Postgraduate Studies Program
«ENVIRONMENTAL ENGINEERING»

Specialization: 2-WWT: WATER AND WASTE TREATMENT

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<tr>
<th>Code:</th>
<th>WWT 200</th>
<th>Course:</th>
<th>Advanced water and wastewater treatment</th>
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<td>Required:</td>
<td>X</td>
<td>Elective:</td>
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<td>1st semester</td>
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<td>2nd semester</td>
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Instructors:
Professor E. Diamadopoulos
Professor N. Kalogerakis
Associate Professor P. Gikas

Bibliography

Course objectives
The course aims at the analysis and design of advanced processes for the treatment of water, wastewater and biosolids (sludge), as well as topics related to the operation of wastewater treatment plants.

Syllabus
1. Membrane separation processes [ED]
   i. Basic principles of osmosis and reverse osmosis
   ii. Modelling of membrane separation
   iii. Membrane separation systems
2. Heavy metal removal by precipitation [ED]
   i. Basic principles of water equilibrium
   ii. pH – Buffering capacity of water
   iii. Solubility product – Chemical precipitation
3. Anaerobic treatment of wastewater and sludge [ED]
4. Attached growth treatment systems and membrane bioreactors [PG]
   i. Immobilized biomass reactors
   ii. MBR systems
5. Management and treatment of biosolids (sludge) [PG]
   i. Thickening, dewatering and stabilization of biosolids
   ii. Composting of biosolids
   iii. Energy valorization of biosolids by thermal processes
6. Reclamation and reuse of wastewater [PG]
   i. Legislation and limits
   ii. Tertiary treatment systems
   iii. Disinfection of reclaimed wastewater

7. Generation and control of odors [NK]
   i. Generation of odors in sewers and pumping stations
   ii. Generation of odors in wastewater treatment plants
   iii. Quantitative measurement of odors
   iv. Technologies for odor control

8. Automation, programming and control systems [NK]
   i. Feedback/Feedforward systems
   ii. Basic control variables
   iii. Process control through microscopic observations
   iv. PLC & SCADA systems

9. Modelling of activated sludge systems–ASM3 [NK]
   i. Application in an extended aeration treatment plant
   ii. Application in Sequencing Batch Reactor (SBR) systems
   iii. Application in Membrane Bioreactors (MBR)

**Work load**

A. Lab exercises
   1. *Reverse osmosis desalination*
   2. *Wastewater treatment in biofilters*

B. Three (3) written assignments

**Student evaluation**

1. Lab reports (20%)
2. Written assignments (30%)
3. Final exam (50%)