Earth Science (w/Lab) Syllabus

EAS K102, Four semester hour credits
(CRN/SEC) - #10257/M01 & #10257/M1A
Spring 2006
Three Rivers Community College
Mohegan Campus
Norwich, CT 06360

Instructor: Bill Dopirak
e-mail: wdopirakjr@trcc.commnet.edu
Phone: 892-5758

Office Hours:
M - 9:30-10:00am, T - 4:00–6:00pm
W – 10:00-11:00am, R -4:00 –6:00pm
F - Noon-1:00pm
(Or by appointment)

Required Text:

Conte, D.J; D.J. Thompson and L.L. Moses. 2001. Earth Science: An integrated perspective, 2nd ed. College Custom series, McGraw-Hill Primis. 432p.

Supplementary Materials (NOT REQUIRED)

Pough, H. F. 1991. *Peterson First Guide to Rocks and Minerals*. Houghton Mifflin Co.

Catalog Description:

A study of the earth as a planet including a study of the new geology and physiography of Connecticut. Emphasis is placed on Connecticut's earthquakes, dinosaurs, and rock identification. This course is designed for liberal arts and business students desiring to meet a science requirement for a degree and for prospective teachers. Some fieldwork is involved. Three lecture hours, three laboratory hours.

Primary Objectives:

In addition to developing an understanding of earth science processes as they relate to other scientific disciplines, the student will be aided to obtain an awareness of the interdependence of physical processes and natural laws governing the earth to ensure their continuation and stability. An understanding of geosystems and the interrelationship between humans and other life forms will be developed. The student also will be encouraged to gain intuition about the earth sciences: **Astronomy;** measurements of the universe, the solar system, and light. **Meteorology;** weather & climate, temperature, humidity, pressure, and wind. **Geology;** the rock cycle, earth's substance, mineral identification, erosion, and geomorphology. **Oceanography;** hydrologic cycle, wind, waves, water circulation, and tides.

Attendance Policy:

Students are expected to attend class and laboratory sessions regularly, as in accordance with school attendance policy. If a class or lab is missed due to circumstances beyond your control, **please**, be sure to notify your instructor and make the necessary arrangements for obtaining the lecture notes. **You will be responsible** for the material. A five-point bonus will be implemented to your final grade if 100% attendance is noted.

Grade Evaluation:

There will be three examinations. Although the subject matter does tend to build on itself, the final examination is not cumulative, and will be given during final exam week (**27 April 2006**). There will be eleven **weekly** quizzes. The lowest quiz grade will be dropped. **There will be no makeup quizzes!** Exam and quiz questions will consist of multiple choice and/or short answers. Two-laboratory practicals will also be included.

A systematic research paper on one of four **research projects** is also required:

1) Astronomical Observation Project: this project includes daily-weekly observations of lunar and solar activity.

2) Geologic Survey of Global Seismic & Volcanic Activity Project (via the Internet): this project incorporates the use of the 'World Wide Web' to monitor (current) global seismic and volcanic activity.

3) Atmospheric Monitoring & Weather Forecasting Project (via the Internet or, newspaper): this project will include tracking storms as jet steams and fronts influence them. Collect, display, and analyze accumulated data for precipitation, temperature, dew point, and interactions between high & low pressure systems. Predict approaching disturbances of local weather.

4) A Formal 3-5-page Research Paper and Oral Report: Selections for your paper could be taken from a list of topics found within this syllabus or from your own interests.

More will be said pertaining to your paper/project through the semester. Oral presentations may also accompany research project.

******Research Project Due Date (27 April 2006) *******

Suggestions for the course:

To gain a better understanding is sure to read the required reading sections **before** coming to class. Also, be prepared to participate in classroom discussions.

