SAN LEANDRO UNIFIED SCHOOL DISTRICT
COURSE PROPOSAL

SECTION A. COVER PAGE

1. **Course Title: Earth Science**	7. **Action** ☒ New Course ☐ Course Revision ☐ Title Change Only
2. **Date Submitted:**	8. **Grade Level** ☐ 9 ☒ 10 ☒ 11 ☒ 12
3. **Transcript Title/Abbreviation(s)**	9. **Prerequisites** (Please list.) ☐ Required ☒ Recommended Algebra 1 completed
4. **Transcript Course Code/Course Number :**	10. **Seeking Program Distinction?** ☐ YES ☐ Honors ☒ NO ☐ AP
5. **Subject Area** Earth Science	11. **Is this a CTE course?** ☐ YES ☒ NO **If YES, complete Section C**
6. **Department** Science	12. **Previously approved by UC?** ☐ YES ☒ NO Year approved Year removed
13. **UC ELIGIBILITY** **Already eligible?** ☐ YES ☐ NO a☐ b☐ c☐ d☐ e☐ f☐ g☐ **Proposing eligibility?** ☒ YES ☐ NO a☐ b☐ c☐ d☒ e☐ f☐ g☐ Please mark one for approved eligibility or proposed eligibility.	14. **Unit Value/Course Credit/Length of Course** ☐ 0.5 (semester or half-year ☒ 1.0 (one year equivalent) ☐ 2.0 (two-year equivalent) ☐ Other
15. School Contact: Name:Joseph Chapdelaine Phone:(510) 6184600 ext 2248 Email:jchapdelaine@slusd.us Position:Teacher	
16. Signatures: Department Chair: _____ Principal: _____	**DISTRICT OFFICE USE ONLY** **Date approved by Board Curriculum Committee** 1/6/15 **Date approved by Board**

SECTION B. COURSE CONTENT

17. Course Description

Earth Science is a laboratory science that will take an in-depth look at the natural world and its processes. Its curriculum will focus on matter, energy, origin and evolution of the Earth and its solar system, geology, meteorology, oceanography, and the cycles that circulate energy and material through the biosphere. The objective and purpose of this course is to have students master a broad curriculum that gives them a comprehensive understanding of the universe and the natural world. Inquiry-based labs and activities are the cornerstone way that curriculum is introduced and taught in this course. Additional assignments and in-class activities are also incorporated throughout the week, which reinforce the material taught. There are no prerequisites for this class as it is designed to be a sophomore science class, or an elective class for older students who are looking to take extra science classes. This class is also designed for students who do not qualify for Chemistry, but allows students to gain their physical science credit to fulfill their graduation requirements. This laboratory course also fulfills the "d" requirement for University of California eligibility so students will not be wasting a year of science if they are not ready for Chemistry. Lastly, this course will also prepare students for the Next Generation Science Standards since there is an Earth Science component to them.

18. Course Goals and/or Major Student Outcomes

*The learner will develop abilities necessary to do and understand scientific inquiry on the earth and its processes.-
*The learner will acquire an understanding of the earth in the solar system and its position in the universe.
*The learner will build an understanding of the origin and evolution of the universe.
*The learner will build an understanding of the composition of the Earth, the importance of each layer, and how it relates to biosphere.
*The learner will develop an understanding of the Earth's geology and its tectonic processes (earthquakes, volcanoes, tsunamis, etc.)
*The learner will develop and understanding of California's geology and its fresh water availability and needs.
*The learner will acquire an understanding of global and local weather and climate patterns, as well as global climate change.
*The learner will build an understanding on the composition of the atmosphere.
*The learner will develop an understanding of the Earth's oceans.

19. Course Objectives (standards)

*The learner will conduct a variety of laboratory and field inquiries on the Earth and its processes using scientific inquiry.
*The learner will study the Earth and its relationship to the solar system and universe through a series of laboratories and models.
*The learner will investigate the origin and evolution of the universe.
*The learner will conduct a series of laboratories and inquiry-based activity to build a model of Earth's geology and tectonic processes.
*The learner will conduct a variety of laboratories to investigate the composition of the Earth and how material cycles through the biosphere.
*The learner will use scientific inquiry to investigate a series of maps to build their understanding on California's geology, freshwater supply, resources, and natural hazards.
*The learner will conduct a variety of laboratories to build their understanding of weather, climate, and climate change.
*The learner will study and investigate the composition and evolution of Earth's atmosphere and oceans.

