Course guide
250MEA007 - 250MEA007 - Environmental Engineering Laboratory

Last modified: 17/06/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MÒNICA REIG I AMAT

Others: ADRIANA FARRAN MARSA, MÒNICA REIG I AMAT

TEACHING METHODOLOGY

The course is highly experimental and is based on a methodology focusing on active learning by students.

The course is planned for which it is performed in sessions of three hours, in which combine theory and practice. In lectures expose the concepts, methods and fundamentals necessary to perform laboratory work. In the practice sessions are performed experiments related to water treatment processes and other related to the application of the most common chemical analysis methods of environmental analysis laboratories controlling inorganic compounds in drinking water. On the other hand, different sampling, conservation and preparation methodologies will also be studied for their analysis. In this case, the subject will cover sampling processes and techniques for soil, water and air samples.

At the beginning of the course will be given a script of practices. The practical classes arise in groups, but for that student participation is active. During these sessions, teachers will promote the approach of issues, situations or differential discussions. At the end of the session, each group will make a technical report and practice must answer a series of questions concerning the data and experimental results, which will allow reflecting on what did and lay knowledge.

Before each practical session at the lab, each group should answer some previous questions to be able to realize the lab session of the day.

It is obligatory to attend the practical classes with lab coat. Laboratory work will be provided with appropriate security measures.

To do the laboratory practices you need the following personal protective equipment (PPE):
* Lab coat
* Safety glasses

LEARNING OBJECTIVES OF THE SUBJECT

CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or little-known environments within the broader (or multidisciplinary) contexts related to their area of â□□â□□study.
CB9 - That students know how to communicate their conclusions - and the knowledge and ultimate reasons that support them - to specialized and non-specialized audiences in a clear and unambiguous way.
CE01 - Apply scientific concepts to environmental problems and correlation with technological concepts.
CE03 - Acquire basic work skills in the laboratory and identify the methods and instrumentation for the determination of relevant parameters for the analysis of environmental problems

STUDY LOAD

Type	Hours	Percentage
Hours large group	25,5	20.38
Hours small group	9,8	7.83
Hours medium group	9,8	7.83
Self study	80,0	63.95

Total learning time: 125.1 h

CONTENTS

Introduction

Description:
Theoretical session explaining the organization of the course, the basic safety rules in a laboratory chemical and precautions in handling reagents and use of the material volume. It also explains the treatment of laboratory waste for proper environmental management.

Full-or-part-time: 6h
Theory classes: 3h
Self study : 3h

Basic concepts on chemical analysis

Description:
Sessions theoretical of consolidation and review of basic concepts of chemical analysis:
* Definition and classification of different chemical analysis techniques. Quality parameters of methods and instruments. Calibration methods. External calibration pattern. Adding standard.
* Classic analysis techniques. Theoretical basis of volumes and acid-base complexomètriques. Logarithmic diagrams and titration curves.
* Instrumental analysis techniques. Fundamentals of optical absorption methods: molecular absorption spectrometry UV-Vis, ICP. Electrochemical methods: potentiometry. Introduction to Chromatography.
* Sampling, conservation and preparation of soil, water and air samples.

Full-or-part-time: 18h
Theory classes: 9h
Self study : 9h

Laboratory of chemical environmental analysis

Description:
Determination:
* Alkalinity by acid-base titration.
* pH and conductivity by electrochemical methods.
* Hardness determinations by complexometric titration.
*Chlorides by conductimetry titration
* Chemical elements by ICP.
* Sulphates by visible spectrophotometry

Sampling on field

Full-or-part-time: 81h
Laboratory classes: 27h
Self study : 54h

Presentation and discussion of results

Description:
Each group presents the results obtained, their meaning is discussed among all and the results of the different groups are compared

Full-or-part-time: 12h
Laboratory classes: 3h
Self study : 9h

Assessment test

Description:
Final exam

Full-or-part-time: 8h
Laboratory classes: 3h
Self study : 5h

GRADING SYSTEM

The rating will be obtained from the ratings of lab activities (75%) and the assessment of theoretical knowledge (25%).
The lab activities mark is divided by a 50% corresponding to the laboratory reports and 50% la the work group mark.

The rating is the average teaching laboratory reports made by each laboratory sessions (group mark).

The evaluation tests of knowledge consist of issues concepts associated with learning objectives regarding subject knowledge and understanding, and a set of application exercises (individual mark).

EXAMINATION RULES.

To pass the course must have attended all the laboratory sessions have been completed and have submitted all the reports of practices, and must have passed the exam.

BIBLIOGRAPHY

Basic:
- American Public Health Association, American Water Works Association, Water Environment Federation. Standard methods for the examination of water and wastewater. 23rd ed. Washington, D.C.: American Public Health Association, 2017. ISBN 978-0875532998.
- Manahan, S.E. Environmental chemistry. 11th ed. Boca Raton: CRC Press, Taylor & Francis, 2022. ISBN 9780367558871.
- Droste, R.L.; Gehr, R. Theory and practice of water and wastewater treatment [on line]. 2nd ed. Hoboken, NJ: John Wiley & Sons, 2019 [Consultation: 12/09/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5554617. ISBN 9781119312376.
- Harris, D.C.; Lucy, C.A. Quantitative chemical analysis. 10th ed. New York, NY: Macmillan Education, 2020. ISBN 9781319324506.