Grading:

Final grade will based on the following:

Semester Grade*----------55%
Laboratory Grade£----------25%
Research Project----------20%
----------100%

*Semester grade = 45% Unit tests + 10% quizzes
£Laboratory grade = 20% Lab practicals + 5% Lab reports

Final Grade:

100.0-99.0= A	79.4-77.5= C+
98.9-93.5= A	77.4-72.5= C
93.4-90.5= A-	72.4-69.5= C-
90.4-87.5= B+	69.4-63.5= D+
87.4-84.5= B	63.4-59.5= D
84.4-79.5= B-	59.4-00.0= F

College Withdrawal Policy:

A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. Withdrawal forms are available at the Registrar's office on both campuses and the office at the Subase. Nonpunitive "W" grades are assigned to any withdrawal requested before the various unrestricted withdrawal deadline. After that period, a student wishing to withdraw must obtain **written** authorization of the instructor to receive a "W" grade on their academic record, non-punitive grade indicating termination of class participation. Students who do not withdraw, but stop attending **will receive** a grade of "F" for the final grade. Students are advised that withdrawal from 50% or more of their classes will result in being placed on **Progress Probation** for the following semester Eligibility for refund of tuition is based upon date of withdrawal when received by the Registrar. **Verbal withdrawals cannot be accepted**.

Disabilities Statement:

If you have a hidden or visible disability, which may require classroom or test-taking modifications, please see me as soon as possible. If you have not already done so, please be sure to register with disability counselors by contacting Counseling and Advising Center.

Academic and Classroom Misconduct:

The instructor has the primary responsibility for control over classroom behavior and maintenance of academic integrity, and can order the temporary removal or exclusion from the classroom, and/or laboratory, of any student engaged in conduct violative of the general rules and regulation of the institution. Extended or permanent exclusion from classroom, and/or laboratory, or further disciplinary action can be effected only through appropriate college procedure. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Students guilty of academic dishonesty directly or indirectly will receive a **zero** for an exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions, which maybe imposed through the regular institutional procedures. Any student that believes he or she has been erroneously accused may appeal the case through the appropriate institutional procedures if their grade was affected.

Informative Earth Science Web Sites

Hourly, local star charts: http://skymaps.com/index.html
Compute local sidereal time: http://tycho.usno.navy.mil/sidereal.html
Earth and moon viewer: http://www.fourmilab.ch/earthview/vplanet.html
National earthquake information center: http://wwwneic.cr.usgs.gov/neis/current/world.html
Global volcanic activity: http://volcano.und.nodak.edu
SeaWiFS Project home page: http://seawifs.gsfc.nasa.gov/SEAWIFS.html
Earth & Environmental Science: http://www.educationindex.com/environ/
Rockhounds informative page: http://www.rahul.net/infodyn/rockhounds/rockhounds.html
Windows to the universe: http://www.windows.umich.edu/
NASA TV Home Page: http://www.nasa.gov/ntv

MANY MORE

Tentative Spring 2006 EAS K102 Laboratory Activities

1) Planetary system replication
2) Earth-Moon-Sun interactions
3) Astronomical observations
4) Global time zones: International date line & prime meridian
5) Dew point & Relative humidity: Use of a sling psychrometer
6) Heat transfers: Conduction and Convection
7) Mineral formation
8) Mineral identification
9) Rock identification
10) The dynamic ocean floor
11) Plate tectonics
12) Effects of glaciers & morainal formation
13) Expressing topography on a map
14) Reading geologic maps & Integrating geological concepts
15) Geologic Time Scale & Fossil lab

Possible Field Excursions

1) Mystic Seaport Planetarium (Mystic, CT)
2) Cochegan Rock (Montville, CT)
3) Glacier Park (Ledyard, CT)
4) Lantern Hill (North Stonington, CT)
5) Bailey's Ravine (North Franklin, CT)
6) Yantic Falls (Norwich, CT)
7) Dinosaur Park (Rocky Hill, CT)

Tentative Spring 2006 EAS K102 Lecture Schedule

Week	Topic	Chapter(s)
1	Introduction/ Aspects of earth science/Elements of earth	1
2	**Quiz 1-** Earth-Moon-Sun interactions/Lunation cycle	20
3	**Quiz 2-** Solar system/Eclipses/Tides	20-21
4	**Quiz 3-** Earth's atmosphere/Meteorology/Pressure systems	18-19
5	**Quiz 4-** Fronts/Atmospheric influences on weather	15-17
6	**Review & UNIT EXAM I**	
7	**Quiz 5-** Mineralogy/ Rock Cycle & Rock types	2-3
8	**Quiz 6- LAB PRACTICAL I -** Earthquakes/ Volcanism	6-7
9	**Quiz 7** - Plate tectonics/ Orogeny	8-9
10	**Quiz 8 -** Metamorphism/ Glaciation	5
11	**Review & UNIT EXAM II**	12-14
12	**Quiz 9 –** Marine Environments	13-15
13	**Quiz 10 -** Paleontology/ Geologic timetable & periods	10-11
14	**Quiz 11/LAB PRACTICAL II** Connecticut Geology	
15	**Review/Final Exam**	

