UNICUSANO
ROME

Code: ICAR/03 **Credits: 12**
Matter: Sustainable Management of Water and Waste
Main language of instruction: Italian
Other language of instruction: English

Teaching Staff

Head instructor
Prof. Lidia Lombardi - lidia.lombardi@unicusano.it

Introduction

1. *Objective of the course:*

The aim of this course is to provide basic knowledge on the sustainability of resource use, with reference to the urban environment, focusing on water and waste management. In addition to the necessary references to the national regulations, the main methods of water and waste management and treatment will be illustrated, with preliminary elements of process sizing and application examples.

Objectives

2. *Course Structure:*

Module 1 – Introduction
Module 2 – Drinking water.
Module 3 – Wastewater treatments.
Module 4 – Municipal solid waste.

Competencies:

A. Knowledge and understanding.

Knowledge of the main parameters describing water quality, ability to understand the information they provide.
Knowledge of the regulations on water intended for human consumption and the main treatment processes for surface and groundwater; understanding of the methods and parameters of sizing and control.
Knowledge of the regulations on the protection of water from pollution.

Knowledge of wastewater treatment processes and understanding of the methods and main parameters of sizing and control.
Knowledge of the regulatory principles that govern waste management, particularly urban waste, and of the integrated management system of collection and treatment.
Knowledge of the different types of treatment and understanding of the functioning of the processes, also in relation to preliminary parameters and methods of sizing.

B. Applying knowledge and understanding.
Ability to solve simple calculation problems related to concentration of pollutants and environmental quality parameters.
Ability to solve simple calculation problems related to preliminary sizing of water purification systems.
Ability to solve simple calculation problems related to preliminary sizing of wastewater treatment processes.
Ability to qualitatively and quantitatively describe urban waste flows and solve simple calculation problems related to preliminary sizing of treatment processes.

C. Making judgements.
Ability to choose appropriate problem-solving procedures and methodologies for solving assigned problems. Ability to evaluate and explain the results obtained from solving problems with respect to the expected results based on the theoretical study.

D. Communication skills.
Development of a correct and comprehensible technical-scientific language that allows to express in a clear and unambiguous way the knowledge acquired. Ability to communicate and describe accurately the resolution procedure and the methodologies used to solve the assigned problems.

E. Learning skills.
Capability of autonomously studying additional in-depth details related to the subject.

Syllabus

3. *Programme of the course:*

Module 1. Introduction - Water quality parameters. Concentrations. Biogeochemical cycles and their alteration
Module 2. **Drinking water. Purification. Sedimentation. Disinfection**
Module 3. Wastewater management. Wastewater treatment plants. Introduction to microbial metabolism. Reactors. Biological plants with suspended biomass and sludge recirculation. Oxygen transfer in aerobic biological reactors. Application examples

Module 4. Municipal solid waste. Introduction and regulatory notes. Waste characterization. National and European data. Mechanical treatments. Thermal treatments. Anaerobic treatments. Aerobic treatments

Evaluation system and criteria

The exam is a written test, with maximum evaluation of 25/30.
The remaining 5 points can be obtained by submitting an assignment related to calculation problems, to be completed before the written test.
The written test consists of exercises as those solved and explained during the class. Students are required to solve the exercises accurately reporting and explaining the calculations they perform, reporting - when it makes sense - the schematic of the process/layout.
The test incorporates salso some theoretical questions.
The written exam is composed by two parts: Test 1 and Test 2, relating to the following subjects:

- Test 1: subjects 1-2.
- Test 1: subjects 3-4

Students can decide to:

- do the complete test (Test 1 + Test 2);
- do only the first part (Test 1);
- do only the second part (Test 2) if they already passed the first part (Test 1).

Students must communicate their intention to the teacher before starting the written test.

Bibliography and resources

4. *Materials to consult:*

Slides and teaching materials provided by the teacher.

5. *Recommended bibliography:*

- Giovanni De Feo, Sabino De Gisi, Maurizio Galasso. Acque reflue. Progettazione e gestione di impianti per il trattamento e lo smaltimento. Flaccovio Dario Editore. 2012
- Giovanni De Feo, Sabino De Gisi, Maurizio Galasso. Fanghi di depurazione. Flaccovio Dario Editore. 2013
- Giovanni De Feo, Sabino De Gisi, Maurizio Galasso. Rifiuti solidi. Progettazione e gestione di impianti per il trattamento e lo smaltimento. Flaccovio Dario Editore. 2012

- Piero Sirini. Ingegneria Sanitaria–Ambientale: Principi, teorie e metodi di rappresentazione. 2002. McGraw-Hill
- Metcalf & Eddy. Ingegneria delle acque reflue. McGraw-Hill. 2006
- George Tchobanoglous, Carlo Noto La Diega, Piero Sirini. Ingegneria dei rifiuti solidi. McGraw-Hill. 2009
- Mackenzie L. Davis and David A. Cornwell. Intro to environmental engineering. McGraw-Hill Education. 5° edizione. 2018
- Metcalf & Eddy Inc., George Tchobanoglous, H. David Stensel, Ryujiro Tsuchihashi, Franklin L. Burton. Wastewater Engineering: Treatment and Resource Recovery. McGraw Hill. 2013