Department: Mathematics

Course No: MATH 1050Q [108Q]

Title: Mathematical Modeling in the Environment

Credits: 3

Contact: David Gross

Content Area: CA 3 Science and Technology

WQ: Q

Catalog Copy: -MATH 1050Q [108Q]. Mathematical Modeling in the Environment. Either semester. Three credits. Recommended preparation: MATH 101 or the equivalent. A solid background and good performance in high school algebra are highly recommended.

An interdisciplinary approach to environmental issues, such as: ground water contamination, air pollution, and hazardous materials handling. Emphasis on
mathematical models, social and ethical implications, and physical and chemical principles. Includes a spread sheet program for water and air pollution data; a computer modeling package to analyze hazardous materials emergencies; creative use of the Internet; field research.

Course Information:
-a: This course intends to provide an in-depth, interdisciplinary introduction to several environmental issues. It is intended to cover the scientific processes, the ethical, legal and political implications, and the mathematical modeling involved in analyzing these issues fully. It will use the Internet, EXCEL, and a HazMat software to facilitate virtual involvement and computations.

b: Exams: Two in-class, mid-semester exams, and a Final Exam.
Homework Assignments: Weekly assignments of 4 - 6 projects/exercises, ranging from: Internet , mathematical problem sets, or computer assignments involving EXCEL, or a HazMat software.

c: Major Topics will include:
a. Water pollution (particularly, groundwater pollution)
b. Air pollution (particularly, fixed source emissions)
c. Hazardous Material mishandling (particularly accidents
involving toxic or flammable spills)

CA3 Criteria:

1. Explores an area of science or technology by introducing students to a broad, coherent body of knowledge and contemporary scientific or technical methods: Explores the broad and relevant area of environmental pollution. Emphasizes quantitative and scientific aspects, without

neglecting the social and ethical implications. Exposes students to the coherent body of scientific knowledge, and to the methods and technologies, necessary for analysis of case scenarios of groundwater contamination, air pollution, and hazardous material accidental releases.

2. Promote an understanding of the nature of modern scientific inquiry, the process of investigation, and the interplay of data, hypotheses, and principles in the development and application of scientific knowledge: The course exposes students to the step by step inquiry required to model real life phenomena. The process involves the translation of the situation into mathematical language, the solution of the resulting mathematical problem with the use of appropriate technology, and the interpretation of the results in the context of the original real-life problem. Therefore, students acquire direct knowledge of the process of applying scientific thought and methods to investigate real life phenomena.

3. Introduce students to unresolved questions in some area of science or technology and discuss how progress might be made in answering these questions: Human contamination of the environment is one of the biggest unresolved issues of contemporary relevance. The course provides a background to many of the problems, and an in-depth look at selected problems. Class discussions and guest speakers cover topics that investigate the extent to which progress in sciences is capable to solving environmental problems.

4. Promote interest, competence, and commitment to continue learning about contemporary science and technology and their impact upon the world and human society. Students are involved in environmental issues through the internet, through guest speakers, through the use of a professional risk analysis software created by the Environmental Protection Agency, and through analysis of real-life case scenarios. The aim is to provide the students with a body of knowledge on environmental issues, which can be used to make informed and responsible decision on theseissues, when they are encountered later on in life.

Q Criteria : -The course include mathematics at or above the basic algebra level as an integral part of the course which is used throughout the course. The course included the use of basic algebraic concepts such as: formulas and functions, linear and quadratic equations and their graphs, systems of equations, polynomials, fractional expressions, exponents, powers and roots, problem solving and word problems. The course require the student to understand and carry out actual mathematical manipulations and use them in order to draw conclusions.

Role of Grad Students: -This course is taught typically taught by faculty, but on rare occation, it might be taught by a graduate teaching assistant under faculty supervision.