OAKLAND UNIVERSITY
SCHOOL OF EDUCATION AND HUMAN SERVICES
TEACHER DEVELOPMENT AND EDUCATIONAL STUDIES
Winter, 2018

COURSE SYLLABUS

1. **COURSE:** SCS 2060; Science for the Elementary Teacher; 4 credit hours; Elementary Education Program, Department of Teacher Development and Educational Studies (Tuesday, 5:30-8:40pm. Section 10059, Room 150 Pawley Hall)

2. **CATALOGUE DESCRIPTION:**
Develops science concepts and processes based on recent elementary school curricula in the fields of earth, physical and chemical science. For elementary education majors only; includes laboratory experiences. Prerequisite: Grade of 2.0 in one of (BIO 104 or BIO 1002), (BIO 110 or BIO 1004), (BIO 111 or BIO 1200), (BIO 113 or BIO 1300), (BIO 300 or BIO 3000), (CHM 104 or CHM 1040), CHM 157 (no longer offered), CHM 167 (no longer offered), (CHM 300 or CHM 3000), (ENV 308 or ENV 3080), (GEO 106 or GEO 1060), (PHY 101 or PHY 1010), (PHY 104 or PHY 1040), (PHY 105 or PHY 1050), (PHY 106 or PHY 1060), (PHY 115 or PHY 1150), (PHY 120 or PHY 1200), (PHY 151 or PHY 1510), or (SCI 100 or SCI 1000). [NOTE: It is the student's responsibility to ensure that prerequisites are met prior to registering for this course.]

3. **DROP DATE INFORMATION:**
The last day to drop this class with 100% tuition refund, as well as other important academic dates, can be found on the Office of the Registrar web page that lists important dates: http://oakland.edu/registrar/important-dates/ For this term, the final drop date is January 17, 2018 (by 4 PM).

4. **COURSE/INSTRUCTOR EVALUATIONS:**
Course evaluations are available approximately 2 weeks prior to the final day of classes at http://www.oakland.edu/evals. You can access all your course evaluations by entering your Grizzly ID number and password. You will be asked to rate the course and the instructor on 20 items. Written comments are also encouraged. The last day of class is the last day to complete the evaluation. A summary of the results is not available to the professor until after final grades have been submitted. Your feedback is taken seriously, and you are encouraged to be honest in your evaluations. Your participation is greatly appreciated.

5. **AUTHORIZED INSTRUCTOR:**

INSTRUCTOR: **Doug Baltz**
OFFICE HOURS: After class and **by appointment**
E-MAIL: Please use Moodle's Internal Email for all course-related correspondence. All other correspondence may be sent to: **baltz@oakland.edu**
Teacher Development and Educational Studies
485B Pawley Hall
2200 N. Squirrel Road
Rochester, MI 48309-4497

Phone: (248) 370-2613
Fax: (248) 370-2639

6. REQUIRED TEXTBOOKS OR READINGS:

ScienceSaurus: A student handbook. (New Ed.). (2014). United States: Houghton Mifflin Harcourt. [Note that this is the Grades 6-8 version and has a green cover. There is a similar book for elementary grades with a blue cover.]

Mastering science content for middle school teaching and the NES general science exam Rillero, P. & Eddis, S. (2017). Retrieved from amazon.com for purchase (1.99) https://www.amazon.com/Mastering-Science-Content-Teaching-General-ebook/dp/B06XXPQLWG/ref=sr_1_1?ie=UTF8&qid=1499981452&sr=8-1&keywords=mastering+science+content+for+middle accessible through kindle reading application on smart phones, tablets, or computer operating systems.

Recommended:

Michigan Department of Education. (November, 2015). Michigan K-12 standards: Science. Retrieved from http://www.michigan.gov/documents/mde/K-12_Science_Performance_Expectations_v5_496901_7.pdf, August 11, 2017.

Achieve, Inc. (2013). *Next generation science standards.* Retrieved from http://www.nextgenscience.org/overview-dci

Michigan Department of Education. (January, 2008). Certification standards for elementary teachers. Retrieved from http://www.michigan.gov/documents/mde/Elementary_Program_Standards_557145_7.pdf August 11, 2017.

