I. LOCATOR INFORMATION:

Semester: **Fall**  
Year: **2003**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Name</th>
<th>Credit Hours</th>
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<tr>
<td>NSCI 110</td>
<td>Comprehensive Physical Science</td>
<td>4</td>
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</table>

Instructor: Dr. Alexander Umantsev

Office Location: _LS 318______________________________

Office Telephone: __x 1449______________________________

Office Hours: __later notice______________________________  
Available at other times by appointment

Departmental Office Location: _LS 130

Departmental Office Telephone: 672-1691

II. COURSE DESCRIPTION:

NSCI 110 (Comprehensive Physical Science) will explore the principle concepts of the physical sciences, which include physics, chemistry, astronomy, geology, meteorology, and oceanography. When taken in sequence with NSCI 120 (Modern Biology) the student will receive a comprehensive view of the major science disciplines. This course will consist of lecture, demonstration, discussion, and laboratory sessions. Every opportunity will be provided for the student to make observations, develop problem-solving skills, and use inductive and deductive reasoning. The overall objective for this course is to assist the student in becoming knowledgeable of the viewpoint of science, its study and limitations, and the application of the "scientific method."

III. TEXTBOOK:


IV. SPECIFIC COURSE OBJECTIVES AND COMPETENCIES:

In view of the scope and sequence of this course, the following objectives have been identified. (Numbers in parentheses identify competencies established by the State Department of Public Instruction for Middle Grades Education majors.)

Students shall:

A. Understand the relationships between matter, energy, and motion.
   1. List the International System units of measure for length, mass, volume, time, and force; and apply the basic metric system prefixes to these measurements.
2. Define mechanics, vector and scalar quantities, speed, velocity, acceleration, work, potential energy, kinetic energy, power, and momentum; and calculate any of these when given sufficient data.

3. State Newton's three laws of motion and use each to analyze the implications for objects at rest or in motion. (Physics 31)

4. Discuss the differences between nuclear fusion and nuclear fission reactions, and characterize each as to changes in mass, atomic structure, and radiation. (Physics 29)

5. List and describe the properties of waves and waveforms and compare and contrast electromagnetic radiation with sound. (Physics 33)

6. Explain and interpret heat, temperature, specific heat, heat capacity, entropy, plasma, latent heat of fusion, latent heat of vaporization, and the laws of thermodynamics. (Physics 29)

7. Differentiate between conductors and insulators, super conductor and semiconductor, AC and DC current, series and parallel circuits, a motor and a generator, and other technological devices. (Physics 30, 32, 34)

B. Understand the macro- and microscopic composition of matter.

1. Describe the general structure of an atom and distinguish between the electromagnetic, gravitational, and nuclear forces that bind the atom together. (Chemistry 13, 14)

2. Identify the relationships between atomic structure, atomic mass, atomic number, periodic ordering, and chemical bonding. (Chemistry 15)

3. Define compounds, mixtures, molecules, ions, solutions, colloids, and exothermic, endothermic, activation energy, equilibrium, and electrochemistry. (Chemistry 17, 18)

4. Define organic chemistry and relate its nomenclature and structure to the various classes of organic compounds such as aliphatic, aromatic, and the major biochemical compounds.

5. Utilize chemical symbols to construct, balance, and read chemical equations.

C. Understand the Earth's structure and the processes, which operate to change its surface features.

1. Define mineral; describe how atomic arrangements affect physical properties; and use physical properties to identify the most common minerals. (Earth Science 20)

2. List the three types of rocks, describe how each are formed, and place each within the rock cycle. (Earth Science 20)

3. Explain the weathering and erosion processes that are a result of water, ice, wind, and gravity. (Earth Science 24, 27)

4. Describe how earthquakes are used to determine the earth's internal structure. (Earth Science 21, 22)

5. Discuss how volcanoes and earthquakes are related to plate tectonics, and describe the geologic processes that occur at divergent, convergent, and transform plate boundaries. (Earth Science 21)

D. Understand the processes, which operate in the earth's atmosphere.

1. Characterize each of the layers of the earth's atmosphere as to composition, temperature, pressure, and other special features.

