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COURSE: Waste management and contaminated site remediation

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ACADEMIC YEAR: 2019-2020

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TYPE OF EDUCATIONAL ACTIVITY: Characteristic

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PROFESSOR: Salvatore Masi

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e-mail: [salvatore.masi@unibas.it](mailto:salvatore.masi@unibas.it)

web:

phone: +39 0971 205155

mobile (optional): +39 329 3178377

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Language: Italian

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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: II

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The waste composition and waste hazard are the basic concepts of the presented course. The different methodologies for plants management are investigated, giving attention to mechanical, chemical-physical, and biological treatment plants. The course focuses on the composition of different type of waste, the potential environmental impacts linked to their production and disposal, and the available treatment technologies for a sustainable waste cycle. Regarding the contaminated site remediation, the course deals the available environmental control systems, suggesting also the suitable remediation activities.

- **Knowledge and understanding:** the student must demonstrate knowledge and understand the issues related to:
    - Basic concepts of the environmental regulation about waste management and site remediation;
    - Methodologies for waste classification and environmental matrices characterization;
    - Description of the most important systems used for waste treatment, as well for the remediation of contaminated matrices;
    - 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 recoverable waste, 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 management systems and environmental remediation. 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 waste management and the remediation of polluted sites 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.)

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#### SYLLABUS

1) Waste management

Environmental Regulation about 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.

2) Contaminated site remediation

Environmental Regulation on contaminated site remediation, pollution phenomena, environmental control systems, chemical-physical analysis on environmental matrices, risk assessment modelling, groundwater remediation, treatment technologies of contaminated soil.

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#### TEACHING METHODS

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

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#### EVALUATION METHODS

Oral examination. The exam focuses on:

- Environmental regulation about waste management, methods for waste characterization, systems for waste collection and transportation;
- Technologies for waste treatment, reuse, and disposal;
- Methodologies for environmental analysis and site remediation.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Piero Sirini, George Tchobanoglous, Rosario Carlo Noto La Diega. Ingegneria dei rifiuti solidi McGraw-Hill.
- Luca Bonomo. Bonifica di siti contaminati - Caratterizzazione e tecnologie di risanamento. McGraw-Hill.
- Professor's 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)<sup>1</sup>

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. All the date will be published on the online platform at least 10 days before the exam date.

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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#### FURTHER INFORMATION

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