Council of Chief State School Officers (CCSSO). (April, 2013). InTASC model core teaching standards and learning progressions for teachers. Retrieved from http://www.ccsso.org/resources/publications/InTasc_model_core_teaching_standards_and_learning_progressions_for_teachers_10.html, August 11, 2017.

University of Michigan (2016). TeachingWorks: High-leverage practices. Retrieved from http://www.teachingworks.org/work-of-teaching/high-leverage-practices August 11, 2017.

Dragonfly
Great Exploration in Math and Science (GEMS)

Activities that Integrate Math and Science(AIMS)
Project 2061 (AAAS Report)
Science Scope - NSTA
Oh, Education – Mike Stone
WonderScience - American Chemical Society
Science World - Scholastic

The Science Teacher - NSTA
CESI Science - Council for Elementary Science International publication

Reading and video assignments as posted on Moodle.

7. LEARNING GOALS FOR CANDIDATE PERFORMANCE:

1. Candidates know, understand, and use fundamental concepts in the subject matter of science – including physical, life, and earth/space sciences – as well as concepts in science and technology, science in personal and social perspectives, the history and nature of science, the unifying concepts of science, and the inquiry processes scientists use in discovery of new knowledge to build a base for scientific and technological literacy. (MI Elementary Science Certification, 1.1)
2. Candidates use scientific knowledge in Earth and Space science in terms of systems and subsystems (such as atmospheric systems, crustal systems, solar systems, or galaxies), which are useful in explaining phenomena, including volcanic eruptions, earthquakes, thunderstorms, and eclipses. (MI Elementary Science Certification, 1.2.4)
3. Candidates use scientific knowledge in Physical science that focuses on phenomena such as motion, electromagnetic interactions, or physical, chemical, and nuclear changes in matter. (MI Elementary Science Certification, 1.2.5)
4. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content. (InTASC 4)
5. The teacher how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic and global issues. (InTASC 5)

8. COURSE TOPICS: See attached course outline.

9. FIELD EXPERIENCE AND CLINICAL PRACTICE:

Students may be provided with an opportunity to attend a science field trip, professional science teaching conference or professional development workshop as an integral component of the course when such events are scheduled within the semester.

10. METHODS OF INSTRUCTION: This course requires the active participation of students in class sessions and online. Methods of instruction include: lecture / demonstration; laboratory / field experiences; media presentations; review and analysis of teaching strategies / materials; library research; collaborative / cooperative learning.

11. PERFORMANCE ASSESSMENT:

The topics for this course target physical, earth and space sciences. The topics are organized around the Next Generation Science Standards (NGSS) which align Michigan K-12 Science Standards. The only major difference is that Michigan has a selected number of Michigan-specific standards in addition to the national standards. The course is designed to foster inquiry and exploration through activities and experiments conducted during class sessions (Face-to-Face/FTF) and online simulations and experiences to reinforce scientific concepts, vocabulary, and processes. **Students are expected to check Moodle postings *at least* once a week and between sessions**. Students will also be required to read selections in the required text book as noted on the syllabus and in class.

PLEASE CHECK MOODLE FOR MORE INFORMATION ON EACH ASSIGNMENT

For further information on specific assignments and grading criteria associated with these, please refer to the *SCS 2060 Assignment Guide.*

Assignments (100 points)

Students are expected to check Moodle postings *at least* weekly. Students will also be required to read selections in the required textbooks as noted on the syllabus and in class. Students will be required to complete assignments across the range of physical and earth science topics targeted by this course. The topics target Physical Science Standards and Earth Science Standards in *Science education: Practices, crosscutting concepts, and core idea.*

Assignments aligned with each area include: Real-World Science and NGSS Questions, Explaining and Modeling High-leverage Teaching Practices (Modeling Report and Science Content Information, Five NGSS Conceptual/Inquiry Questions with correct explanations), Presentation Evaluation (by instructor), and Online sessions. For further information on specific assignments and grading criteria associated with these, please refer to the *SCS 105 Assignment Guide.*

Online Sessions (24 points)

This course is comprised of 2 online sessions which engage students in learning and/or reinforcing new science content involving the physical or earth sciences. The online sessions involve quizzes to demonstrate participation and development of understanding. The due dates for the online assignments are firm and cannot be made up at a later date. At the conclusion of these sessions students complete an accompanying online assignment related to the content of the session. Each content session assignment is assigned a value of 12 points.