20. Course Outline

I. Scientific Inquiry and its Procedures, Metric System, and other Science Basics

- Using the Scientific Method to conduct science experiments
- Creating Models to explain scientific phenomena
- Laboratory safety
- Understanding graphs and how to set up a graph
- Metric System basics- grams, liters, and meters
- How to do metric conversion
- Understanding mass, volume, and density
- Calculations: D= M/V, M= D x V, V= M/D
- Understanding maps: Latitude and Longitude
- Topographic Maps and contour lines

II. Astronomy

- The formations and structure of our solar system
- Characteristics of each of the planets in our solar system and how Jovian and Terrestrial Planets differ

- Understanding Earth's moon: The Collision-Ring Theory and moon phases
- Understanding the greenhouse effect and planets' surface temperatures
- Planet motion and the historical theories and evidence that led to our current understanding
- The expanding universe- Understanding the Big and Theory and how cosmic background radiation and the red shift of distant galaxies provides evidence for the theory.
- Characteristics of spiral, oval, and irregular galaxies
- Understanding the Milky Way galaxy
- Star characteristics, life cycle, and nuclear fusion

III. Geology
- The history of how the Earth formed and how it evolved to the way it is today
- Layers of the Earth and the characteristics of each layer
- Understanding convection currents in the mantle
- Understanding Rocks: Igneous, Sedimentary, and Metamorphic
- Minerals and mineral identification
- The Rock Cycle: Understanding the process that break down rock and the processes that change rock from one type to another.
- Pangaea and Alfred Wegener's theory of Continental drift
- Evidence of continental drift and sea floor spreading
- The ocean floor
- Analyzing patterns in Earthquakes and volcanoes to find plate boundaries
- Understanding plate boundaries: Convergent, Divergent, and Transform
- Geologic features found at each plate boundary and how to analyze specific types of maps to determine where plate boundaries are and which type they are (for example- patterns of shallow earthquakes show one that there is a plate boundary, while deep earthquakes show one that the plate boundary is converging)
- Making a model of a imaginary planet and investigating its plate boundaries
- Understanding how Earthquakes work and the scales we use to measure them
- Tsunamis
- Understaning the three types of Volcanoes, their characteristics, and what makes a volcano explosive or not

IV. California Geology
- Understanding how California is divided into eleven provinces based on geology
- The geologic hazards of California and each of its province
- Looking for patterns in California geology and hazards
- California's water freshwater supply and population by region
- California's natural resources

V. The Atmosphere and Earth's Energy

- The Atmosphere: composition, layers, and how temperature and air pressure changes as altitude increases
- Understanding why solar radiation is either absorbed or not in each layer
- Understanding the Ozone and the greenhouse effect and its effect on plant and animal life
- Knowing the difference between the ozone and greenhouse gases
- Incoming solar radiation: where it is absorbed and reflected and at what percentage
- Distribution of Earth's energy
- Energy and how heat transfers (radiation, conduction, convection)
- Skin cancer: What it is, how one can get it, its consequences, and prevention

VI. Climate and Weather
- Uneven heating of Earth's surface- how it creates pressure differences which create local and global winds
- Global wind patterns
- Understanding weather and climate: what they are and how they are different
- Factors that affect climate
- Temperature inversion
- Why the Earth has seasons

VII. Biogeochemical Cycles
- Understanding the Water Cycle and the processes that drive it (solar energy, evaporation, transpiration, etc)
- Nitrogen Cycle
- Carbon Cycle
- Photosynthesis and Cellular Respiration

VII. The United States National Parks
- Students conclude year with a national parks project. Students research a national park and use their knowledge from the year to discuss its geology and history.

