

Course Title: Earth/Physical Science (Elective 10 Credits)

Course Description:

This course centers on the study of the Earth and physical science concepts including: Earth's place in the universe, dynamic Earth processes, energy within Earth's system, climate, biogeochemical cycles of the earth, structure and composition of the atmosphere, and the geology of California. There is a thirty (30) hour lab component, and lab participation and completion of scientific inquiry are requirements. Lab activities will promote utilization of research and reporting, data collection and analysis, and understanding of earth and physical science concepts.

In this course, all topics and units will be covered. A minimum of 50% of the units will be covered in-depth through a variety of instructional experiences that may include: internships, independent projects, workshops, individual and small group seminars, college classes, online courses, field studies, traditional research, written reflections, tutoring, student exhibitions, and lectures from outside experts. A credentialed instructor in this subject area will analyze the rigor of the work completed in order to ensure that the learning objectives were addressed with adequate depth.

In addition, all students will be expected to complete a minimum of two project-based assignments relating to this course. Along with this project work, students will be required to complete all assigned required reading on a case by case basis and conduct active research embedded in their internship projects centered on the selected topic/s agreed upon by their advisor/teacher and mentor as they relate to the course standards. In keeping with the Big Picture philosophy, academic learning will be linked to student interests and connected to real world experiences. This active learning must include both primary and secondary source analysis and written reflections of these source materials will be expected along with final products for all student work. Students will have access to standards-based academic texts, the Internet, primary and secondary sources, as well as expertise at their internship site and outside experts as lecturers.

There is a thirty (30) hour lab component, and lab participation and completion of scientific inquiry are requirements. Lab activities will promote utilization of research and reporting, data collection and analysis, and understanding of course standards and science concepts. **Overall, advisors will monitor the combination of these general lab experiences, with the specific experiences at internships so that overall the students get a depth of experience in some of the basic areas of: The Solar System, Plate Tectonics, The Sun's Energy and the Earth's Convection Currents, Climate, Biogeochemical Cycles, Atmosphere, and Geology of California. Students will not complete each lab in each area, rather they will utilize the labs menu, selecting labs with the guidance of their advisor, the school team and their learning team that correspond with their interests and internship studies, to meet the minimum 30 hour lab component.**

Specific texts may include: Earth Science (California Edition) Prentiss Hall, in addition to supplementary texts, articles, video and web resources (such as <http://volcano.und.nodak.edu>, www.nasa.gov, <http://climatechange.nrcan.gc.ca/english/Home.asp?x=1>, and <http://www.ucmp.berkeley.edu/geology/tectonics.html>)

Course Outline:

TOPIC	UNITS	LABS MENU	SAMPLE ACTIVITIES & PROJECTS
Solar system, stars, galaxies and the universe <i>CA 1: Astronomy and planetary</i>	<ul style="list-style-type: none">▪ Age of solar system▪ Earth change over time▪ Mass extinction▪ Planetary evidence▪ Milky way galaxy	<ul style="list-style-type: none">▪ Scale model of the solar system▪ Tour of the solar system lab▪ Evolution of a star lab	<ul style="list-style-type: none">▪ Research planetary differences▪ Compare sizes of the planets and sun in our solar system in scale drawings▪ Create a scale model of the solar system▪ Calculate weight of a student on different planets