Explaining and Modeling High-leverage Teaching Practices (36 pts.)

A. **Explaining and Modeling Report Components (21 points)**
   Select one of the concepts or topics provided on class sign-up sheet. – Activity to model must be different than one assigned in class. Although preparation, correctness/accuracy of your scientific explanation, and demonstrating you understand the components of Explaining and Modeling remain important for success on this assignment, more emphasis will be placed on science correctness and on the extent to which you can effectively explain and model a scientific concept (e.g., teaching of a concept). You are required to video record your Explaining and Modeling example. See assignment guide.
B. **Five NGSS Research questions with correct explanations. (15 pts)**
   These questions should be related to the NGSS you have chosen to focus on **and** the specific activity/lesson you will teach. They should display an understanding of the scientific principles students are to understand as a result of engaging in the activity/lesson you developed. They should provoke thought and inquiry, thereby increasing the "minds-on" aspect of the lesson. These questions should not be multiple-choice or have simple "one word" answers. Instead, they should ask students to demonstrate some depth of understanding of the concepts being taught. See *Real World and NGSS Questions* for examples.

Real World and NGSS Research Questions (24 points)*

This assignment is comprised of answering 3Real World Q. and 3 NGSS research questions* that target specific standards. This assignment has multiple purposes: (1) it will help you develop understanding of various science topics, (2) it will help you practice formulating clear and thorough explanations for others (such as a student who asked you a question), (3) it will help you become more familiar with the nature of standards that require students to understand specific information.

***<u>All students must complete one NGSS research question.</u> However, in place of the remaining two research questions there are two optional replacement assignments: choose <u>either</u> the STARBASE Field Trip and Report OR MDSTA Conference Attendance and Report. The explanations and criteria for these assignments can be found on Moodle. <u>By the due date of the second research question, students must demonstrate that they have signed up for (or attended) STARBASE or the MDSTA Conference in order to participate in the optional assignments.</u>**

<u>Quizzes and Final Test (80 points)</u>

Two comprehensive quizzes (20 pts. each) will be administered at mid-semester and towards the end of the semester. The final exam (40 points) will take place as noted in the syllabus and designated by the university final exam schedule. The quizzes and final exam will target questions related to understanding concepts, important science terminology, and applying what is learned through hands-on activities to new situations. These quizzes are administered on the dates found within the tentative timeline for the course. In order to prepare for these quizzes and tests, students must be actively involved in class experiences, integrate understandings from assigned readings, and ask questions when concepts are not adequately understood. Students will be required to complete assigned readings posted on Moodle, handouts provided in class, and readings in *Science Saurus: A Student Handbook*. Students will also be responsible for content and vocabulary taught as part of the peer presentations. Planned online sessions will involve students in learning about physical and earth sciences through interactive activities. Information from these sessions will be assessed on each quiz and the final exam.

<u>Attendance and Participation (20 points*)</u>

Maximum benefit for students involves, not only engaging in the hands-on activities provided, but also sharing with others your personal ideas, plans, and experiences. Regular attendance and class participation is extremely important in this course. Participating in class activities and experiments is an integral component to success in this class. Each student is expected to prepare for, and take an active part in, class discussions, activities, and collaborative group work. This requires students to complete assigned reading and homework prior to their due dates.

Credit is earned for <u>full</u>, <u>positive</u>, participation at each Face-to-Face (FTF) class period. Additionally, each student is responsible for maintaining a clean classroom environment during the semester as part of positive participation. Tardiness and partial attendance is often disruptive to class and full participation points will not be earned when this occurs. There are 8 FTF sessions as noted on the syllabus and a maximum of three points may be earned for each session. Note that the total (3 pts. x 8 possible) exceeds the 20 pt. allocation for attendance. Thus, it is possible to earn extra points in this category. Because of the nature of class activities, it will be impossible to make up missed class time. However, check with your classmates and/or instructor to ensure that you did not miss critical information. <u>Points will not be earned for missed sessions, irrespective of the nature of the absence, and students need not provide a reason</u>.

