Characterization, Management and Treatment of Water Pollution (250659)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA) Departament d'Enginyeria Química (EQ)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA AMBIENTAL (pla 2014)
Course	2024/25

Main teaching language at each group

- Group 10ES1 Spanish (Q1)

Faculty

Responsible Faculty: Joan Garcia Serrano
Faculty: Joan Garcia Serrano, Maria Solé Bundó

Objectives of Education

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.
CE04 - Identify, define and propose technological management and appropriate solution to an environmental problem.
CE05 - Dimension conventional treatment systems and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving environments, atmosphere, water and soil.
Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.
Sized systems for the treatment of major pollutants vectors.
Interprets rules, identifies goals, evaluates alternative techniques, proposes appropriate solutions and prioritize actions.

Parameters of water quality: Criteria and standards; Water supply and sewage; Sampling techniques. Simple and compound samples, flow measurement; physicochemical parameters and biological characterization and analytical techniques.
Pretreatment: Grids and sieves; Desanders and fat separation, regulation of flows and loads.
Sedimentation and flotation: Types of sedimentation; general theory of sedimentation of particles in a fluid; zonal Decanting. Kynch Theory of sedimentation based on a single batch experiment method, based on the solids flow analysis method; Constructional features of decanters; flotation separation systems.
Coagulation and flocculation: Stability of colloids and mechanisms of destabilization; Coagulants and associated reactions, chemical precipitation of phosphorus and constructive aspects of implementation.
Filtration and membrane processes: granular media filtration; Rating filtration systems, pressure drop and minimum fluidization velocity, classification and description of membrane processes.
Ion exchange.
Adsorption and disinfection: Sizing of a team of activated carbon; disinfection. Physical and chemical disinfectants, germicidal efficiency of chlorine. Dosing to the breaking point.
Suspended aerobic biological processes of biomass: activated sludge process, material balance, oxygen requirement; Aeration. Systems and efficiencies, design criteria and operational characteristics. Classification systems; Sizing activated sludge system. Aerobic processes of fixed biomass: trickling filters,

submerged filters and bio-discs, characterization and design of trickling filters.
Anaerobic biological processes without biomass retention: Material Balance and classification systems, anaerobic contact reactor, activity assays, biodegradability and toxicity; Characterization of facilities and energy use of gas.
Anaerobic biological process with biomass retention Reactor anaerobic filter; sludge bed reactor, fluidized bed reactor.
Biological nutrient reduction: Plants nitrification, denitrification plants, combined nitrification - denitrification systems, plants for biological phosphorus reduction.
Impoundment and other systems: aerobic lagoons, facultative and anaerobic; treatment systems for small communities, natural treatment systems .

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Management of these water resources

Bàsics.
Influence of water treatment in integrated management.

Flow characteristics and water supply and wastewater

Water flows.
Microbiological quality parameters.
Physicochemical quality parameters.

Pretreatment and sedimentation

Pretreatment processes.
Basics of sedimentation.
Design of primary treatment.

Biological treatment. Facilities activated sludge

Kinetics of microbial growth.
Facilities activated sludge.
Type of activated sludge.
Design of activated sludge.

Drainage study: septic tanks and Imhoff tanks

Independent Sanitation.
Septic tanks and Imhoff tanks. Concepts.
Septic tanks and Imhoff tanks. Design.

Lagoons and rotating biological contactor (RBC)

Basic concepts.
Type of lagoons.
Types of RBC
Design.

Reclaimed water

Basics.

Treatment and disposal of sludge

Characteristics of sludge.
Thickening.
Dehydration.
Anaerobic digestion.
Final Destination sludge.
Design.

Treatment plant project

Basic concepts
Visit

Directed activities

Writing a press release

Evaluation

Teaching Methodology

The subject consists of 3.0 hours per week of classroom lessons in the classroom.

They are devoted to theoretical classes, 17.0 hours, in which the teacher exposes the concepts and basic materials of the subject, presents examples and carries out exercises.

9.0 hours are spent solving problems with a greater interaction with the students.

Practical exercises are carried out in order to consolidate the general and specific learning objectives. The rest of the weekly hours is dedicated to laboratory practices and a visit to a plant.

Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment activities and directed learning and bibliography.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

Grading Rules

(*) The evaluation calendar and grading rules will be approved before the start of the course.

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.

Final Mark = 0,65 * Final Test + 0,20 * Test + 0,15 * Assessments

Test Rules

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Office Hours

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Monday from 16:30 to 18:00.
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Bibliography

Basic

- Metcalf & Eddy. Wastewater engineering: treatment and resource recovery. 5th. New York: Mc Graw-Hill, 2014. ISBN 9780073401188.
- American Water Works Association; Edzwald, J.K. Water quality & treatment: a handbook on drinking water. 6th ed. New York: McGraw-Hill, 2015. ISBN 9780071630115.
- Asano, T.; Burton, F.L.; Leverenz, H.L.; Tsuchihashi, R.; Tchobanoglous, G. Water reuse: issues, technologies, and applications. New York: McGraw-Hill, 2007. ISBN 9780071459273.
- Water treatment handbook. 7th ed. Malmaison Cedex: Degrémont, 2007. ISBN 9782743009700.

Complementary

- Crites, R.; Tchobanoglous, G. Small and decentralized wastewater management systems. Boston: Mc Graw Hill, 1998. ISBN 0072890878.
- Droste, R.L. Theory and practice of water and wastewater treatment. New York: Wiley, 1997. ISBN 0471124443.