<p><i>exploration reveal the solar system's structure, scale, and change over time</i> CA 2: Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time.</p>	<ul style="list-style-type: none"> ▪ Galaxy composition ▪ Life cycle of stars ▪ Evidence for Big Bang 	<ul style="list-style-type: none"> ▪ Shadow patterns and the motion of the sun ▪ Asteroid impact lab ▪ Decay of radiocarbon ▪ Planetary orbit lab ▪ Astronomy timeline lab ▪ Spectroscopy lab ▪ Atomic emissions ▪ Star color, temperature, and composition ▪ Measuring distances between stars lab 	<ul style="list-style-type: none"> ▪ Create a working sundial ▪ Research asteroid impact and mass extinction ▪ Research Galileo and planetary motion ▪ Shadow an astronomer ▪ Volunteer as a tour guide at local observatory ▪ View planets through a telescope and collect data ▪ Record orbits of planets graphically ▪ Calculate age of the universe using the Hubble constant ▪ Use Wien's Law and Stefan's Law in analysis ▪ Calculate the length of time it takes for the sun's light to reach us, do the same for Andromeda.
<p>Plate tectonics CA 2: Plate tectonics operating over geologic time have changed the patterns of land, sea, and mountains on Earth's surface.</p>	<ul style="list-style-type: none"> ▪ Ocean floor features ▪ Plate boundary types ▪ Formation of rock ▪ Earthquakes ▪ Volcanoes ▪ Hot spots 	<ul style="list-style-type: none"> ▪ Sea floor spreading lab ▪ Continental drift lab ▪ Pangea puzzle lab ▪ Convergent, divergent, transform faults ▪ Locate volcanoes and earthquakes ▪ Patterns of volcanism lab ▪ Locate an epicenter ▪ Scale model of Earth's interior ▪ The rock cycle ▪ Rock types lab ▪ Absolute and relative dating ▪ Mineral identification ▪ Vocabulary and definitions lab 	<ul style="list-style-type: none"> ▪ Model Pangea's movements over time ▪ Track earthquake activity in Northern California ▪ Test the hardness of different minerals ▪ Create a cross sectional model of the Earth's interior ▪ Research local impact of earthquake, and volcanic activity: calculate human impact on such events ▪ Explain the connection between earthquakes, volcanoes, and mountain ranges and tectonic plates ▪ Calculate the epicenter of a local earthquake ▪ Teach a lesson on the rock cycle and provide samples to middle school students ▪ Identify local geology ▪ Research use of carbon dating, successes and difficulties with the technology. How does it work?
<p>The sun's energy and Earth's convection currents CA 4. Energy enters the Earth system primarily as solar radiation and eventually</p>	<ul style="list-style-type: none"> ▪ Solar radiation ▪ Reflection, absorption, and photosynthesis ▪ Greenhouse effect ▪ Differential heating ▪ Coriolis effect ▪ Ocean currents ▪ Biome distribution 	<ul style="list-style-type: none"> ▪ Plant growth lab ▪ Energy from the sun lab ▪ Soil heat capacity ▪ Heating soil vs. water lab ▪ Material absorption and reflection lab ▪ Sources of carbon dioxide lab ▪ Patterns in convection 	<ul style="list-style-type: none"> ▪ Test the strength of sun tan lotions with UV beads ▪ Observe and measure plant growth with direct vs. indirect sunlight ▪ Model the greenhouse effect ▪ Record solar absorption with different colored paper ▪ Build a solar oven and explain its function ▪ Research carbon dioxide levels in developing vs. industrialized countries ▪ Model convection currents