To encourage full participation, students may earn attendance points as follows:

3 points:	Full, positive participation (i.e., not texting, e-mailing, surfing) and arrive/depart as scheduled.
2 points:	Positive participation but late arrival or early departure.
1 point:	Participation limited and/or significant late arrival early departure.
0 point:	Session not attended

FOR ALL ASSIGNMENTS:

1. All formal assignments should be formatted in MS Word or a program that can easily be opened in Moodle and by most computers. Any required attachments may be scanned/photographed and submitted electronically. Complete web addresses should be included in APA formatted citations and references.
2. All assignments should relate to the teaching of *science* as opposed to general teaching methods.
3. Students are **encouraged to arrange to meet with the instructor for help and feedback on assignments**. As future teachers, it is essential that you demonstrate care with respect to the submission of written assignments. For each assignment, spelling, grammar, organization, and clarity of written work are evaluated. Errors such as these often result in lower assignment grades.

4. Assignments are to be uploaded to Moodle by the due date and time. Assignments turned in late, except assignments or quizzes associated with the online sessions, will be accepted for reduced credit (a reduction of 20% for first week the assignment is late and greater reductions as submission time increases).

5. All assignments are expected to be the individual student's original work and writing. Any quoted material should appear in quotations and be properly referenced with page numbers (APA style). This means that work from other students should also be referenced (e.g., lessons from Conceptual Change Units found in the ERL). Paraphrased material should be referenced using APA style. Students are strongly encouraged to complete the online Plagiarism Tutorial found on the KresgeLibrary website. All allegations of academic misconduct will be reported to the Dean of Students and, thereafter, to the Academic Conduct Committee for adjudication. Anyone found guilty of cheating in this course may receive a course grade of 0.0, in addition to any penalty assigned by the Academic Conduct Committee. Please refer to the 2017-2018 Oakland University Undergraduate Catalog to read the full *Academic Conduct Policy* listed under *Other Academic Policies* online at http://catalog.oakland.edu/content.php?catoid=29&navoid=2996#Other_Academic_Policies

12. COURSE REQUIREMENTS AND GRADING:

Participation and Attendance	20 pts.*
Assignments(100 points total)	
Real-World Science and NGSS Questions	24 pts.
Session HW - various	6 pts.
Explaining and Modeling High-leverage Teaching Practices (Modeling Report with Science Content Information and Five NGSS Conceptual/Inquiry Questions with correct explanations)	36 pts.
Presentation Evaluation	10 pts.
Online Sessions (2 X 12pts each)	24 pts.
Quizzes and Tests (80 points total) .	
Quiz 1 - all standards and on-line information first half of semester	20 pts.
Quiz 2 - all standards and on-line information second half of semester	20 pts.
Final Exam - Inclusive and on-line information	40 pts.
TOTAL	**200***

***Note that 4 extra points are possible through maximum attendance and participation.**
**** An optional replacement assignment for the NGSS Research Questions is available on Moodle and will be explained in class (STARBASE OR MDSTA Conference Attendance and Report)**

GRADING SCALE

Considered "A"s

4.0: 100 % - 98.60	197-200 points
3.9: 98.59 - 96.60	193-196 points
3.8: 96.59 - 94.60	189-192 points
3.7: 94.59 - 92.60	185-188 points
3.6: 92.59 - 90.60	181-184 points

Considered "B"s

3.5: 90.59 - 88.60	177-180 points
3.4: 88.59 - 86.60	173-176 points
3.3: 86.59 - 84.60	169-172 points
3.2: 84.59 - 82.60	165-168 points
3.1: 82.59 - 80.60	161-164 points
3.0: 80.59 - 79.60	159-160 points

Considered "C"s

2.9: 79.59 - 78.60	157-158 points
2.8: 78.59 - 77.60	155-156 points
2.7: 77.59 - 76.60	153-154 points
2.6: 76.59 - 75.60	151-152 points
2.5: 75.59 - 74.60	149-150 points
2.4: 74.59 - 73.60	147-148 points
2.3: 73.59 - 72.60	145-146 points
2.2: 72.59 - 71.60	143-144 points
2.1: 71.59 - 70.60	141-142 points
2.0: 70.59 - 69.60	139-140 points

Considered "D"s

1.9: 69.59 - 68.60	137-138 points
1.8: 68.59 - 67.60	135-136 points
1.7: 67.59 - 66.60	133-134 points
1.6: 66.59 - 65.60	131-132 points
1.5: 65.59 - 64.60	129-130 points
1.4: 64.59 - 63.60	127-128 points
1.3: 63.59 - 62.60	125-126 points
1.2: 62.59 - 61.60	123-124 points
1.1: 61.59 - 60.60	121-122 points
1.0: 60.59 - 59.60	119-120 points
0.5: 30.00 - 59.59	60-118 points
0.0: <30	<60 points

13. BIBLIOGRAPHY:

See complete list on Moodle.

