

Wastewater Treatment

1. Course number and name: 020TEUCS5 Wastewater Treatment

2. Credits and contact hours: 4 ECTS credits, 2x1:15 contact hours

3. Names of instructors: Renalda El-Samra

4. Instructional materials:

- Class notes by Renalda EL-SAMRA
- References:
 - E. W. Steel, and T. J. McGhee, Water Supply and Sewerage, 6th Edition, Mc Graw-Hill, 1991.
 - Hammer, M. J. Sr. and Hammer, M. J. Jr., Water and Wastewater Technology, Pearson New International Edition, 7th edition, 2014.
 - Tchobanoglous, G. et al., Wastewater Engineering: Treatment, Disposal and Reuse, 4th Edition, Mc Graw-Hill, 2003.

5. Specific course information

a. Catalog description:

Classification of wastewater from different points of view. Assessment of wastewater pollution. Equipment of wastewater treatment plants. Technological lines of wastewater treatment and sludge disposal. Mechanical, chemical and biological stage of wastewater treatment. Pretreatment and primary stage of wastewater treatment - mechanical separators, sedimentation and flotation, sedimentation tank. The secondary stage of wastewater treatment - activation and secondary settling tank, basic parameters of activation, types of aerobic bioreactors, nitrification and denitrification, phosphorus removal. The tertiary stage of wastewater treatment - wastewater post-treatment. Anaerobic processes - the types of anaerobic bioreactors. Treatment of sewage sludge. Treatment of industrial wastewater. Physio-chemical and chemical treatment process. Modeling, design and optimization of the activated sludge process. An introduction to the automatic control of wastewater treatment plants.

b. Prerequisites: None

c. Required/Selected Elective/Open Elective: Required

6. Specific goals for the course

a. Specific outcomes of instruction:

By the end of the course, the student will be able to:

- Quantify the physical, chemical, and biological characteristics of wastewater.
- Explain the basic theoretical design principles of wastewater treatment processes.
- Explain the basic theoretical design principles of sludge treatment processes.

b. PIs addressed by the course:

PI	1.1	1.3	2.1	2.2	3.1	5.2	6.4	7.2
Covered	x	x	x	x	x	x	x	x
Assessed	x	x	x	x	x	x	x	x

7. Brief list of topics to be covered

- Overview of Wastewater Characteristics, Quality, Sources Flows and Pollutant Loads.
- Preliminary and Primary Wastewater Treatment Processes: Screening, Grit Removal, Sedimentation.
- Secondary Wastewater Treatment Processes: Activated Sludge, Trickling Filters, Rotating Biological Contactors, and Stabilization Ponds.
- Nitrification and denitrification, phosphorus elimination
- Tertiary Wastewater Treatment Processes.
- Sludge Handling Processes: Gravity Thickening, Flotation Thickening, Dewatering, Pressure Filtration, Stabilization, Aerobic and Anaerobic Digestion, Composting, Drying, and Land Application.
- Treatment of Industrial Wastewater (chemical and physio-chemical).
- Optimization of the activated sludge process.
- Automatic control of wastewater treatment plants.