21. Instructional Materials:
Board approved required text
Earth Science (Prentice Hall

Supplementary materials

22. Key Assignments

I. Scientific Inquiry and its Procedures, Metric System, and other Science Basics

1) Black Box Investigation – Students work in their lab groups (four students) to come up with a model that explains the data that they collect from their "black box". The black box is a wooded box that students cannot see into. It has a funnel on the top in which students pour in measured amounts of water (200mL at a time). There is also a tube that runs out a hole in the bottom of the box where students collect the amount of water that comes out of the box. Inside is a water system that collects water and lets it out at certain levels. The box typically releases three different output of water throughout the activity. Students must figure out the pattern in data and then come up with a model that explains how the box could release differing amount of water. Students then make a poster of their model and present to class. Students are never shown what is inside the box. This supports scientific inquiry, experiment design, and proper data collect technique.

2) Length Lab – Students are sent in their lab groups to measure objects around campus using a meter stick. Students must then convert their measurements to millimeters, centimeters, decimeters, meter, or kilometers.

3) Liquid Density Inquiry Lab – Lab groups are given four different colored liquids in beakers (with different salt concentrations) and must figure out the correct order that causes the liquids to stack unmixed in a graduated cylinder. Only one combination works. During this lab students are introduced to density and once they figure out the correct order they must calculate the density of 20mL of each liquid to conclude that they did their order was correct.

4) Solid Density – Lab groups are given eight small blocks. Students must calculate the density of each block in two ways. First they must find the volume of each block by measuring the length, width, and height with a ruler. Then they must calculate density by finding the volume of the blocks using the water displacement method. Students then must look at their data and determine which method is more accurate. Students are also given a list of material with different densities and they must determine what each block is made of. Students are also learning how to use scales correctly in this lab.

5) Topographic Map Lab – Students work in groups of four to make a topographic map of a small model volcano. Students are given a clear box that has a volcano and other land features in it. Students then fill the box with water one centimeter at a time. After each centimeter of water is added, lab groups must put the clear lid on the top of the box and trace the waterline, which represents the same elevation throughout the box.

II. Astronomy

1) Walk the Solar System Lab – The whole class works together in this lab to "walk" our solar system. The Sun is scaled down to 10cm in diameter and all the planets in our solar system are scaled down accurately compared to the sun. The distance between planets are also scaled down accurately in which every step taken represents five million miles in space. Students also take notes on each planet as they are spaced out in a straight line.

2) Moon Phase Inquiry Lab – Students work in lab groups to discover what is causing the phases of the moon and that the moon axis of rotation is tilted. Students are given Styrofoam balls on sticks and all the lights in the room are turned off except for one bulb that is on in the upper corner of the room. Students also discover that the Earth's moon is locked into its rotation around Earth, which is why we only see one side of the moon.

3) The Expanding Universe Lab – Lab groups are given a medium/large balloon and blow the balloon up to 8cm in diameter. Students then make nine random dots on the balloon and label them A-I. Point A represents the Milky Way Galaxy while the other eight points represent eight distant galaxies. Students measure the distance from Point A to all the other points. They then blow the balloon up to several larger sizes and measure the distance from point A to all the other points. The purpose of this lab is threefold: (1) students understand the that the universe is expanding, (2) Students measure and calculate that galaxies farther away from Point A (the Milky Way) are moving at a greater distant and speed than those closer to Point A, and (3) that it is space itself (in this model the balloon) that is expanding and moving the galaxies.

III. Geology

1) Convection Current Inquiry Lab – Students work in their Lab group to come to discover what convection are and how the temperature of a fluid affects its density, and how convection currents form from it. Students work through several activities involving heating water in a beak on a hot plate with hole punches in it (shows convection). They also work with hot and cold dyed water in a larger tub of water to show how temperature affects density.

2) Rock Cycle Lab – The purpose of this lab is for students to relate how a sugar cube is related to the different stages or types of rock in the rock cycle. For example, a whole sugar cube is similar to sedimentary rock because it is made of individual sugar grains that are compacted together. Students then break down the sugar cube, melt it, and let it cool in which they relate each step to the rock cycle in their lab write-up.