SCS 2060 TENTATIVE TIMELINE
Winter, 2018

SciS = *ScienceSaurus: A student handbook.* Wilmington, MA: Author.
Moodle = Downloadable activities available at https://moodle.oakland.edu
Demo. = Demonstration

SESSION

Jan. 9	**Lecture 1** PS1.A: Structure and Properties of Matter: *How do particles combine to form the variety of matter one observes? By the end of grade 8.* All substances are made from some 100 different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. Pure substances are made from a single type of atom or molecule; each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. In a liquid, the molecules are constantly in contact with each other; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and vibrate in position but do not change relative locations. Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (Boundary: Predictions here are qualitative, not quantitative.) **Introduction to SCS 2060** Course Overview, NGSS, Group Assignment Information **What is Scientific INQUIRY?** **Pre/Post Quiz:** Measuring in Metrics and Properties of Matter 1 **Activities:** Measure density. Just the Ticket (Moodle), Cereal Models (Moodle) **Read:** SciS: 001-016 (21 pages); **Read** "Assignment Guide" and "Syllabus"on Moodle
Jan. 16	**Lecture 2** **PS1A: Structure & Properties of Matter 2** **In class: Sign up for presentation topic** **Pre/Post Quiz**: Properties of Matter 2 **Activities:** **Properties of Matter:** Creating Atoms and Ions (Moodle); **Solids:** Mystery Powder (Moodle) **Liquids:** How many drops (of water) fit on a penny? (Demo.), How Water and Other Liquids Stick Together (P&S, p. 457-458), Can you float a paperclip? (Demo.) **Read:** SciS 055-068, 249-254; 202; **Resource:** States of Matter: Basics: http://phet.colorado.edu/en/simulation/states-of-matter-basics **HW: Real World Question # 1 (due next week)** *Physical Science Online Session – Evidence can be turned in any time before due date*

Jan. 23	**Lecture 3** PS1.B: Chemical Reactions: How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them? *By the end of grade 8.* Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. The total number of each type of atom is conserved, and thus the mass does not change. Some chemical reactions release energy, others store energy. **Activities:** Chemical Change (Moodle), Colour Clues (Moodle), Rain, Rain Go Away (Moodle) **Read:** SciS 255-265; 266-273 **Lecture 4** PS4.A: Wave Properties: What are the characteristic properties and behaviors of waves? *By the end of grade 8.* A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. A sound wave needs a medium through which it is transmitted. Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. PS4.B: Electromagnetic Radiation: What is light? How can one explain the varied effects that involve light? What other forms of electromagnetic radiation are there? *By the end of grade 8.* When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. Lenses and prisms are applications of this effect. A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media (prisms). However, because light can travel through space, it cannot be a matter wave, like sound or water waves. **Pre/Post Quiz**: Sound and Light **Activities:** **Light:** Me & My Shadow (P&S, p. 183), Shadows in the Sun (P&S, p. 183-184), Making Money (P&S 184), Mirror Reflections (P&S, 185), I Can See Myself (P&S, p. 186-187), The Real You (P&S, p. 187-188), Light Relay Races (P&S 188-189), Mirror Balance (P&S, p. 189-190), Some Everyday Magnifiers (P&S, p. 192), How Big Can It Get? (P&S, p. 193), The Colors of the Sun (P&S, p. 200), Diffraction Glasses (Demo.) **Sound Energy:** Hand pipe (Demo.), Good Vibrations (P&S, p. 233), Sound Travels (P&S, p. 238), Vibrations of Metal Objects (P&S, p. 240), A String Telephone (P&S, p.241), Underwater Sounds (P&S, p. 242), Sound Tubes (Demo.), How is sound produced by a tuning fork? (Demo.) Standing wave (Demo). **Read: Energy, waves, light, sound:** SciS 299-313; **Due**: RWQ #1 - *upload this assignment on Moodle* **HW**: Real World Question # 2, (due 1/30)

