SYLLABUS

1. Course number and title: 11:375:201 BIOLOGICAL PRINCIPLES OF ENVIRONMENTAL SCIENCE

2. Credits and contact hours: 3 credits, 2-80 min lectures periods per week

3. Instructor's name: Peter Strom, Donna E. Fennell, and George Van Orden

4. Text book, title, author, and year:
   a. other supplemental materials and notes
   Hardin, G. 1968. The Tragedy of the Commons. Science 162:1243-1248. (available on class website)

5. Specific Course Information
   a. Catalog Description: Hazardous agents, pollution, population interactions and dynamics; biogeochemical cycles in damaged and remediated ecosystems; environmental risk, management, and remediation; human health impacts.
   b. Prerequisites: 01:119:115-116 or 01:119:103, 01:160:159
   c. Course Type: Required

6. Course Goals
   a. Specific Instructional Outcomes
      Students will gain an understanding of the scientific and quantitative principles governing environmental science topical areas: water and elemental cycles; microbially mediated redox reactions; contamination and remediation; wastewater treatment; and environmental toxicology. Student will apply knowledge from the sciences and mathematics to environmental problems and solutions; use the skills and modern environmental science techniques and tools necessary for a successful career in the field; function effectively on multidisciplinary teams; communicate technical information effectively (orally, in writing, and through electronic media). Additionally, they will understand: professional ethical responsibilities; contemporary environmental science issues and the impact of environmental science in a global and societal context; the need, and have the ability, to engage in lifelong learning and to participate in professional organizations.

   b. Specific Outcomes are addressed by the course include:

      a. an ability to apply knowledge of mathematics, science, and engineering.
      Instructional Activity: Scientific information and mathematical approaches to solve problems in environmental science are provided in lectures and practiced in homework assignments. Homework assignments are completely individually and then discussed and/or reworked in class.
      Assessment Activity: Three exams help to ensure all material is mastered.
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

Instructional Activity: Lectures include materials on scientific principles of environmental science. The concepts are related to the broader global environment and environmental problems and solutions are discussed in terms of societal impact. Contemporary environmental science issues and the impact of environmental science in a global and societal context are presented. Students perform literature research that is used to complete a group poster project.

Assessment Activity: Students compete in a game to simulate the concept of the Tragedy of the Commons. Following the game there is a discussion of how environmental quality is affected by decisions and actions of different stakeholders who have different motivations. A group research poster project addressing an environmental issue is completed and graded (see description below).

j. a knowledge of contemporary issues.

Instructional Activity: A group research poster project addressing an environmental issue is completed and graded. Student teams of 3-4 select a topic relevant to biological aspects of Environmental Science, perform literature research, and prepare and present a poster. Students are intended to:
1) research a topic of interest, select relevant papers from the primary literature, and critically read them and extract useful information;
2) synthesize and summarize the information into a coherent presentation for your colleagues;
3) work collectively within their group, pay attention to details, and ask questions that expand understanding.

Student teams submit a tentative title (subject to approval) of the poster and the names of the 3-4 people working together as a first assignment. Later they submit a short outline of the poster contents (bullet points, in an organized form), along with citations for most of the references that are being used. Poster information is synthesized from a minimum of 5 references from the primary literature. Secondary sources such as reports and internet resources may also be used sparingly.

Assessment Activity: Posters are presented in class on two days (~10 posters each time, specific participants to be assigned to specific date). Posters are graded by instructors and the TA during a live presentation. All students submit written evaluations of the posters on the day they are not presenting. Poster grades include quality of student’s poster and also the written evaluations of the other posters.

7. Brief list of topics to be covered

- Global biogeochemical and hydrological cycles
- Environmental pollution
- Redox reactions mediated by microorganisms
- Remediation of pollutants
- Water quality
- Biochemical oxygen demand
- Wastewater treatment
- Human impacts of environmental pollutants
- Principles of environmental toxicology
- Risk assessment