3) Mineral Identification Lab - Students are taught the different ways and tests to identify minerals. They rotate to eight lab stations with a different mineral at each and conduct the identification tests. Once lab groups are done students are given a large data table with 20 minerals with all of their characteristics on it, and lab groups have to identify which minerals were used in the lab.

4) Pangaea/Continental Drift Lab – Students work in pairs and have to recreate Pangaea with laminated paper continents. Students place the continents in their preset locations and then are given clues to try to fit the continents together by their shape or the shape of their continental shelf, their ancient temperatures (which are on the continents), or the rock patters found on the continents. Students then are challenged to figure out where each continent might be in the future.

5) Locating Patterns in Earthquakes and Volcanoes Lab – Students work individually to plot data points of earthquakes and volcanic eruptions that have occurred in the past 100 years. Students come to the realization that there are patterns in where Earthquakes and volcanoes occur. Students discover in the following activity on the sea floor that the world's crust is broken up into plates, and that it is at the plate boundaries where volcanoes and earthquakes occur.

6) Seafloor Spreading Lab – Lab groups have two beakers filled with 200mL of water with pepper mixed in. On the surface of the water 9 (in both beakers) are small transparency cut outs of Africa and South America. Students makes sure that both continents start out pushed together like they were when Pangaea existed. Students then leave one beaker on their table and place the other one on a hot plate. Students discover that convection currents and seafloor spreading are the force that causes continents to move apart.

7) Planet Nighthawk Inquiry Lab –Students work individually and in pairs on an imaginary planet. Students have just learned which tectonic features happen at each type of plate boundary. Students are given a series of maps that they have to work through to

figure out where the plate boundaries are on this imaginary planet, and the type of plate boundary each one is (convergent, divergent, or transform).

8) Earth's Plates Inquiry Lab – Students work in individually and in groups with the same type of maps from the previous lab, but this time the maps are of Earth. Students must figure out where all the plate boundaries are on Earth and identify which type of plate boundary each one is.

9) Mercalli Scale Lab – Students use data of observations of damage from a real earthquake in the past. The observations of damage include cities all over the bay area and up into Sacramento. Students must match up each city's damage summary with a ranking on the Mercalli Scale and then write that numerical value on their map next to the respective city. Students then create a shake map by coloring in their map based on their shaking intensity color key.

10) Volcano Lab – Students work in their lab group to do the classic vinegar and baking soda volcano lab. After students finish lab they then must do a lab write-up that has them apply what they know about volcanoes and the gases and minerals that make them explosive or not.

11) Hawaiian Islands Lab – Students work individually to calculate the speed that the Pacific plate is moving. They do this by measuring the distance between the Hawaiian Islands over time.

IV. California Geology

1) California Freshwater Supply – Students look through a series of maps (California rainfall, streams and lakes, aqueducts, and population) in their lab groups to understand what is going on with California's freshwater supply and demand. Students are then given a California freshwater fact sheet and must complete a lab write up about where California's freshwater is, where most of the population and need for water is, and problems that could arise.

V. The Atmosphere and Energy

1) The Earth Atmosphere Lab – Students are given data on the atmosphere's temperature as altitude increases. Students graph the data and read through some material to determine where to draw the boundary lines for each layer. They then must explain in their write up what temperature is doing through each layer and how solar radiation is either being absorbed or not.

2) Composition of the Air – Students work in lab groups to determine the oxygen content in the air in the troposphere. Lab groups do this by placing a glass beaker on top of a burning candle that is in a box with 1cm of water. As the candle burns out, the water level in the beaker rises to compensate for the oxygen that was just burnt. Students then calculate the height that that the water rose compared to the overall height of the beaker to determine how much oxygen was in the beaker. Students then write-up their finding and apply them to the atmosphere.

3) Uneven Heating of the Earth – Lab groups rotate around room to different lab stations to discover how Earth's surface heats unevenly. For example, one station has a heat lamp that is heating up two thermometers in which one has a black background and the other has a white background. Another station has a heat lamp that is heating up two thermometers in which one has a black cloth wrapped around it and the other has a white cloth wrapped around it. Another station has a heat lamp heating up two beakers. One beaker has dirt in it while the other has water in it. They continue on to several other stations and write-up their findings and apply them to different cities in California.