Jan. 30	**NO CLASS** **Online assignment.** **DUE:** *Real World Question # 2 - upload this assignment on Moodle* **HW:** RWQ # 3 Physical Science Online Session (Located on SCS 2060 Moodle page) **must be completed by Lecture 5. It is expected that any problems or issues related to completing this assignment would have been asked by Lecture 5 (***due 2/13)*
Feb. 6	**Lecture 5** PS2.A: Forces and Motion: How can one predict an object's continued motion, changes in motion, or stability? *By the end of grade 8*. For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first but in the opposite direction (Newton's third law). The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. Forces on an object can also change its shape or orientation. All positions of objects and the direction of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared PS3.C Relationship Between Energy and Forces: How are forces related to energy? *By the end of grade 8.* When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. For example, when energy is transferred to an Earth-object system as an object is raised, the gravitational field energy of the system increases. This energy is released as the object falls; the mechanism of this release is the gravitational force. Likewise, two magnetic and electrically charged objects interacting at a distance exert forces on each other that can transfer energy between the interacting objects. **Pre/Post Quizzes:** Force & Motion **Activities:** **Force and Motion:** Balloon Rocket Engineering Design (P&S, p. 512); Drop it! (Moodle); Ball Drop (Moodle); Free Falling (Moodle); Superbounce (Moodle), Elevator Physics. **Read:** SciS 274-298 **HW:** RWQ #3, *Physical Science Online Session #1* **(Evidence due 2/13***)* *Elevator physics- due 2/13 – scan and upload to Session 4 Lecture in Moodle*
Feb. 13	**Lecture 6** PS2.B: Types of Interactions: What underlying forces explain the variety of interactions observed? *By the end of grade 8*. Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—for example, Earth and the sun. Long-range gravitational interactions govern the evolution and maintenance of large-scale systems in space, such as galaxies or the solar system, and determine the patterns of motion within those structures. Forces that act at a distance (gravitational, electric, and magnetic) can be explained by force fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). PS3.A: Definitions of Energy: What is energy? *By the end of grade 8*. Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. A system of objects may also contain stored (potential)

	energy, depending on their relative positions. For example, energy is stored—in gravitational interaction with Earth—when an object is raised, and energy is released when the object falls or is lowered. Energy is also stored in the electric fields between charged particles and the magnetic fields between magnets, and it changes when these objects are moved relative to one another. Stored energy is decreased in some chemical reactions and increased in others. The term "heat" as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and energy transfers by convection, conduction, and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. **DUE:** RWQ #3, . *Physical Science Online Session #1 Evidence* -you may send evidence via internal email or submit in class. Elevator physics. **Pre/Post Quiz:** Electrical and Magnetic Energy **Activities:** **Electricity:** How to Make a Bulb Light (P&S, p. 276), Series Circuits (P&S. p. 281-282), Parallel Circuits (P&S, p. 282), Electromagnets (P&S, p. 294), Static Electricity (P&S, p. 298) **Magnetism:** Objects Magnets Can Pull (P&S, p. 258), The Power of Magnets (P&S, p. 260), How to Make Magnets (P&S, p. 262), Long-Lasting Magnets (P&S, p. 263), Magnetic Fields (P&S, p. 265), Does Magnetism Go Through Objects? (P&S, p. 266), Make Your Own Compass (P&S, p. 268) **Read:** SciS 314-321 **HW**: *Complete Online Quiz #1* **(Due before 3pm 2/27) Try to complete before break.**
Feb. 20	**NO Class – Enjoy Winter break.** **Online quiz #1 is due by 3pm, 3/27.**
Feb. 27	**<u>Lecture 7</u>** ESS1.C: The History of Planet Earth: How do people reconstruct and date events in Earth's planetary history? *By the end of grade 8.* The geological time scale interpreted from rock strata provides a way to organize Earth's history. Major historical events include the formation of mountain chains and ocean basins, the evolution and extinction of particular living organisms, volcanic eruptions, periods of massive glaciation, and development of watersheds and rivers through glaciation and water erosion. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. **Activities:** Freezing Water and Rocks (P&S, p. 434), Soil Erosion (P&S, p. 435-436), Glaciers (P&S, p. 438), Cross-Section Anayses (Demo.), **Read:** SciS 175-200; P&S: 439-440, 447-449, 452-454 **DUE:** *Online Quiz #1* **(Due before 3pm)**