**************IMPORTANT DATES**************

***(27 April)* Research Projects due**
***(11 May)* Oral presentations**
***(16 May)* Final Exam**

Syllabus Revisions:
This schedule may be subject to change as the instructor sees fit. The instructor will announce any changes in advance.

Research Topic Ideas:

1) Planetary beginnings
2) Cosmology
3) Earth materials
4) Earth's dynamic crust
5) Development of earth's major features
6) Time and Geology
7) Air, climate and weather
8) Structural Geology
9) Plate tectonics
10) Volcanic activity
11) Hydrothermal systems
12) Fault lines
13) Connecticut's geology
14) Connecticut's minerals
15) Mineralogy
16) Orogeny and mountain formation
17) Earthquakes
18) Earth's magnetic field
19) Energy resources from the earth
20) Mineral resources from the earth
21) Igneous rocks
22) Sedimentary rocks
23) Metamorphic rocks
24) The rock cycle
25) Glaciation
26) Geological timescale
27) Weathering and erosion
28) Sediments and sedimentation
29) Folds and other rock deformations
30) Dikes, sills, and magma
31) Glacial erractics
32) The hydrological cycle
33) Hydrology and weather
34) Aquifers
35) Glacial landscapes
36) Regional metamorphism
37) Landscape evolution
38) Interpreting the Grand Canyon sequence
39) Geology of mineral deposits
40) Sedimentation in the sea
41) Earth's interior heat
42) Exploring earth's interior
43) Seismic waves
44) Geological differences between oceans and continents
45) Continental margins
46) Topographic terranes of Connecticut
47) Paleontology
48) Fossils in Connecticut
49) Dinosaur epochs
50) Unraveling geological history

Detailed Course Objectives - EAS K102:

1) The student will develop 'critical thinking skills' through the analysis of scientific data.
2) The student will be able to describe the scientific methods through examples.
3) The student will be able to describe the characteristics of planet earth.
4) The student will be able to identify the principle elements that make up geological formations.
5) The student will demonstrate knowledge of ionic, covalent, and hydrogen bonding.
6) The student will demonstrate knowledge of lunar & solar eclipses, as well as, total, partial, & angular forms of eclipses.
7) The student will be able to identify igneous, metamorphic, & sedimentary rocks.
8) The student will be demonstrating knowledge of the rock cycle.
9) The student will demonstrate knowledge of plate tectonics.
10) The student will be able to list the various geological time scales.
11) The student will be able to explain the difference between particle sorting.
12) The student will be able to identify minerals.
13) The student will demonstrate knowledge of the various earth sciences.
14) The student will demonstrate knowledge of the processes involved in the earth's formation.
15) The student will provide and overall perspective of the earth as part of the universe.
16) The student will be able define energy and state the laws of energy conservation.
17) The student will be able to explain geomagnetic processes.
18) The student will be able to define the term's geomorphism & topography.
19) The student will be able to define the term's paleontology & glaciation.
20) The student will to demonstrate knowledge of chemical composition of the earth's crust.
21) The student will be able to explain the role of earthquakes & volcanoes.
22) The student will be able to understand the relationship between humans & their planet.
23) The student will demonstrate knowledge of the geological succession.
24) The student will demonstrate knowledge of the various earth science interactions.
25) The student will be able to discuss some common theories pertaining to the origin of the earth and our solar system.
26) The student will demonstrate knowledge of modern mapping techniques.
27) The student will demonstrate knowledge of hydrothermal vent systems.
28) The student will be able to illustrate the immensity of the solar system.
29) The student will be able to list the types of bodies found in the solar system.
30) The student will demonstrate knowledge of meteorology.
31) The student will be able to construct and read weather maps.
32) The student will demonstrate knowledge of pressure systems and weather fronts.
33) The student will be able to define convection and conduction and apply the two to winds and heat exchange.
34) The student will be familiar with cloud types and able to recognize basic types.
35) The student will gain working knowledge of relative humidity and dew point values.