2. Name the atmospheric properties that are commonly measured, and describe the instruments and techniques used to make these measurements. (Earth Science 23)

3. Discuss how the earth's rotation and geographic characteristics affect atmospheric circulation, temperature, and moisture content. (Earth Science 23)

4. Explain evaporation, condensation, precipitation, and apply these to cloud formation under local conditions, and advancing frontal systems. (Earth Science 26)

5. Analyze the importance of natural and manmade factors in determining the climate of geographic regions. (Earth Science 26, 27)
E. Recognize the distinguishing characteristics of the universe.
   1. Characterize the components of the Solar System with respect to their similarities and
differences in composition, structure, mass, orbital parameters, and special features such as
atmospheres, rings, moons, etc., when applicable. (Earth Science 25)
   2. Explain the bases for our time-keeping system and the reason we have seasons and eclipses.
   (Earth Science 25)
   3. Relate what information may be gained from an analysis of light, and explain how this is used
to establish the physical properties of stellar objects. (Earth Science 25)
   4. Compare and contrast the life histories of stars with masses less than the Sun, five times
greater than the Sun, and ten times more than the Sun. (Earth Science 25)
   5. Draw polar and equatorial diagrams of the Milky Way galaxy, and label each with size
information, Sun's distance from center, and location of nucleus, halo, spiral arms, and
globular clusters. (Earth Science 25)
   6. Discuss Hubble's law and relate it to the origin of the universe. (Earth Science 25)

V. EVALUATION CRITERIA:
   The progress of each student will be evaluated by means of THREE one-hour exams to be given
during the semester, reports related to the laboratory exercises to be performed, and a comprehensive final
examination. The lowest exam may be dropped at the discretion of the instructor.

   A. Grade Distribution:
      Final grades will be determined by weighting the averages and scores from the above-mentioned
      evaluative activities.
      Hour Exams & Quizzes 50%
      Laboratory Exercises 25%
      Final Examination 25%

   B. Grading Scale:
      The final letter grade assigned to the student will be based upon the following numerical
      equivalencies as stated in the University Catalog. A curving system will be applied.
      A = 93 - 100
      B = 83 - 92
      C = 73 - 82
      D = 64 - 72
      F = Below 64

VI. COURSE OUTLINE WITH ASSIGNMENT SCHEDULE:
   Lectures and laboratory exercises will be undertaken in accordance with the following assignment
   schedule. The laboratory work may take the form of discussions, demonstrations, paperwork exercises,
   further excursions into the depths of the principles of theory with explanations by the instructor, as well as
   hands-on investigations involving the submission of a lab report by the student. It is also assumed that in
   addition to the topics listed below, the student is assigned both the textual material as well as the exercise
   problems at the end of the chapters. Listed below is the tentative lab and examination schedule that may
   change due to constraints imposed by equipment and space limitations.

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<thead>
<tr>
<th>WEEK</th>
<th>CHAPTER</th>
<th>ASSIGNMENT</th>
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<tbody>
<tr>
<td>1.</td>
<td>1</td>
<td>Metric System; units, linear graphs, slopes, Nature of science, ratios, density. LAB #1 - Significant figures, graphing, slopes</td>
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<tr>
<td>2.</td>
<td>2,3</td>
<td>Motion, velocity, acceleration, forces, Newton's laws, momentum, circular motion. LAB #2 - Measurements, Conversions and Density</td>
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| 3. | 4 | Exam #1 | Energy, work.  
LAB #3 **Work and Power** |
|---|---|---|---|
| 4 | 5, 6 | Molecular theory, heat, thermodynamics; Wave motion and sound.  
LAB #4 - **Specific heat of metals** |
| 5 | 7, 8 | Electric charge, current, magnetism, generators, transformers; Light, refraction  
diffraction & interference.  
LAB #5 - **OHM's Law** |
| 6 | 9, 10 | Exam #2 | Atomic structure Periodic Table, elements, chemical families.  
LAB #6 - **Periodic Properties of the Elements** |
| 7 | 11, 12 | LAB #7 **Chemical Reactions** |
| 8 | 13, 14 | Solutions, acids, bases and salts; organic compounds, hydrocarbons and  
derivatives, nuclear reactions, radioactivity. |
| 9 | **MID TERM EXAMINATIONS** |
| 10 | 16, 17 | Exam #3 | The universe, stars & galaxies; solar system, planets, comets, meteors,  
aroids  
LAB #8 - |
| 11 | 18, 19 | Earth & its motions, size/shape, moon, tides; Rocks and minerals.  
LAB #9 - |
| 12 | 20, 21 | Exam #4 | Interior of earth, magnetic field ; diastrophism, earthquakes  
LAB #10 - |
| 13 | 22, 23 | Earth's surface processes, weathering, erosion geologic time, fossils  
LAB #11 - |
| 14 | 24, 25 | Earth's atmosphere, structure, & winds; weather phenomena, clouds, air masses |
| 15 | 26 | Exam *5 | None | Final Exam 8:00 am |

