LEAD CITY UNIVERSITY
Faculty of Sciences
Department of Environmental Management and Toxicology

COURSE PARTICULARS
Course Code: EMT 313
Course Title: Environmental Monitoring Systems and Techniques
Course Units: 3
Course Duration: Two hours of lecture per week for 15 weeks
Course Status: Compulsory

LECTURER'S DETAILS
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Introduction
This course aims to give students an introduction to the environmental monitoring system, models and methods that have been developed for the purpose of environmental monitoring for better environmental protection.

Course objectives
The objectives of this course are to enumerate to students the general principles of environmental monitoring; significance and importance of environmental monitoring system, models and methods for the purpose of environment protection. The students will also be introduced to the sampling techniques and data quality objectives for environmental monitoring, pollution, bioassays, biotesting and toxicity and the students will be active participants in the scientific method through the laboratory exercises. Students will develop skills in critical thinking (via test questions), posing questions (in class); a general understanding of the environmental variables appropriate for monitoring; reversible effects of human activities on the global environment and atmospheric dispersion modeling.

Course description
The course exposes the students to the knowledge on environmental monitoring system. Students will be introduced to the basics of environmental monitoring techniques; organisation of monitoring programmes for site and resource specific strategies, classification of monitoring techniques and use (physical, chemical, biological radioactive), studies of the global sources, sinks, transport (mass balance) of both man-made and natural atmospheric trace components; reversible effect of human activities on the global environment e.g. greenhouse effect, climate change, depletion of stratosphere ozone layer, acid rain; air pollution meteorology, atmosphere dispersion models and elements of air pollution control.

Learning outcomes

At the end of the course, students should be able to:

- Understand the general principles of environmental monitoring
- Know the significance and importance of environmental monitoring system and techniques;
- Appreciate the environmental components of monitoring;
- Describe the environmental variables appropriate for monitoring;
- Identify the pollutants and mechanism of pollutant interaction with soil and vegetation.
- Put the principles learnt into practice on field with a view to be a good environmentalist

Teaching plan

Week	Topic
1	Introduction
2	Techniques for environmental monitoring
3	Sampling and data quality objectives for environmental monitoring
4	Environmental management plan
5	Elements of environmental management plan
6	Pollution
7	Environmental variables appropriate for monitoring
8	Reversible effects of human activities on the global environment
9	Atmospheric dispersion modeling
10	Sampling and air monitoring techniques
11	Mechanism of pollutant interaction with soil and vegetation
12	Bioassays, biotesting and toxicity

Course requirement

Class attendance	-	5 marks
Assignment	-	15 marks
Test(s)	-	20 marks
Final examination	-	60 marks

Reading list

Artiola, J.F., Pepper, I.L., Brusseau, M.L. (2004). Environmental monitoring and characterization. Burlington, MA: Elsevier Academic Press.

DEAT (2004) Environmental management plans, Integrated environmental management, information series 12, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

Engelbrecht, J.C. (2013). Atmospheric air pollution sampling. Source sampling stack sampling: An overview of sampling techniques Tshwane University Technology

Hicks, B.B. et al. (1989). Atmospheric processes research and process model development. Washington, DC, National Acid Protection Assessment Program.

Lovett, G.M., Burns, D.A., Driscoll, C.T., Jenkins, J.C., Mitchells, M.J., Rustad, L., Shanley, J.B., Likens, G.E., Haeuber, R. (2007). Who needs environmental monitoring? Frontiers in Ecology and the Environment, 5(5), 253-260.

Martin, M., Oberson, O., Chopard, B., Mueller, F. and Clappier, A. (1999). Atmospheric pollution transport: the parallelization of a transport & chemistry code, Atmospheric Environment, 33 1853–1860.

McDonald, T.L. (2003). Review of environmental monitoring methods: survey designs. environmental monitoring and assessment, 85, 277-292.

Mitchell, B. (2002). Resource and Environmental Management (2nd ed.). Harlow: Pearson Education Limited.

Timbrell, J. (2000). Principles of biochemical toxicology. 3rd ed., Taylor & Francis, London

Rand, G.M. (1995). Fundamentals of aquatic toxicology, 2nd Ed., Taylor and Francis, Bristol, PA

Vicent, T. et al. (2013). Emerging organic contaminants in Sludges: Analysis, fate and biological treatment, Hdb Env Chem 24: 1–30, Springer-Verlag Berlin Heidelberg

Wiersma, G.B. (Ed.) (2004). Environmental monitoring. Boca Raton, FLA: CRC Press.

Tutorial Questions

1. Explain the concept of environmental monitoring
2. Examine the view that the "modern remote sensing techniques in combination with suitable information management are the only possible means towards effective environmental monitoring, both at a global and a local level"
3. a. Define representative unit, spatial and temporal properties
   b. Explain in your own words using an example, the use of a standard as related to precision and accuracy
   c. Why do the chances of making a false-positive error increase as data values near instrument detection limits? Explain your answer
4. a. What is environmental management plan?
   b. Identify and discuss the elements of environmental management plan
5. a. Describe the importance of meteorology regarding to air pollution
   b. Identify the physiological effects of SO_2 and NO_x
   c. State the role of inversion on the concentration of air pollutants
6. a. Differentiate primary and secondary air pollutants
   b. Enumerate different types of physical forms of air pollutants
7. Briefly discuss the major problem areas considered to be most relevant for early implementation in any global monitoring programme
8. "Environment affects human activities and human activities affects environment, the two interact" (United Nations Conference on Environment and Development, 1992). Discuss
9. a. Describe the harmful effects of NO_2 on living things and the environment
   b. Define aerosol, dust and smoke
   c. Explain the toxicological effects of CO in blood
10. a. Describe industrial air pollution
    b. Enumerate common industrial air pollutants and their sources
    c. Identify health effects of air pollutants on Man
11. a. What is atmospheric dispersion modeling?
    b. Highlight and explain the types of dispersion models
12. In what ways can the ambient air pollutants be monitored?