Detailed Course Outline – EAS K102

I **Introduction**

- **A) Aspects of earth science**
  - **1.** Astronomy
  - **2.** Meteorology
  - **3.** Oceanography
  - **4.** Geology
- **B) Elements of earth**
  - **1.** Atoms
    - **a)** Atomic number & mass
    - **b)** Behavior of electrons
    - **c)** Energy & stability of atoms
      - **1)** Ions
      - **2)** Isotopes
  - **2.** Matter
    - **a)** Phases of matter
    - **b)** Influencing factors
      - **1)** Temperature
      - **2)** Pressure
- **C) Properties of earth**
  - **1.** Age of earth
  - **2.** Age of universe
  - **3.** Hydrosphere
  - **4.** Biosphere

II **Astronomy**

- **A) Planetary system**
  - **1.** Solar system
    - **a)** four inner terrestrial planets
    - **b)** four outer gaseous planets
    - **c)** one smallest, furthest planet
  - **2.** Electromagnetic radiation
  - **3.** Solar day
  - **4.** Sidereal time
  - **5.** Lunar day
- **B) Planetary motion**
  - **1.** Rotation
  - **2.** Revolution
  - **3.** Galactic rotation
  - **4.** Eccentricity
  - **5.** Aphelion
  - **6.** Perihelion
  - **7.** Precession
  - **8.** Inclination
    - **a)** seasonal fluctuations
      - **1)** solstices
      - **2)** equinoxes

II **<u>Astronomy</u> (cont.)**

- **C) Earth – Moon system**
  - **1.** Leading theories of origin of moon
  - **2.** Phases of moon
    - **a)** new moon
    - **b)** waxing crescent
    - **c)** first quarter
    - **d)** waxing gibbous
    - **e)** full moon
    - **f)** waning gibbous
    - **g)** third quarter
    - **h)** waning crescent
  - **3.** Tides
    - **a)** Spring tides
    - **b)** Neap tides
    - **c)** Apogee
    - **d)** Perigee
- **D) Eclipses**
  - **1.** Ecliptical seasons
    - **a)** umbra
    - **b)** penumbra
  - **2.** Solar eclipses
  - **3.** Lunar eclipses
    - **a)** Lunar nodes
  - **4.** Partial
  - **5.** Total
  - **6.** Angular
- **E) Earth's atmosphere**
  - **1.** Troposphere
  - **2.** Stratosphere
    - **a)** Ozone layer
  - **3.** Mesosphere
  - **4.** Thermosphere
    - **a)** Ionosphere

III **<u>Meteorology</u>**

- **A) Climatology**
  - **1.** Biomes
- **B) Weather influences**
  - **1.** Sun
  - **2.** Ocean
  - **3.** Topography
  - **4.** Rotation & revolution of earth
  - **5.** Climate
- **C) Air masses & Air pressure**
  - **1.** High pressure systems
  - **2.** Low pressure systems
  - **3.** Wind
  - **4.** Jet Streams

