

**POLYTECHNIC UNIVERSITY OF PUERTO RICO
MASTER OF ENVIRONMENTAL PROTECTION MANAGEMENT**

SYLLABUS

MEM 6940 (3 credits)

Prerequisites: None

I. Title: Introduction to Pollution Control of the Earth Systems

II. Description:

This course introduces the student to the concept of the earth as an integrated system, where human activity, based on the use of natural resources for material development, generates impacts on the environment, interfering with ecology, and creating scenarios that present challenges related to human health and a balanced environment.

The student will acquire knowledge on issues related to i) the oceans, comprising geological, physical, chemical, and biological oceanography; ii) fresh water, discussing properties and characteristics on both pristine and contaminated water bodies, as well as available water purification technologies; iii) land contamination, learning the properties of soils, the mechanisms of contamination, the fate and transport of contaminants in the soil media, and remediation techniques; iv) the atmosphere, including meteorological concepts, significant pollutants, global warming, acid rain, and an introduction to air pollution control; and v) ecology, focused on Puerto Rico and the Caribbean, discussing recent regulatory constraints, marine ecology, the shore, the reef, mangroves and wetland, bio-luminescent embayment, terrestrial ecology, pollution species extinction, environmental disasters, the human population, resource management and societal and economic considerations. The course will be capped with a discussion on the Integrated Earth System, pinpointing the main interactions of the human species with the environment, the problems arising, and the issue of carrying capacity.

III. Goals and Objectives:

The general goal (or objective) is to provide an overview of the earth system, describing its main components, pinpointing the consequences of human activities on this sensitive system, and providing available solutions to existing impacts, as well as future trends and the issues of sustainable growth.

IV. Topics:

Lecture Number	Professor and Date		Contact Hours	Contents
1	Dr. Peláez Nov. 11, 2003.	L	4 Hours	The Ocean <ul style="list-style-type: none"> • Introduction: The history of oceanography and some facts about the oceans. • Geological Oceanography. • Chemical Oceanography.
2	Dr. Peláez Nov. 18, 2003.	L	4 Hours	The Ocean <ul style="list-style-type: none"> • Physical Oceanography. • Biological Oceanography: Necessary conditions for life in the oceans. • Marine resources.

3	Dr. Pimenta Nov. 25, 2003.	L	4 Hours	Fresh Water <ul style="list-style-type: none"> • Description of water characteristics and main properties. • Main sources, routes, and problems of surface and groundwater contamination.
4	Dr. Pimenta Dec. 2, 2003.	L	4 Hours	Fresh Water <ul style="list-style-type: none"> • Fate and transport of contaminants in water bodies. • Methods available for water treatment. • Trends in regulations for water resource preservation.
5	Dr. Pimenta Dec. 9, 2003.	L	4 Hours	Land <ul style="list-style-type: none"> • Description of soil characteristics and main properties. • Main sources and routes, and problems arising from land contamination.
6	Dr. Pimenta Dec. 16, 2003.	L	4 Hours	Land <ul style="list-style-type: none"> • Mechanisms of contaminant association to soils. • Fate and transport of contaminants in the land. • Methods available for land clean-up. • Trends in regulations for land protection.
7	Dr. Leal Jan. 13, 2004.	L	4 Hours	Atmosphere and Air Quality <ul style="list-style-type: none"> • The Atmosphere. • Introduction to Air Pollution: Indoor and Outdoor.
8	Dr. Leal Jan. 20, 2004.	L	4 Hours	Atmosphere and Air Quality <ul style="list-style-type: none"> • Atmosphere pollution induced by humans. • EPA emissions trends. • Pollutant sources, health effects and source control.
9	Dr. Cerame Jan. 27, 2004.	L	4 Hours	Ecology <ul style="list-style-type: none"> • Overview of Puerto Rico's tropical ecology and climate. • Recent regulatory constraints, which are applicable to each ecosystem. • Fundamental concepts of ecology.

10	Dr. Cerame Feb. 3, 2004.	L	4 Hours	Ecology <ul style="list-style-type: none"> • Terrestrial ecology, pollution species extinction, environmental disasters. • The human population. • Resource management and societal and economic considerations.
11	Dr. Pimenta Feb. 10, 2004.	L	4 Hours	The Integrated Earth System <ul style="list-style-type: none"> • Human activities. • Supplementary human activities and needs/habits/dreams. • Main interactions of the human species with the environment. • Ecological/contamination problems arising from human interactions and activities. • Future goals and the issue of sustainable growth.
12	Dr. Leal Feb. 17, 2004.	Final Exam	4 Hours	Final Exam

V. Text Books

- **Ocean:** Duxbury, A.C., A. Duxbury, & K.A., Sverdrup. An introduction to the World's Oceans. 7th. ed. McGraw-Hill, 2002
- **Water:** Letterman, R.D., *Water Quality and Treatment*, American Water Works association, Fifth edition, McGraw-Hill, Inc., New York, 1999
- **Land:** Chiou, Cary T., *Partition and Adsorption of Organic Contaminants in Soils* John Wiley & Sons, Inc, Hoboken, New Jersey, 2002
- **Atmosphere and Air Quality:** "Air Pollution Control Engineering", Noel de Nevers, McGraw-Hill, Second Edition 2000, ISBN 0-07-03937-2
- **Ecology:** Ecología Puerto Rico. Máximo J. Cerame Vivas. 2001. Publicaciones Puertorriqueñas. xviii & 207 pp. (Text)

VI. Academic Methodology

Lectures will introduce fundamentals and new concepts. The discussion of specific environmental scenarios will be emphasized. Students will be required to read scientific papers and present critiques.

VII. Evaluation Criteria

- Five Paper Reviews (50%)
- One Final Exam (50%)

VI. References:

- Thurman, H.V. & E.A., Burton. Introductory Oceanography, 9th edition, Prentice Hall, 2002
- NASA-JPL-PO.DAAC. Physical oceanography from space. 1998. Retrieved 11/11/02 <http://podaac.jpl.nasa.gov/kids/index.html>
- McBride, Murray; *Environmental Chemistry of Soils*, Oxford University Press, New York, 1994
- U.S. EPA. Up-to-date news and information on air pollution and radiation. <http://www.epa.gov/ARD-R5/>
- Award-winning site for pollution prevention, compliance, and policies <http://es.inel.gov/index.html>

- <http://earthsciencesportal.gsfc.nasa.gov>
- <http://earthsciences.gsfc.nasa.gov>
- <http://esse21.usra.edu>
- <http://www.earth.nasa.gov>

Revised by Edbertho Leal-Quirós Ph.D.
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