SYLLABUS

1. **Number and Name: 11:375:203 – PHYSICAL PRINCIPLES OF ENVIRONMENTAL SCIENCE**

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

3. **Instructor:** Valdis Krumins

4. **Text:** There is no required text book for this class. Course materials including, lectures, problem sets, and solutions will be posted on Sakai (https://sakai.rutgers.edu).

   References on Reserve at Chang Library:

   Mihelcic, James R. "Fundamentals of Environmental Engineering," John Wiley and Sons, New York, 1999.

   Masters, Gilbert "Introduction to Environmental Science and Engineering, Prentice Hall, Upper Saddle River, New Jersey.

   Environmental Systems and Processes by Walter J. Weber, Jr. Wiley Interscience, New York (2001)

   Bird, R. Byron, Stewart, Warren E., and Lightfoot, Edwin N. "Transport Phenomena," John Wiley and Sons, New York.

5. **Specific Course Information**

   a. **Catalog Description:** *Physical properties of water, air, and soils; energy and water in the earth system; kinetic and potential energy; and soil/plant/atmosphere relations.*

   b. Prerequisites: *01:750:193 or 01:750:203 or 01:750:123 and 124.*

   Corequisite*: 01:750:194 or 01:750:204 or 01:750:227*

   c. Course Type: Required

6. **Course Goals**

   a. Specific Instructional Outcomes: After this class, students will be able to:

   - Apply knowledge of mathematics, science and engineering (mass, energy and momentum transport principles) to solve environmental problems
   - Function on multidisciplinary teams
   - Provide quantitative answers to highly complex problems by making assumptions and communicating the knowledge gained and limitations imposed by those assumptions.
   - Communicate scientific calculations clearly in writing

   Students will have a basic understanding of

   - climate change,
   - the relationship between the residence time (or lifetime) of a compound in a reservoir and its concentration (or loading) in that reservoir,
   - the equations of motion governing mass, energy and momentum transport, and
   - the associated commonly used terminology.

b. Specific Student Outcomes addressed by the course include:

a. Ability to apply knowledge of mathematics, science, engineering

Instructional Activity: Concepts of mass, energy and momentum transport and example applications to environmental problem solving will be covered in lectures. Students will practice these skills by doing weekly problem sets and by addressing a problem of their own design.

Assessment Activity: Student performance will be assessed through weekly problem sets, four quizzes and the final exam.

d. Ability to function in multidisciplinary teams

Instructional Activity: The students will practice multidisciplinary team work and address a problem of their own design in teams of 3-4 students with 1-2 engineering students per team. (This class is predominantly comprised of engineering, meteorology and environmental science students)

Assessment Activity: Evaluation of team project report and student feedback.

7. Topics:

Lecture	Topic
1	The nature of environmental problems
2-3	Introduction to Environmental Calculations
4-6	Phase partitioning/phase changes
7-15	Mass Transport
15-19	Energy Transport
20-28	Momentum balances and fluid flow

Grading:

Problem sets -	20%
Quizzes -	40% (10% each)
Group Project –	10%
Final exam -	30%

Prepared by: Valdis Krumins 05/23/17