

Title Ingegneria sanitaria II Environmental and Sanitary Engineering II mutua da Ingegneria sanitaria ambientale II MODULO	Degree Corso di Laurea Magistrale in Ingegneria per l'Ambiente e il Territorio (DM 270/04) Corso di Laurea Magistrale in Ingegneria per l'Ambiente e l'Energia (DM 270/04)	Year 2	Teaching Period 2	Credits 6
Teacher: Daniele Goi		Academic year: 2012/2013		

Objectives:

The course aims to study treatment of wastewater, with reference to the topics of hydraulic and process engineering. The course consist of theoretical and practical knowledge related to science and technology in support of wastewater treatment. The course will develop arguments, reports and modeling concerning civil and industrial water pollution. The course aims to introduce basics for designing wastewater treatment plants with a reference to sanitary, energy consumption and environmental quality.

Acquired skills:

- Wastewater treatment plant planning and design;
- Wastewater treatment plant upgrade;
- Wastewater treatment process unit design;
- Modeling wastewater treatment process;
- Planning and design bench-top and pilot plant for wastewater treatment.

Lectures and exercises		hours
Topics	Specific contents	
Introduction and recall Environmental and Sanitary Engineeri	Wastewater characterization and engineering	6
Wastewater treatment plant examination	Hydodynamics principles in wastewater treatment plants.	6
Wastewater treatment plants I	Preliminay treatment of wastewater: pumping, grit removal, equalization. Examples.	8
Wastewater treatment plants II	Physical treatment of wastewater: mixing, settling, filtration and other physical treatments. Examples.	8
Wastewater treatment plants III	Chemical treatment of wastewater: coagulation, flocculation, precipitation and other physical treatments. Examples.	8
Wastewater treatment plants IV	Traditional biological treatment of wastewater: activated sludge, N-P removal, respirometry, other biological treatments. Examples.	10
Sludge from wastewater treatment plant	Characterization and treatment of sludge	4
Wastewater treatment plants V	Final treatment of wastewater: disinfection, ultrafiltration, RO, other final treatments. Examples.	6
Check and design	Wastewater treatment plants design and modelling. Laboratory test planning and design.	4
Total hours for lectures and exercises		60
for exercises only		
Further educational activities		hours
Labs		4
Tutorials / Seminars		
Workshops		
Guided tours		4
Total hours for further educational activities		0
Total hours		68

Type of exam: Oral and/or thesis

References:

- Qasim, Syed R. Wastewater treatment plants : planning design and operations, Technomic, Basel, 1994.
- Leslie Grady, Glen, C.P; Daigger, T., Lim, Henry C., Biological wastewater treatment, - 2nd ed., revised and expanded. Dekker, 1999
- Arcadio P. Sincero; Gregoria A. Sincero, Physical-Chemical treatment of water and wastewater, IWA publishing, CRC PRESS, 2003.
- Collivignarelli ,C., Bertanza, G., bina, S., La verifica idrodinamica nel trattamento delle acque, CIPA editore, 1995.