GLENDALE UNIFIED SCHOOL DISTRICT

Senior High School

January 18, 2011

Department:	Science
Course Title:	Environmental Geographic Information Science (GIS)
Course Number:	7128, 7129
Grade Level:	11-12
Credits Earned:	5 per semester (2 semesters)
Prerequisite(s):	Technology Literacy, Biology 1-2, Science Research (B or better required in all courses, or instructor approval)
Approved Textbook:	Getting to Know ArcGIS Desktop, ESRI Press

Course Description: This course will provide a basic understanding of ArcGIS mapping software and GPS technology. This is a course for juniors and seniors who are prepared to apply concepts learned in Biology and Technology Literacy to real-world problems. Students will participate collaboratively in a field research group project focused on an environmental issue. Students will increase their skills and knowledge in science, laboratory work, research skills, and computer technology by applying academic content in their research and course studies. **This class does not replace a core science course.**

This class provides an academically challenging course in scientific research in the following fields of Biology, Geography and the physical sciences. This course will require students to apply their academic knowledge to the problem solving tasks associated with scientific research. It is the objective of this course to enable students to apply their knowledge of life and physical sciences while working with professionals who will provide mentorship on researching a specific topic in science applicable to the mentor's field of research and the student's field of interest. The students will utilize literature research skills (library/computer/internet) to begin their projects. Students will present the results of their work in both formal written documents and public forums to further develop their written and oral presentation skills. In the classroom they will continue to deepen their knowledge in their chosen field of research and enlighten their peers.

I. Standards

A. California Standard: Ecology.

Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:

1. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.

2. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

3. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.

4. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.

5. Students know a vital part of an ecosystem is the stability of its producers and decomposers.

B. California Standard: 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. The student 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 reason for inconsistent results, such as sources of error or uncontrolled conditions.

4. Formulate explanations using logic and evidence.

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

6. Create and design topographic and geologic maps.

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

8. Recognize the cumulative nature of scientific evidence.

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

10. Investigate a science-based societal issue by researching the literature, analyzing the data, and communicating the findings. Examples of issues include effects of Marine Protected Areas, biomagnification in marine life, and oil platforms as artificial reefs in California.

C. Additional Learning Objectives:

1. Students will increase their understanding of life and/or physical sciences and demonstrate their ability to solve problems and think critically by effectively completing literature searches in their field of research, which can include but is not limited to the fields of Biology, Geography, Geology, and Chemistry.

2. The student will develop a clear understanding of the research area he/she is researching and will demonstrate this knowledge by describing the following:

   a. Standard research technology and equipment used for laboratory tests that are routinely performed, and the professionals involved.

   b. Students will become familiar with all professions in the focused research area and will write a description of each.

   c. Students will be given an area of research to construct their own hypothesis and test their ideas.

3. Students will develop advanced technical reading and writing skills and will be able to understand and critically evaluate the content of scientific text and print materials.

4. Students will investigate factual material for information and analysis and will be able to write in a technical/scientific style with appropriate composition.

5. Students will understand and be able to apply and document common research methods:

    a. Identify problems and unresolved resource needs

    b. Formulate hypotheses based on problem identification

    c. Create an appropriate investigative/experimental design to test a hypothesis

    d. Utilize statistics to analyze experimental data

    e. Document observations, inferences and conclusions from data

6. Students will produce a resource, which involves the application of the discipline areas (science, technology, and English). This resource will be useful to the community, and will be accompanied by written and statistical support, and will be presented as a culmination and demonstration of skill developed in the class.

7. Students will submit a scientifically formatted paper for publication.

II. Sample Assessments

A. Traditional forms of assessment

1. Written reports including research, evaluation, and lab reports

2. Written tests

3. Individual oral/visual presentations

B. Project Based

1. Project selection and development

2. Literature review

3. On-going cumulative portfolio record of project and accomplishments

4. Group presentations (as necessary)

5. Individual presentation to the professional scientific community (conference or science fair)

6. Final project

7. Individual assessment

III. Topic of Study - Suggested Time Distribution

This class is a research-based class therefore time-lines and topics are student specific.

1. Project selection, student research, computer mapping, literature reviews	75%
2. Presentations to fellow classmates	10%
3. Final project and other assessments	10%

4. Attending symposiums	5%

IV. Recommended Materials

A. Texts for Environmental GIS include:

1. *Getting to Know ArcGIS Desktop,* ESRI Press (core)

2. *Mapping Our World; GIS for Educators,* ESRI Press (supplemental)

3. *The Ecology of Marine Fishes; California and Adjacent Waters,* University of California Press (supplemental)

B. Community partners willing to provide data and expertise include:

1. Ventura County Sheriff's Search and Rescue

2. National Oceanic Atmospheric Administration

3. Bureau of Ocean Energy Management, Regulation and Enforcement, formally known as the Mineral Management Services

4. California Department of Fish and Game

5. California State University, Northridge