



COURSE: Planning and management of wastewater treatment plants

ACADEMIC YEAR: 2029-2020

TYPE OF EDUCATIONAL ACTIVITY: Characteristic

PROFESSOR: Ignazio M. Mancini and Salvatore Masi

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Language: Italian

ECTS: (lessons e
tutorials/practice) 9

n. of hours: (lessons e
tutorials/practice) 90

Campus: Potenza
School of Engineering
Program: Master Degree in
Environmental Engineering

Semester: I

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course focuses on the water and wastewater cycles, giving attention to the methodologies for planning and management of wastewater treatment plants (WWTPs). The main aim is to evaluate the potential environmental impacts of wastewater treatment, thus identifying the suitable plant configuration for each site specific situation.

- **Knowledge and understanding:** the student must demonstrate knowledge and understand the issues related to:
 - Basic concepts of the environmental regulation about water cycle and wastewater treatment;
 - Description of the biological and chemical-physical units for wastewater and sludge treatment;
 - Criteria for the optimization of the integrated systems for a sustainable wastewater cycle;
 - Biochemical processes during wastewater treatment;
 - **Ability to apply knowledge and understanding:** The student must demonstrate that he is able to design complex systems optimized for specific territorial and environmental contexts. In particular, it must demonstrate the ability to make choices, adapted to the changing technological and market environment of the water treatment industry, with a view to sustainability and respect for the principles of the circular economy.
 - **Autonomy of judgment:** The student must be able to independently assess the effects and implications of a technical, economic and environmental nature of the project alternatives that characterize the water and waste water treatment plant. It must also be able to address decision-makers and stakeholders towards eco-compatible and innovative solutions with a view to constantly improving system performance and reducing overall environmental impacts.
 - **Communication skills:** The student must acquire the ability to communicate with competence and adequate language, even to people not expert in the matter, the selection criteria, the environmental implications and the costs related to the technological and managerial choices adopted. In this regard, active participation in public events and meetings with stakeholders on cases concerning collection, transport and treatment of water and waste water will be stimulated.
 - **Learning skills:** The student must be able to continuously update himself and complete his own training related to the discipline, through the consultation of texts and sites of scientific and normative documentation already used during the lessons. The student must also acquire useful information for the choice of post-university courses of advanced training and specialization, as well as the main national and international conferences and technical exhibitions.
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PRE-REQUIREMENTS

In order to attend this course, the basic concepts of Chemistry and Sanitary-Environmental Engineering have to be well known (e.g. elements of organic and inorganic chemistry, biological processes, material properties, etc.)

SYLLABUS



Discharge regulations, authorization aspects and administrative controls.
Qualitative and quantitative characterization of waste water. Sewer sizing elements and relationship with the treatment plant.
Introduction to treatment techniques.
Analysis and choice of treatment alternatives.
Primary treatments. Screening, equalization, sand removal, oil removal, primary sedimentation.
Selection criteria and sizing of biological treatment units. Aerobic oxydation, nitrification-denitrification, phosphorus removal processes (chemical and biological techniques).
Suspended and attached growth biological treatment processes. Anaerobic treatment processes.
Tertiary treatments. Disinfection, filtration, adsorption on activated carbon, ozonation.
Natural treatment processes. wetlands, phytodepuration, infiltration.
Sludge treatments. Thickening, dewatering, stabilization and disposal.
System location criteria: single systems and centralized systems. Automation and remote control of the plants..
Development of a municipal wastewater treatment plant project. Elements of structural sizing of the main units, sizing of hydraulic circuits, sizing of electromechanical units, construction costs.
Management and economic aspects related to the operation of waste water treatment plant: energy consumption, consumption of chemical products, personnel costs, monitoring and control costs, ordinary and extraordinary maintenance, management and disposal of sludge, management of safety procedures in the workplace.

TEACHING METHODS

90 hours for theoretical lessons and exercises. About 15 hours for technical visits in full-scale treatment plants.

EVALUATION METHODS

Purpose of the exam is verifying the level of achievement of the previously indicated educational goals.

The exam is carried out in oral mode. Questions will be submitted in three different areas::

- Environmental regulation about wastewater treatment, wastewater and sludge characterization, available technologies for wastewater treatment;
 - Criteria for WWTP designing;
 - Operation costs for energy consumption, chemicals, plant management.
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TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Metcalf & Eddy. Wastewater Engineering Treatment and Reuse. McGraw-Hill.
 - Luca Bonomo. Trattamenti delle acque reflue. McGraw-Hill
 - Professor handbook.
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INTERACTION WITH STUDENTS

- Firstly, the course aims, syllabus, and evaluation methods will be defined. Secondly, the professor's handbook will be provided by means of dropbox folders. Simultaneously, a student list will be done, including first name, last name, student ID, e-mail.
 - Professor's office hours: Monday from 9.30 a.m. to 10.30 a.m.
 - If there is the need to more explanations about the items argued during the course, further office hours could be defined subsequently.
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EXAMINATION SESSIONS (FORECAST)¹

24/09/2019, 17/10/2019, 14/11/2019, 12/12/2019, 16/01/2020, 13/02/2020, 12/03/2020, 16/04/2020, 14/05/2020, 18/06/2020, 23/07/2020. All the date will be published on the online platform at least 10 days before the exam date.

SEMINARS BY EXTERNAL EXPERTS YES NO

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.



Università degli Studi della Basilicata
Scuola di Ingegneria

FURTHER INFORMATION



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