UNIVERSITÀ DI PAVIA

Anno Accademico 2020/2021

WASTE ENERGY RECOVERY

Enrollment year	2019/2020
Academic year	2020/2021
Regulations	DM270
Academic discipline	ICAR/03 (ENVIRONMENTAL AND HEALTH ENGINEERING)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	ENVIRONMENTAL ENGINEERING
Curriculum	Impiantistico
Year of study	2°
Period	2nd semester (08/03/2021 - 14/06/2021)
ECTS	3
Lesson hours	25 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	COLLIVIGNARELLI MARIA CRISTINA (titolare) - 3 ECTS
Prerequisites	Waste and wastewater treatment plant design. Waste treatment and contaminated sites remediation.
Learning outcomes	This course deals with the design and the management of waste treatment/disposal plant for energy recovery.
Course contents	REGULATORY ASPECTS Overview. Municipal solid waste production and energy recovery situation in Europe and in Italy. Regulatory aspects concerning energy recovery. BIOCHEMICAL PROCESSES General aspects. Influence of parameters on biochemical processes. Biochemical processes with attached and suspended biomass, hybrid and multi-stage processes.

	Design criteria. THERMOCHEMICAL PROCESSES Overview. Gasification. Pyrolysis. The use of pyrolysis/gasification products. RECOVERY OF MATTER AND ENERGY FROM SEWAGE SLUDGE Sludge management issues. Main technologies for minimization of sludge production. Recovery of matter and energy from sewage sludge. Biogas production assessment from anaerobic digester. Characteristics and use of biogas. Thermal drying of sewage sludge: theoretical principles and design criteria. RENEWABLE ENERGY Overview. Renewable energy sources: definition, regulatory aspects. Biomass energy: definition, classification, legislation. Environmental impact of biomass energy plants. A visit to a waste recovery facility is scheduled.
Teaching methods	Lectures (hours/year in lecture theatre): 21 Practical class (hours/year in lecture theatre): 5 Practicals / Workshops (hours/year in lecture theatre): 3
Reccomended or required readings	A copy of the course slides will be distributed. De Fraja Frangipane E., Vismara R.. Recupero di materia ed energia da rifiuti solidi - Collana Ambiente Volume 19. Cipa Editore. Bertanza Giorgio, Foladori Paola, Guglielmi Lorena (2018). Recupero di materia e di energia negli impianti di depurazione. Maggioli Editore - Ambiente & Territorio.
Assessment methods	The exam consists of an oral test.
Further information	Experimental theses are available on the topics explained in the course. For further information, please contact the Professor via email.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile