



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	CIVIL ENGINEERING
SUBJECT	ENVIRONMENTAL SUSTAINABILITY OF WORKS AND INFRASTRUCTURES
TYPE OF EDUCATIONAL ACTIVITY	D
AMBIT	20558-A scelta dello studente
CODE	22319
SCIENTIFIC SECTOR(S)	ICAR/03
HEAD PROFESSOR(S)	VIVIANI GASPARE Professore a contratto in Univ. di PALERMO quiescenza
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	VIVIANI GASPARE Monday 9:00 11:00 proprio studio (stanza n.2031, ed.8 2° piano) del Dipartimento di Ingegneria Tuesday 9:00 11:00 proprio studio (stanza n.2031, ed.8 2° piano) del Dipartimento di Ingegneria Wednesday 9:00 11:00 proprio studio (stanza n.2031, ed.8 2° piano) del Dipartimento di Ingegneria Thursday 9:00 11:00 proprio studio (stanza n.2031, ed.8 2° piano) del Dipartimento di Ingegneria Friday 9:00 11:00 proprio studio (stanza n.2031, ed.8 2° piano) del Dipartimento di Ingegneria

PREREQUISITES	Basic knowledge of sanitary and environmental engineering, chemistry and hydraulics, allowing to understand the principles and processes analyzed in the course.
LEARNING OUTCOMES	<p>Knowledge and understanding The student at the end of the course will acquire knowledge on the potential impact produced by works and infrastructures, with particular reference to soil and groundwater pollution, contaminated sites, waste management and environmental control systems.</p> <p>Applying knowledge and understanding The student will be able to apply procedures and standards to assess environmental impacts of works and infrastructures. He will be able to develop selection criteria and sizing of possible interventions to contain soil and groundwater pollution, contaminated sites, waste management.</p> <p>Making judgments The student will be able to evaluate the best techniques and technologies for managing the infrastructures impacts, identifying interventions for the protection of the environment.</p> <p>Communication skills The student will acquire the ability to identify and describe the main impact that can be produced by infrastructures and possible methods of containment, with regard to the pollution of soils and groundwater, contaminated sites and waste management.</p> <p>Learning ability The student will acquire learning skills in the field of infrastructure impact assessment. He will be able to participate in second level masters and advanced courses on specific issues of civil and environmental engineering.</p>
ASSESSMENT METHODS	<p>The exam will be oral with single test. The candidate has to answer at least three questions posed orally, on the elaborate developed during practical classes and on all topics included in the program and during the course. Final assessment aims to evaluate whether the student has knowledge and understanding of the topics, has acquired jurisdiction to interpret and independent judgment of concrete cases.</p> <p>The pass mark will be reached when the student shows knowledge and understanding of the subjects at least in general terms, and has domain expertise in order to solve concrete cases; It will also have presentation skills and argumentative as to allow the transmission of his knowledge to the examiner. Below this threshold, the examination will be insufficient. The more, however, the examinee with its argumentative and presentation skills can interact with the examiner, and the more his knowledge and application capabilities go into detail on the subject of discipline occurs, the more the assessment is positive.</p> <p>The assessment is carried out of thirty.</p> <p>Details of the valuation methods:</p> <p>Excellent - 30-30 cum laude Outcome: excellent knowledge of the topics, excellent properties of language, good analytical ability, the student is able to apply knowledge to solve problems proposed</p> <p>Very good - 26-29 Outcome: good control of the subjects, full ownership of the language, the student is able to apply knowledge to solve problems proposed</p> <p>Good - 24-25 Outcome: basic knowledge of the main topics, discrete properties of language, with limited ability to independently apply the knowledge to the solution of the proposed problems</p> <p>Satisfactory - 21-23 Outcome: the candidate does not have full command of the main teaching subjects but it has the knowledge, satisfactory property language, poor ability to independently apply the knowledge acquired</p> <p>Enough - 18-20 Outcome: minimum basic understanding of the main teaching and technical language issues, very little or no ability to independently apply the knowledge acquired</p> <p>Insufficient Outcome: the candidate does not have an acceptable knowledge of the contents of the topics covered in the teaching</p>
EDUCATIONAL OBJECTIVES	The course deals with issues concerning the potential impacts produced by works and infrastructures, in the ante-operam, on-site and post-operam phases. The topics covered in the course are direct to provide training in soil and groundwater pollution, contaminated sites, management of waste produced during the construction of infrastructures, mandatory and voluntary

	<p>environmental control systems.</p> <p>The course is aimed to complete the preparation of students who intend to carry out their professional activities in civil and environmental engineering, with particular reference to the problems concerning the assessment and containment of infrastructure impacts.</p>
TEACHING METHODS	<p>The teaching will be organized by conducting lectures, exercises for the preparation of a project, in groups, and consequent revision of the topics, organization of technical visits.</p>
SUGGESTED BIBLIOGRAPHY	<p>Dispense e materiale bibliografico sono distribuiti durante il corso. Per maggiori approfondimenti, si suggerisce la consultazione dei seguenti testi:</p> <p>E. Blasizza: "Ambiente 2022 – manuale normo-tecnico". IPSOA Manuali HSE, ed. Wolters Kluwer, 2022.</p> <p>G. De Feo, S. De Gisi, M. Galasso: "Rifiuti solidi: Progettazione e gestione di impianti per il trattamento e lo smaltimento". Ed. D. Flaccovio, 2012. ISBN: 978-88-579-0133-6.</p> <p>P. Ficco: Gestire i rifiuti tra legge e tecnica. Ed. Ambiente, 2014 (free download http://freebook.edizioniambiente.it/). ISBN: 9788866273233.</p> <p>M. Gorla: "Siti contaminati". Ed. Flaccovio, 2012.</p> <p>G. Tchobanoglous, C. Noto La Diega, P. Sirini: "Ingegneria dei rifiuti solidi". Ed. McGraw-Hill, 2009. ISBN: 9788838665271.</p>

SYLLABUS

Hrs	Frontal teaching
5	Impact of works and infrastructures - Ante-operam, on-site and post-operam evaluations. Screening of possible forms of impact. Case study analysis.
8	Soil and groundwater pollution - Definition of a polluted site. Soil quality criteria. Diffusion of pollutants in soil and groundwater. Pollution phenomena. Characterization of soils and groundwater: sampling and analysis surveys. Procedures for the characterization of contaminated sites. Monitoring methods with direct and indirect analyzes.
8	Interventions within contaminated sites - Interventions in brownfields and agricultural areas. Conceptual models. Risk analysis: definitions, models; health risk and environmental risk. Emergency safety measures (MISE). Interventions for the remediation and safety of land and groundwater, in-situ and ex-situ, on-site and off-site. Biological, physical, chemical-physical, thermal treatments. Environmental restoration interventions. Use of geosynthetics for the safety of contaminated sites: types, selection and use criteria. Landfill remediation: capping and aeration interventions; landfill mining. The remediation of asbestos. Regulations.
9	Waste management - Production and management of urban and special waste. Hazardous substances, products and waste. Physico-chemical and biological characteristics of waste. Management of particular categories of waste: excavated earth and rocks, land use plans, construction and demolition materials, waste containing asbestos, etc. Impact of waste treatment and disposal plants. Landfill disposal: interventions during operational and post-operational management; sizing of base and surface waterproofing systems (capping); use and sizing of geosynthetics; equivalence criteria for surface and base waterproofing systems; calculation of settlements: processes, measures and forecasting models; analysis of the durability of materials. Plant decommissioning. Regulations.
6	Environmental control systems - Principles and applications of mandatory and voluntary environmental management procedures: VIA, VAS, VINCA, AIA, AUA, ISO 14001, EMAS, OHSAS 18001, ISO 45001. Minimum environmental criteria (CAM). Environmental crimes. Administrative responsibility in the management system (Legislative Decree 231/2001). Case study analysis.
Hrs	Practice
18	Carrying out exercises on: forms of soil and groundwater pollution; forms of soil and groundwater pollution; risk analysis of a contaminated site; remediation and safety interventions of a contaminated site; plans for the use of excavated earth and rocks; landfill waterproofing systems.