<p><i>escapes as heat.</i> CA 5: Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.</p>		<p>currents</p> <ul style="list-style-type: none"> ▪ Convection lab ▪ Modeling the greenhouse effect lab ▪ Ocean current identification lab ▪ Earth's biomes 	
<p>Climate <i>CA 6: Climate is the long-term average of a region's weather and depends on many factors.</i></p>	<ul style="list-style-type: none"> ▪ Weather vs. Climate ▪ Energy transfer ▪ Effects of climate ▪ Climate change over time 	<ul style="list-style-type: none"> ▪ Formation of clouds ▪ Relative humidity lab ▪ Dew point vs. frost point ▪ Factors that influence climate ▪ Analyzing weather maps ▪ Climate chronology ▪ Rainfall lab ▪ Predicting precipitation 	<ul style="list-style-type: none"> ▪ Research and photograph different cloud types ▪ Intern with a local weatherman ▪ Explain how specific heat influences local weather ▪ Present a weather forecast at PMU ▪ Collect, monitor and graph local rainfall quantities ▪ Research how human activity affects the earth's climate: What other major events have had a substantial impact?
<p>Biogeochemical cycles <i>CA 7: Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.</i></p>	<ul style="list-style-type: none"> ▪ Carbon Cycle ▪ Photosynthesis ▪ Physical and chemical forms of carbon ▪ Element reservoirs and their movement 	<ul style="list-style-type: none"> ▪ Carbon cycle lab ▪ Varied forms of carbon lab ▪ Nitrogen cycle lab ▪ Photosynthesis vs. respiration ▪ Effects of light on photosynthesis lab ▪ Water, Atmospheric, and Earth reservoirs ▪ Movement of elemental reservoirs 	<ul style="list-style-type: none"> ▪ Field Studies ▪ Eco-columns project ▪ Comparison of carbon forms ▪ Teach nitrogen/carbon cycle to an advisory ▪ Demonstrate the connection between photosynthesis and respiration ▪ Prove that plants make oxygen as a waste product
<p>Atmosphere <i>CA 8: Life has changed Earth's</i></p>	<ul style="list-style-type: none"> ▪ Thermal and chemical structure ▪ Composition of Earth's 	<ul style="list-style-type: none"> ▪ Chemical structure of the atmosphere lab ▪ Atmospheric pressures 	<ul style="list-style-type: none"> ▪ Create a scale drawing of the atmosphere ▪ Create a timeline that describes changes in atmospheric composition

<p><i>atmosphere, and changes in the atmosphere affect conditions for life.</i></p>	<p>atmosphere</p> <ul style="list-style-type: none"> ▪ Origin of atmospheric oxygen ▪ Evolution of Earth's atmosphere ▪ Function of ozone layer ▪ Human impact of ozone layer. 	<ul style="list-style-type: none"> ▪ Pollution and the atmosphere ▪ Consequences of thinning ozone lab ▪ Atmospheric changes over geologic time ▪ Calculate percent oxygen lab ▪ Atmospheric changes and elevation lab. 	<ul style="list-style-type: none"> ▪ Describe the atmospheric impact of slash and burn practices ▪ Compare the pollution created by an SUV and an electric hybrid ▪ Illustrate the damage that CFC's cause to the ozone layer ▪ Compare skin cancer rates over time at local hospital internship
<p>Geology of California <i>CA 9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards.</i></p>	<ul style="list-style-type: none"> ▪ Natural resources of California ▪ Natural hazards of California and their geologic origin ▪ Origin and use of fresh water 	<ul style="list-style-type: none"> ▪ Measuring stream flow lab ▪ Snow pack vs. river flow ▪ Erosion and landslide lab ▪ Human activity and water quality ▪ Contaminant limits in fresh water ▪ Lithosphere permeability lab ▪ Measuring dissolved oxygen in water ▪ Create an aquifer lab 	<ul style="list-style-type: none"> ▪ Participate in Water Education Summit ▪ Intern with USGS or CA Forestry Dept ▪ Research gold mining practices and the environmental consequences incurred ▪ Research contaminants in local lake where fishing is permitted ▪ Investigate the causes and model a landslide ▪ Investigate how housing pressures influence water management ▪ Research California's water needs and how they affect neighboring communities

Learning Outcomes. The student will be able to understand:	Learning Activities and Projects that address the stated Learning Outcomes (Be sure to include how mastery of the learning outcomes will be evaluated):	How Standard was Met	Grade for Topic	Advisor Initials	Date Year Tri.
1. Solar system, stars, galaxies and the universe					
2. Plate tectonics					
3. The sun's energy and Earth's convection currents					
4. Climate					
5. Biogeochemical cycles					
6. Geology of California					

Key:

Internship = LTI Independent Project = IP Workshops = W Advisory = A College Classes = CC Online Courses = OC	Summer School = SS Field Studies (day trips, summer travel) = FS Pick Me Ups / Lecture = L Test = T Interviews = IV
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Date Code:

Number of the quarter, and the year (for example: Q1 0405)