4) Conduction Heat Transfer Lab – Students use two Styrofoam cups with lids and an aluminum bar in this lab. Students pour room temperature water in one cup and hot water into the other. Students then cover the cup with lids and then connect the aluminum bar, which is U-shaped, to both cups, as well as thermometers. Students then record the temperature of both water cups for ten minutes. They observe heat transferring due to conduction.

VI. Climate and Weather

1) Climate of an Imaginary Continent – Students are given a map with one large continent surrounded by an ocean. The map also contains latitude and longitude. The continent has geologic features (such as mountains) and five cities labeled on the continent. Students then must work through the data given to them and the location of the cities to determine the climate of each city.

VII. Biogeochemical Cycles

1) Glucose/Photosynthesis Lab - The purpose of this lab is for you to gain an understanding of the molecular changes that take place during photosynthesis. In groups you students collect the different molecules, (reactants), which are necessary for carrying out the photosynthetic process of synthesizing glucose molecules, (products), just like a plant does. Students will figure out how many of each molecule is necessary for creating one molecule of glucose. Lab groups work with different colored golf balls, which represent the different elements, to complete this lab.

23. Instructional Methods and/or Strategies

I) Warm-Ups – Students start every class with warm-up questions that review recent material, have a challenge question, or ask for their opinion on a topic.

II) Vocabulary – Most topics within a unit are begun with a vocabulary assignment. Fryer diagrams are often used. In a Fryer diagram the student defines the word, writes down characteristics of the word, an example of the word, and draws a picture of the word.

III) Notes – Students regularly take notes during lectures. Students are scored for doing summaries of each set of notes.

IV) Practice Problem Sets/Worksheets – selected problems from the book are often used within units to help reinforce the material to the students. These practice problems also allow instructor to assess student learning and leave feedback.

V) Laboratories – Students work collaboratively in pairs or fours to conduct an experiment. Each student, however, must write the prelab, collect their own data, calculate, graph, and do the post-lab write-up on their own.

VI) Cooperative Learning Activities – Students often work in groups of varying sizes to complete certain tasks for an activity and reach the learning goal.

VII) Video Worksheets – PBS Nova videos are often used to support the curriculum in the classroom and to bring relevancy and intrigue into the

classroom. Students answer questions as they watch the video and turn in their worksheets for scoring.
VIII) Participation – A record of student participation is kept and is an important part of students understanding of material.
IX) Tests and Quizzes - Tests and quizzes are an essential assignment as they display to students what they have learned. It is also a very significant portion of a student's grade.

24. Assessment Methods and/or Tools

1. Summative Assessment – students will be tested on each unit throughout the year and will also receive final exams testing their cumulative knowledge for each semester.
2. Formal Assessment – Students will be given a variety of assignments and will be graded and have feedback on it.

25. Grading Policy

A running total of points will be accumulated throughout the semester and final grades will be determined by the following grade breakdown:

Grading Scale		Final grade will consist of:	
90-100%	A	35%	Quizzes and Tests
80-89%	B	15%	Final Exam
70-79%	C	20%	Classwork and Homework
60-69%	D	20%	Labs and Projects
59%-below	F	10%	Participation

SECTION C

26. Context for Course (optional)

REQUIRED FOR CTE COURSES

NOTE: In order to understand the context for a new course, sometimes it is helpful to understand the broader educational program and/or reform efforts of the school. How does this course fit into broader departmental and/or pathway structure? How does it fit into the overall school restructuring plans? Is the course intended to be a core course or supplemental? What are the student/school/community needs met by this course?

27. History of Course Development (optional)

REQUIRED FOR CTE COURSES

NOTE: Likewise, it is sometimes helpful know the origins of a course and who was involved in its development. Was this course modeled after another course at another school? If so, is that course UC approved? How does the course being submitted differ from the course after which it was modeled? Has this course received any special recognitions, designations or awards? Has it been articulated to local community colleges or universities?