Department: Marine Sciences

Course No : MARN 220Q

Title : Environmental Reaction and Transport

Credits : 4

Contact: Annelie Skoog

Content Area: CA3 Science and Technology

QW: Q

Course Information :

Goals and Objectives: This course is designed to transition students from "plug-and-chug" quantitative analysis to writing and solving the defining equation themselves. The course starts with a simple verbal and algebraic definition of the Conservation of Mass equation that is elaborated with multiple examples and homework problems. The concept is explored in terms of the physical meaning of both the reaction and the transport terms as expressed in various units as a function of time and space.

Course requirements: Students are assigned mathematical problems weekly that explore their comprehension and application of fundamental concepts of reaction and transport in multiple environmental examples. Students generate their defining mathematical balance from the information presented. For several homework assignment, specific demonstrations are performed that generate real data that are analyzed by students as process rate constants, residence times and dynamic equilibria.

Exams consist of both a 'take-home" section (similar to homework) and an in class section. The students are also assigned a semester long task of interpreting archived data from www.mypond.uconn.edu that results in a team presentation.

Major themes, issues, topics: Algebraic and physical meaning of numbers, calculations, 2) mass balance equations for multiple environmental systems, 3) components of reaction and transport and their expression in differential terms, 4) interpretation of data in time and space, 5) quantification of fluxes across boundaries, 6) development of problem solving techniques for the real world

Q Criteria: This course is designed to transition students from "plug-and-chug" quantitative analysis to writing and solving the defining equation themselves. The course starts with a simple verbal and algebraic definition of the Conservation of Mass equation that is elaborated with multiple examples and homework problems. The concept is explored in terms of the physical meaning of both the reaction and the transport terms as expressed in various units as a function of time and space. The algebraic Conservation of Mass Equation is then expanded into its

differential form with an appropriate discussion of initial conditions, boundary conditions and simplifications and an investigation of advective and diffusive transport.

Students are assigned mathematical problems weekly that explore their comprehension and application of fundamental concepts of reaction and transport in multiple environmental examples. Students generate their defining mathematical balance from the information presented. For several homework assignment, specific demonstrations are performed that generate real data that are analyzed by students as process rate constants, residence times and dynamic equilibria.

Exams consist of both a ‘take-home” section (similar to homework) and an in class section. The students are also assigned a semester long task of interpreting archived data from www.mypond.uconn.edu that results in a team presentation. At the end of the course, students are able to read data (typically concentration) as a function of time and space and interpret such data in terms of the dynamics processes that contribute to the observations, quantify the rate of response of the systems and pose hypotheses to test their interpretations. The ‘answer' in this course is a mathematically derived number with appropriate unit for which the student can proscribe specific physical meaning.

Role of Grad Students : - The graduate assistant will grade homework, conduct office hours for student help and conduct one hour per week of examples problems in a recitation type discussion. During some recitations, demonstrations will be conducted that provide real data for quantitative interpretation assigned as homework.