Module Title:
Natural Water Speciation

Module Code:
AM0501

Maximum Number of Students:
20

Total ECTS Credits
2

Notional Learning Hours
(a) Contact Time - 20h
(b) Private Study - 30h

Format of Teaching:

Lectures	10,5 h
Laboratories or Practicals	8 h
Other	1,5 h

Teaching Strategy:
7 X Formal lectures in 90 min timetable. One 8h laboratory practical.
1 X 90 min tutorial

Convener:
J. P. Pinheiro

University:
University of Algarve

Language of Tuition:
English

Module Description - The Purpose or Aims:

To introduce the fundamentals of equilibrium trace metal speciation and bioavailability
To teach the basic concepts of the analytical techniques used in speciation studies
To illustrate the concepts of measurement of trace metal uptake by organisms
To demonstrate the dynamic nature of trace metal speciation and bioavailability

Learning Outcomes:

At the end of the module the learner is expected to be able to:

1. explain the meaning of trace metal speciation and bioavailability
2. select an adequate speciation technique and develop an experiment to perform trace metal speciation for a given natural sample
3. critically analyse and evaluate the dynamic nature of the biouptake of trace metals by microorganisms and its relation with metal speciation.

Summary of Course Content:

This module will discuss the influence of trace metal speciation on the biouptake of metals by microorganisms in natural waters. An introduction will be given about the thermodynamic trace metal speciation and bioavailability, covering the equilibrium speciation modeling and the Free ion activity model for trace metal biouptake. Then we will introduce the concepts of trace metal dynamic speciation and briefly describe the analytical techniques that are used in its study. Finally we will discuss the problematic of dynamic bioavailability and its consequences regarding both toxic and essential trace metals.

Transferable Skills Taught:

Communication:
Ability to write a laboratory report

Interpersonal skills:
Elaborate a group written assignment

Assessment Methods:

1. LO1 and LO3 – Written Examination (30%)
2. LO2 – Laboratory Work Assignment (30%)
3. LO3 – Group Written Work assignment (40%)

Assessment Criteria:

Treshold
LO1 – to correctly describe the concept of trace metal speciation and bioavailability
LO2 – to identify the different speciation techniques and the when they can be applied
LO3 – to understand the basic relationship between dynamic metal speciation and metal uptake by microorganisms

Good
LO2 – to be able to choose the most adequate speciation technique to perform the analysis of a given sample
LO1 and LO3 – to correctly analyze the influence of changes in the matrix over trace metal speciation and the respective variation on metal biouptake.

Excellent
LO2 – given a set of samples, to choose the best available speciation techniques to analyze each sample and devise an experimental protocol to perform the respective study.
LO1 and LO3 – to quantify the influence of changes in the trace metal speciation on the respective metal biouptake.

Resource Implications of Proposal and Proposed Solutions:

Lecture notes will be available for students.
Recommended reading:
"Metal speciation and bioavailability", A. Tessier e D. Turner (eds.), John Wiley & Sons, New York, 1995.
"In Situ Monitoring of Aquatic Systems: Chemical Analysis and Speciation", J. Buffle and G. Horvai (eds.), John Wiley & Sons, New York, 2000.