

Unidade Curricular: Water Quality

Área Científica: ENG

Duração: Semestral

Horas de trabalho: 81

Horas de contacto: 30

ECTS: 3

Docente Responsável: Maria Paula Gomes Cantinho da Silva

Outros Docentes: Maria Teresa Loureiro dos Santos

Learning outcomes of the curricular unit

1. Understand the global availability of water resources, the characteristics of natural water bodies and their potential while freshwater resources for human activities.
2. Realize the importance of the Water Framework Directive as a key instrument for concerted management of surface and groundwater quality at EU level, and to know the legislation arising from its transposition which regulates at the national level the discharge standards and the water quality standards for the different uses. Understand, in this context, the concepts of Watershed management and Urban Water Cycle.
3. Characterize the different water pollutants, according to their origins and environmental significance in the water bodies, particularly with regard to those related to WWTP discharges and uptake sources of WTP for drinking water production.
4. To use tools for assessing/predicting pollutants behaviour in surface waters.

Syllabus

1. Hydrologic cycle and water distribution on Earth. Characterization of natural waters.
2. Freshwater habitats. Surface waters and groundwater characterization. The Watershed as area of study.
3. Framework for Community action in the field of water policy. The Water Framework Directive (WFD): objectives, definitions, management plans. National Regulation arising from the WFD: discharge standards and quality standards according to water uses (human consumption, irrigation, bathing, reuse). The Urban Water Cycle.
4. Water quality parameters set in the WFD - characterization of different pollutants: organic matter, nutrients, pathogenic microorganisms, toxic substances (priority/hazardous). Pollutants origin: point and diffuse sources. Expression of parameters: loads and concentrations.
5. Effects of pollutants on freshwater habitats: WWTP discharges - mass balances and modelling; evaluation of the eutrophication status of lakes/reservoirs intended for the production of drinking water in WTP.

Demonstration of the syllabus coherence with the curricular unit's learning objectives.

The UC addresses a set of contents within the scope of Water Quality, with particular focus on providing core competencies for the conduct of the subsequent UC of Water and

Wastewater Treatment Plants. In a first part, the UC covers contents related to the characterization of surface waters and groundwater that provide students with skills for their study and analysis, for understanding the importance of the EU Water Framework Directive in its management and for applying the resulting national regulation, particularly as regards to the articulation of the discharge and quality standards according to water uses. In a second part, contents are provided concerning the origin, characterization and environmental significance of the different pollutants, which allow students to understand and evaluate their effects on water bodies, within a practical perspective through exercises using methods of assessment/prediction of the pollutants behavior.

Teaching methodologies (including evaluation)

Theoretical classes: oral exposition, supported by slide presentations. Theoretical-practical classes: practical exercises according to the theoretical classes, using spreadsheets (EXCEL) for some of the contents. Practical classes: demonstration of methods and equipment involved in the determination of water pollution parameters, previously covered in theoretical classes (class held at the Laboratory). Continuous evaluation: 1. Realization of a group work (TG). 2. Global written test at the end of the semester (Tg). The minimum required grade in each evaluation element is of 8 values. Final mark (NF) = $0,3 \text{ TG} + 0,7 \text{ Tg}$. Approval when $\text{NF} \geq 9,5$ values. Exam evaluation: written exam, covering all the subjects studied (Ex), performed in one of the exam seasons. Approval when $\text{NF} \geq 9,5$ values.

Demonstration of the coherence between the teaching methodologies and the learning outcomes

The teaching methodology adopted in the Curricular Unit involves theoretical classes articulated in their content with theoretical-practical classes. Theoretical classes present the concepts and scientific foundations of the subject matters, complemented by examples and case study analysis. The theoretical-practical classes concern application exercises, following the concepts introduced in theoretical classes, in order to consolidate the acquired knowledge and detect any weaknesses that indicate the need to review some contents. The teaching methodology further considers a practical class, to be held at the Laboratory, in order to familiarize students with the methods and equipment used in the determination of water pollution parameters. Out of the contact hours, and under tutorial guidance, one group work is carried out, corresponding to a water quality assessment/prediction exercise involving the methodologies taught, research and data analysis, which allows the assessment of the acquired knowledge and promotes skills of autonomy and critical thinking

Mandatory consultation/existence bibliography:

1. Boyd, C. E., "Water Quality. An Introduction", Springer, 2nd Edition, 2015.
2. N. F. Gray, "Water Technology. An Introduction for Environmental Scientists and Engineers", 2nd Edition, Elsevier B.H., 2005.
3. Sawyer, C. N., McCarty, P. L., Parkin, G.F., "Chemistry for Environmental Engineering and Science", McGraw-Hill, 5th Edition, 2003.