

Title <b>(Technologia ścieków)</b>	Code <b>1010134281010130427</b>
Field <b>Environmental Engineering Extramural First-cycle studies</b>	Year / Semester <b>4 / 8</b>
Specialty -	Course <b>core</b>
Hours Lectures: <b>3</b> Classes: -    Laboratory: <b>1</b> Projects / seminars: <b>14</b>	Number of credits <b>6</b>
	Language <b>polish</b>

**Lecturer:**

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**Status of the course in the study program:**

major subject

**Assumptions and objectives of the course:**

- The objective of the course is to broaden the knowledge and skills scopes of wastewater technology necessary for the selection of technology methods of basic pollutants removal from municipal wastewater.

**Contents of the course (course description):**

-Lecture  
Ecology in water and wastewater management. Type and characteristics of wastewater. Flow rates (quantity characteristic). Composition of wastewater ? wastewater characteristics (quality characteristic). Loading of contaminants. Unit loads. Population equivalent (p.e.). Regulation for effluent wastewater to sewer systems and recipients. Efficiency of treatment process at wastewater treatment plants (WWTP). Types of WWTPs ? process flowsheets, processes used, pollutants removed, devices and facilities used, effectiveness. Mechanical WWTP (screening, grit chambers, grease tank, primary settling tanks). Chemical WWTP. Biological WWTP (trickling filters, activated sludge). Integrated biological processes for BOD removal (organic components) and Nutrient Removal (nitrogen and phosphorus). Types of solid and sludge wastes at WWTP. Sludge characteristic. Processes and devices used for treatment and disposal of sludge wastes: thickening, stabilization (anaerobic digestion, aerobic digestion, alkaline stabilization), dewatering. Sludge waste disposal - utilization and landfilling.

Laboratory subjects:

1. Hydraulic efficiency of settling tanks.
2. Effectiveness of aeration facilities
3. Activated sludge process.

Project subjects:

1. Balance of rates (quantity characteristic) and composition of wastewater (quality characteristic). Loading of contaminants. Population equivalent (p.e.). Technological calculations of mechanical WWTP (screening, grit chambers, primary settling tanks)
2. Technological calculations of biological WWTP with nutrient removal (activated sludge, final settling tanks)

3. Technological calculations of devices used for treatment of sludge wastes (gravity and mechanical thickening, anaerobic conventional German digesters with reinforced concrete construction, devices for dewatering).

**Introductory courses and the required pre-knowledge:**

fluid mechanics

**Courses form and teaching methods:**

-Lecture, project,

**Form and terms of complete the course - requirements and assessment methods:**

-Lecture

1. Attendance and lecture activity checkup
  2. Written finale exam
- Laboratory exercises
1. Short entrance written test before each laboratory
  2. Written report of each laboratory exercise
  3. Written final test regarding all exercises
  4. Activity evaluation during each laboratory

Project

1. Verification of project advancements and independent design work after each of 3 project parts (Part 1 ? primary treatment process, Part 2 ? biological treatment, Part 3 ? sludge handling)
2. Written exam after each of 3 project part

**Basic Bibliography:**

1. . Praca zbiorowa pod redakcją Z. Dymaczewskiego: Poradnik eksploatatora oczyszczalni ścieków. Wyd. III, PZITS, Oddz. Wielkopolski, Poznań 2011
2. Heidrich Z., Witkowski A.: Urządzenia do oczyszczania ścieków - Projektowanie, przykłady obliczeń. Wyd. ?Seidel-Przywecki. Sp. z o.o., Warszawa 2010

**Additional Bibliography:**

1. Wastewater Engineering. Treatment and Reuse. Metcalf & Eddy. Inc. Mc Graw Hill, wyd. 4, 2003