   a. Test 1 on Blackboard next week
   b. Hand out review sheet
   c. Review testing procedure
II. Discussion: How to write a lab report
III. Work on Lab during class
IV. Assignment: Prediction and Measurement in Science Lab write-up (due on Sept 16)

Sept 16/Session 4

I. Announcements
   a. Test 1 on Blackboard
II. Assignment: Glider Lab
   a. Create groups
   b. Discuss experimental design

Module 2 *What is Inquiry?*

Sept 23/Session 5

I. Announcements
II. Discussion: The Nature of Inquiry
III. Activity: Is it inquiry? Assignment due at the end of class.
IV. Activity: Lab book analysis Assignment
    a. Discuss in class
V. Assignment: Reflection paper on Lab book analysis (due Oct 7)
VI. Reading: Text, Chapters 9, 10, & 11

Sept 30/Session 6

I. Discussion: NGSS – What are the national science standards?
    a. State Standards on Nature of Science, NSTA position
II. Develop a proposal for an inquiry based lab activity/lesson
III. Discussion: Share you proposal ideas

Oct 7/Session 7

I. Announcements: Test 2 on-line next week, same format as before
II. More on NGSS
III. Work on inquiry lab assignment during class
    a. Discuss the plan

Oct 14/Session 8

I. Announcements: Test 2 on Blackboard. Complete the test by midnight October 17th.
II. Plan for poster construction/work on lab (due on Nov 11)
III. Reading: Text, Chapters 12 & 13

Module 3 *Why teach the Nature of Science?*

Oct 21/Session 9

I. Announcements
II. Discussion: Why teach the Nature of Science?
III. Discussion: Science Literacy
IV. Activity: What is Science Literacy? Work in groups of 2, complete task, report to class.

Oct 28/Session 10

I. Announcements:
II. Grad and SAL students present research articles.
III. Sign up for Famous Scientist Presentation

Nov 4/Session 11

I. Announcements:
II. Assignment: Famous Scientist Presentation (To be given on November 18 and/or December 2)

a. Instructions
b. Research in class to get started
    i. Select famous scientists
    ii. Sign up for presentation date

III. Assignment: Science Fiction Movie Review (due on Nov 18)

Nov 11/Session 12

I. Announcements: Test 3 on Blackboard
II. Poster Session

Module 4 *Who are some famous scientists?*

Nov 18/Session 13

I. Announcements:
II. Famous Scientist presentations

November 25-Thanksgiving No Class

Dec 2/Session 15

I. Course evaluation
II. Finish student presentations - Famous Scientist

December 7 through 12 – Finals Week

December 12 & 13 – Commencement

End of Semester