Glendale Unified School District

Senior High School

March 20, 2012

Department: Science

Course Title: Geology of Disasters A

Course Number:

Grade Level: 10-12

Semester Credits: 5

Recommended Prerequisite: Physics and Algebra I (concurrent enrollment)

Recommended Textbook: Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes (3rd Edition), Edward A. Keller, Duane E. DeVecchio (2012) Prentice Hall

Course Description: The Geology of Disasters, a Hazus-MH Training Course, is a Career Technical Education course integrating Earth Science standards. This course is appropriate for 10th through 12th grade students who are interested in the geologic features and processes behind natural disasters. Students will learn disaster preparedness planning and how to use free online mapping programs to monitor and communicate disaster locations and conditions. Section "A" not a required prerequisite for section "B."

I. Standards

A. **Dynamic Earth Processes**
Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. (3)

As the basis for understanding this concept:

1. Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics. 3.a

2. Students know the principal structures that form at the three different kinds of plate boundaries. 3.b

3. Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes. 3.c

4. Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude. 3.d

5. Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes. 3.e

6. Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction. *3.f

B. Energy in the Earth System
Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.

As a basis for understanding this concept:

1. Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat. 5.a

2. Students know the relationship between the rotation of Earth and the circular motions of ocean currents and air in pressure centers. 5.b

3. Students know the origin and effects of temperature inversions. 5.c

4. Students know properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms. 5.d

5. Students know rain forests and deserts on Earth are distributed in bands at specific latitudes. 5.e

6. Students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts. *5.f

7. Students know features of the ENSO (El Niño southern oscillation) cycle in terms of sea-surface and air temperature variations across the Pacific and some climatic results of this cycle. *5.g

C. Climate is the long-term average of a region's weather and depends on many factors.

As a basis for understanding this concept:

1. Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere. 6.a

2. Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents. 6.b

3. Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement. 6.c

4. Students know how computer models are used to predict the effects of the increase in greenhouse gases on climate for the planet as a whole and for specific regions. *6.d

D. California Geology

The geology of California underlies the state's wealth of natural resources as well as its natural hazards.

As a basis for understanding this concept:

1. Students know the resources of major economic importance in California and their relation to California's geology. 9.a

2. Students know the principal natural hazards in different California regions and the geologic basis of those hazards. 9.b

3. Students know the importance of water to society, the origins of California's fresh water, and the relationship between supply and need. 9.c

4. Students know how to analyze published geologic hazard maps of California and know how to use the map's information to identify evidence of geologic events of the past and predict geologic changes in the future. *9.d

E. Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:

1. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

2. Identify and communicate sources of unavoidable experimental error.

3. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.

4. Formulate explanations by using logic and evidence.

5. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.

6. Distinguish between hypothesis and theory as scientific terms.

7. Recognize the usefulness and limitations of models and theories as scientific representations of reality.

8. Read and interpret topographic and geologic maps.

9. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).

10. Recognize the issues of statistical variability and the need for controlled tests.

11. Recognize the cumulative nature of scientific evidence.

12. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

13. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

F. **Career Technical Education Environmental and Natural Science Engineering Pathway Standards**

E2.0 Students study and understand the fundamentals of earth science as they relate to environmental engineering:

E2.1 Students classify the three major groups of rocks according to their origin on the basis of texture and mineral composition.

E2.2 Students analyze the importance and use of soil, and evaluate how soil may be preserved and conserved.

E2.3 Students know how to assess and evaluate geological hazards.

E2.4 Understand how to read, interpret, and evaluate topographical maps and images.

E2.5 Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.

E2.6 Analyze soil erosion and identify the causes.

E3.0 Students understand the effects of the weather, the hydrosphere, and the atmosphere on the environment:

E3.1 Understand the effects of weather fronts on regional air pollution.

E3.2 Know the common causes of atmospheric contamination.

E3.3 Analyze atmospheric pressure and weather systems.

E3.4 Know the major systems used to monitor, analyze, and predict conditions of meteorological events.

E3.5 Analyze the mechanisms for air mass movement.

E3.6 Understand the relationship between the health of the marine environment and climate control.

E3.7 Understand the effects of human activity on the atmospheric environment.