III **Meteorology (cont.)**

5. Cloud formations

a) Condensation nuclei

b) Water vapor

c) Low atmospheric pressure

d) Three basic cloud forms

1) Cirrus

2) Strata

3) Cumulus

e) Four families of clouds

1) Development

2) Height

D) Air masses & Fronts

1. Aspects of air masses

a) Saturation value

b) Absolute Humidity

c) Relative Humidity

d) Dew Point

2. Fronts & Cloud formation

a) Warm front

b) Cold front

c) Stationary front

d) Occluded fronts

E) Weather Mapping

F) Weather Symbols

G) Weather Forecasting

IV **Geology**

A) Divisions of solid earth

B) Earth's crustal composition

1. Oceanic crust

2. Continental crust

C) Mineralogy

1. Crystal & crystallization

2. Physical properties of minerals

D) Rock Cycle

1. Igneous

2. Sedimentary

3. Metamorphic

E) Crystallization of magma

1. Bowen's series of reactions

a) Granitic rocks

b) Andesitic rocks

c) Basaltic rocks

d) Pyroclastic rocks

2. Igneous textures

a) Aphanitic

b) Phaneritic

c) Porphyritic

d) Glassy

IV **Geology (cont.)**

- **F) Plate tectonics**
  - **1.** Divergent boundaries
    - **a)** Spreading center
  - **2.** Convergent boundaries
    - **a)** Subduction zones
  - **3.** Transform boundaries
- **G) Igneous activity**
  - **1.** Intrusive
  - **2.** Extrusive
  - **3.** Plutons
  - **4.** Volcanism
    - **a)** Types of volcanoes
      - **1)** Shield
      - **2)** Cinder cones
      - **3)** Composite
      - **4)** Calderas
      - **5)** Volcanic pipes & necks
      - **6)** Fumaroles
      - **7)** Fissure eruptions
      - **8)** Intraplate volcanism
    - **b)** Volcanoes & climate
- **H) Seismic activity**
  - **1.** Types of seismic waves
    - **a)** Body Waves
      - **1)** P waves
      - **2)** S waves
    - **b)** Surface Waves
      - **1)** Raleigh waves
      - **2)** Love waves
  - **2.** Epicenter
  - **3.** Focus
  - **4.** Earthquake Magnitude & Intensity
    - **a)** Richter scale
    - **b)** Mercalli scale
  - **5.** Tsunami
- **I) Plate Tectonics & Paleomagentism**
  - **1.** Curie point
  - **2.** Magnetic reversals
- **J) Geological Time Scale**
  - **1.** Relative dating
  - **2.** Radiometric dating

V **Mountain Building**

- **A) Orogensis**
- **B) Isostacy & Isostatic adjustment**
- **C) Mountain Systems**
  1. Folded Mountains
  2. Fault-Block Mountains
  3. Upwarped Mountains
  4. Volcanic Mountains
- **D) Rock Deformation**
  1. Elastic deformation
  2. Plastic deformation
- **E) Folds**
  1. Anticlines
  2. Synclines
  3. Domes
  4. Basins
- **F) Joints & Faults**
  1. Reverse fault
  2. Normal fault
  3. Lateral fault
  4. Thrust fault
  5. Transform fault
  6. Grabens
  7. Horsts

VI **Oceanography**

- **A) Oceanic Zonation**
  1. Vertical zonation
     - **a)** Photic zone
     - **b)** Bathyl zone
     - **c)** Abssal zone
     - **d)** Hadal zone
  2. Horizontal zonation
     - **a)** Littoral zone
     - **b)** Neretic zone
     - **c)** Pelagic zone
- **B) Ocean floor**
  1. Seamounts
  2. Guyots
  3. Atolls
  4. Reefs
  5. Rises & Rifts
  6. Canyons
  7. Continental shelf
  8. Hydrothermal vent systems
- **C) Oceanic Circulation**
  1. Wind & Currents
  2. Pycnoclines
     - **a)** Halocline
     - **b)** Thermocline
  3. Coriolus Effect
  4. Tides

VI **<u>Oceanography</u> (Cont.)**

- **5. Land Masses**
  - **a)** Upwelling
  - **b)** Downwelling
- **6.** Tides

VII **<u>Glaciation</u>**

- **A) Types of Glaciers**
  - **1.** Valley glaciers
  - **2.** Continental glaciers
  - **3.** Ice Caps
  - **4.** Piedmont glaciers
- **B) Glaciers & the hydrological cycle**
- **C) Glacial movement**
- **D) Glacial erosion**
- **E) Glacial deposits**
  - **1.** Moraines
  - **2.** Outwashed plains
  - **3.** Kettleholes
  - **4.** Striate
- **F) Causes of glaciation**
- **G) Glaciers in the geologic past**

- **K) Plate Tectonics & Paleomagentism**
  - **3.** Curie point
  - **4.** Magnetic reversals
- **L) Geological Time Scale**
  - **3.** Relative dating
  - **4.** Radiometric dating

VIII **<u>Connecticut Geology</u>**

- **A) Physiographic regions of CT**
- **B) Connecticut's geological history**
- **C) Connecticut's terranes**
  - **1.** Newark terrane
  - **2.** Avolonian terrane
  - **3.** Iapetos terrane
  - **4.** Proto-North American terrane