COURSE: Sanitary and Environmental Treatment Plant			
ACADEMIC YEAR:			
TYPE OF EDUCATIONAL ACTIVITY: Characteristic			
PROFESSOR: 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: 1° (6CFU) 2° (3CFU)

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) and urban waste treatment plant. The main aim is to evaluate the potential environmental impacts of wastewater and solid waste 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;
  - Basic concepts of the environmental regulation about waste management;
  - Methodologies for waste classification and environmental matrices characterization;
  - Description of the most important systems used for waste treatment.;
  - Criteria for the optimization of the integrated systems for a suitable waste management;
  - Biochemical processes during waste stabilization, waste combustion and waste disposal.

- **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 and waste 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 waste water and solid waste 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 waste water and solid waste 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.

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

Section 1° Water and Waste water treatment

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.

Section 2° Solid waste management

Environmental Regulation about municipal waste management;

solid waste classification, methodologies for waste analysis, waste treatment technologies;

criteria for a suitable integrated waste cycle;

landfill, bio-mechanical treatment systems, waste combustion.

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;
- Environmental regulation about waste management, methods for waste characterization, systems for waste collection and transportation;
- Technologies for waste treatment, reuse, and disposal;
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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
- Piero Sirini, George Tchobanoglous, Rosario Carlo Noto La Diega. Ingegneria dei rifiuti solidi McGraw-Hill.
- Professor handbook.

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.

EXAMINATION SESSIONS (FORECAST)[1]

13/09/2018, 11/10/2018, 15/11/2018, 13/12/2018, 17/01/2019, 14/02/2019, 14/03/2019, 11/04/2019, 16/05/2019, 13/06/2019, 18/07/2019. All the date will be published on the online platform at least 10 days before the exam date.

SEMINARS BY EXTERNAL EXPERTS YES ■ NO □

FURTHER INFORMATION

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