	HW: Moon Phase Observation, NGSS Q #1.
March 6	**<u>Lecture 8</u>** ESS2.C: The Roles of Water in Earth's Surface Processes: How do the properties and movements of water shape Earth's surface and affect its systems? *By the end of grade 8.* Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation as well as downhill flows on land. The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. Global movements of water and its changes in form are propelled by sunlight and gravity. Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. ESS2.D: Weather and Climate: What regulates weather and climate? *By the end of grade 8.* Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. Because these patterns are so complex, weather can be predicted only probabilistically. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. Greenhouse gases in the atmosphere absorb and retain the energy radiated from land and ocean surfaces, thereby regulating Earth's average surface temperature and keeping it habitable. **Activities:** Just a little drink of water (Moodle), Water cycle bracelets (Moodle), Great Lakes watershed (Demo.) Air & Space (P&S, p. 469), Balloon Buoyancy (P&S, 470), Air Has Pressure (Moodle), Using a Syringe to Feel Air Pressure (Demo.), Air (Moodle) **Read:** SciS 201-207, 212-230 P&S: 472-475, 481-487 **DUE:** NGSS Research Q.#1,2, or 3 **HW:** Earth Science Online, moon phase *** ***PRESENTATION CONTENT WORK***
March 13	**NO CLASS - option. Online session** **Baltz will be in the Science Lab (P 150) if you need any help.** **HW:** Earth Science Online, moon phase *** ***PRESENTATION CONTENT WORK***

March 20	**<u>Lecture 9</u>** ESS1.A: The universe and its stars: What is the universe, and what goes on in stars? *By the end of grade 8.* Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. The universe began with a period of extreme and rapid expansion known as the Big Bang. Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. ESS1.B: Earth & the Solar System: What are the predictable patterns caused by Earth's movement in the solar system? *By the end of grade 8.* The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. This model of the solar system can explain tides, eclipses of the sun and the moon, and the motion of the planets in the sky relative to the stars. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. **Activities:** The Way the Earth Rotates (P&S, p. 489-490), Direct Sun (P&S, p. 491-492), Why the Earth Has Seasons (P&S, p. 492-493) Moon Phases (P&S 497-498), Eclipses of the Sun and Moon (P&S, p. 499-500) **Read:** SciS 323-328 **DUE: *** Explaining and Modeling*: - presentation content* **Due for ALL students by 11:59pm, 3/30** Upload document to Moodle (copy of activity may be submitted in class if needed) (All e-mailed documents must be in MS Word (.doc) **HW:** Quiz # 2 opens at 8pm due by 3pm next week. *Online Session #2 Evidence* - you may send evidence via internal email or submit in class.
March 27	**Semester activities wrap-up**. **Computer Programming Activities. Presentation work and preparation** **Quiz 2 due by 3pm.** **Online session 2 Evidence due.** ***** Explaining and Modeling*: - presentation content* **Due for ALL students by 11:59pm, 3/30**
April 3	**Presentation work groups.**
April 10	**Demonstration Lessons**

April 17	**Final Review**
April 24	**Final Exam**

SCS 2060: Presentation Sign-up Sheet

TOPIC	Presentation Date	Names
PS1: Matter and its Interactions Includes Structure and Properties of Matter, Chemical Reactions and Nuclear Processes		
PS2: Motion & Stability: Forces & Interactions Includes Forces and Motion, Types of Interactions and Stability and Instability in Physical Systems.		
PS3: Energy Includes What is Energy, Conservation of Energy, Energy Transfer, Relationship of Energy with Force and Energy in Chemical Processes and Everyday Life		
PS4: Waves and their Applications in Technologies for Information Transfer Includes Wave Properties, Electromagnetic Radiation and Information Technologies and Instrumentation		
ESS1: Earth's Place in the Universe Includes The Universe and Stars, Earth and the Solar System and the History of Planet Earth.		
ESS2: Earth's Systems Includes Earth Materials and Systems, Plate Tectonics and Large-Scale Interactions, Role of Water in Earth's Surface Processes, Weather & Climate and Biogeology		
ESS3: Earth and Human Activity Includes Natural Resources, Natural Hazards, Human Impact on Earth Systems and Global Climate Change.		