**VII. COURSE REQUIREMENTS:**

Students are required to:

1. Attend all lecture and laboratory sessions, except in cases of illness and other unforeseen emergencies. It is the student’s responsibility to contact the instructor about the steps that must be taken for making up any and all missed work. It is recommended that contact with the instructor take place within twenty-four (24) hours of having missed class. The University policy concerning absences from class will be strictly enforced. The instructor will request administrative withdrawal for students who either incur **TWO CONSECUTIVE ABSENCES**, or whose absences exceed 10% of the total contact hours the course meets during the semester. For this course, that would amount to approximately seven (7) total hours of unexcused absences after which the instructor will also submit an administrative withdrawal for the student. See the university catalog for the details.
2. Be punctual. Attendance will be taken promptly at the beginning of each session. Any student coming in after the roll has been called will have been marked absent. It is the student's responsibility to see that all tardies have been duly noted. Students will also be charged with a tardy for departure from the class before the specified end of class. The accumulation of three (3) tardies will result in the student being charged with one (1) absence.

3. Participate actively in classroom discussions and activities. Two key ingredients of every student's learning are sharing opinions and experiences with others, and interacting with others in the teaching-learning situation.

4. Read over and take notes on the indicated chapters BEFORE they are presented in class. This activity mentally prepares one for the learning experience. It also is important because it raises questions that one needs to have answered in order to fully understand concepts presented.

5. Take notes in class. Recopy these notes at the first opportunity after class and certainly the same day as the class in which the notes were taken. Reconcile any discrepancies in the notes taken in class as well as with notes taken in initial reading. Add explanations or drawings or other examples for clarity.

6. Study about two hours for each hour of lecture. This is an absolute minimum for maximum success in a class.

7. Avail themselves of all pertinent audiovisual and computer-assisted instructional materials.

8. Take examinations ON THE SCHEDULED DATES. No make-up examinations will undertake. An automatic grade of ZERO is recorded for any exam missed for any reason.

9. Be in compliance with the university policy on drugs which prohibits the possession or use of alcoholic beverages or illegal drugs on any part of the campus.

10. SEE THE INSTRUCTOR IMMEDIATELY WHEN SPECIFIC DIFFICULTIES ARE ENCOUNTERED.

IX. TEACHING STRATEGIES:

The primary teaching strategy for this course will take the form of lectures and demonstrations of the specific processes and effects related to the topics of interest. Particular sections of the course will be taught in accordance to the instructional styles of the individual faculty member.

BIBLIOGRAPHY

The textbook will be considered the primary resource in this class. However, textbooks often do not contain enough information or information in the manner that will be most advantageous for student learning. In light of these shortcomings, it is recommended that each student perform additional reading on each topic covered in class. This may be accomplished by seeking other physical science texts in the library or the instructor's office.

During the time frame in which this course is taught far more exciting discoveries and interpretations will undoubtedly occur which will not be in texts. It is therefore recommended that the student routinely examine periodical literature such as Astronomy, National Geographic, Sky and Telescope, Science News, Science, and many others.