II. Sample Assessments

A. Formative assessments – checks for understanding, acquisition of information

B. Section quizzes – confirms assimilation of subject material

C. Written composition and reports – demonstrates application of subject material and literacy in the content area

D. Laboratory exercises – practical application of subject area

1. Laboratory Manual in Physical Geology

a. What is Science? A process and a body of knowledge (Incorporating Observing and Measuring Earth Materials and Processes, Laboratory One Laboratory Manual in Physical Geology)

b. Data collection in the field – San Andreas Fault in Palmdale

c. Rock Forming Processes and the Rock Cycle (Laboratory Four)

d. Earthquake Hazards and Human Risks (Laboratory Sixteen)

e. Stream Processes, Landscapes, Mass Wastage, and Flood Hazards (Laboratory eleven)

f. Groundwater Processes, Resources, and Risks (Laboratory Twelve)

2. Unit tests – assesses comprehension of material

3. Interim assessments – assesses mastery of subject

4. Presentations – learning is further developed by teaching others

5. Midterm – assesses comprehension and retention of material

6. Comprehensive final – assesses comprehension and retention of material

7. Capstone project – documents students' ability to adapt course material to real-world predictable and unpredictable situations

III. Topic of Study - Suggested Time Distribution

A.	Dynamic Earth Processes	25%
B.	Energy in the Earth System	25%
C.	California Geology	25%
D.	Investigation and Experimentation standards	25%

IV. Recommended Materials

Laboratory Manual in Physical Geology
Eighth Edition, Pearson/Prentice Hall
Richard M. Busch, Editor

Glendale Unified School District

Senior High School

March 20, 2012

Department:	Science
Course Title:	Geology of Disasters B
Course Number:	
Grade Level:	10-12
Semester Credits:	5
Recommended Prerequisite:	Physics and Algebra I (concurrent enrollment)
Recommended Textbook:	FEMA Hazus-MH workbooks will be used - 313 Basic Hazus-MH - 174 Hazus-MH for Earthquake - 172 Hazus-MH for Flood - 296 Application of Hazus-MH for Risk Assessment - 317 Comprehensive Data Management
Course Description:	The Geology of Disasters, a Hazus-MH Training Course, is a Career Technical Education course integrating Earth Science standards with Environmental and Natural Science Engineering pathway standards. This course is appropriate for 10th through 12th grade students who are interested in disaster preparedness planning and mitigation with geographic information systems. The major focus of the Geology of Disasters course is to prepare students to do risk analysis, loss estimation and evaluate mitigation techniques for earthquake, flood and hurricane wind disasters. Students will employ GIS analysis integrated with cartographic and scientific concepts for the investigation of disaster related problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges throughout the course. Students will also learn how to document their work, and communicate their findings to their peers and members of the professional community. Section "A" not a required prerequisite for section "B."

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3. Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude. 3.d

B. **Climate is the long-term average of a region's weather and depends on many factors.**

As a basis for understanding this concept:

1. Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere. 6.a

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13. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

E. **Career Technical Education Environmental and Natural Science Engineering Pathway Standards**

E1.0 Students know how to communicate and interpret information clearly in industry-standard visual and written formats:

E1.2 Know the current industry standards for illustration and layout.

E2.0 Students study and understand the fundamentals of earth science as they relate to environmental engineering:

E2.3 Students know how to assess and evaluate geological hazards.

E2.4 Understand how to read, interpret, and evaluate topographical maps and images.

E2.5 Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.

E3.0 Students understand the effects of the weather, the hydrosphere, and the atmosphere on the environment:

E3.3 Analyze atmospheric pressure and weather systems.

E3.4 Know the major systems used to monitor, analyze, and predict conditions of meteorological events.

E3.5 Analyze the mechanisms for air mass movement.

E3.6 Understand the relationship between the health of the marine environment and climate control.

E3.7 Understand the effects of human activity on the atmospheric environment.

E5.0 Students understand the design process and how to solve analysis and design problems:

E5.1 Understand the steps in the design process.

E5.2 Determine what information and principles are relevant to a problem and its analysis.

E5.3 Choose between alternate solutions in solving a problem and be able to justify choices in determining a solution.

E5.5 Understand the process of developing multiple details into a single solution.

E8.0 Students understand fundamental automation modules and know how to set up simple systems that will complete preprogrammed tasks:

E8.1 Use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data in a simulated or modeled automated system.

E9.0 Students understand the effective use of environmental and natural science equipment: