



## Course Syllabus

|                         |   |                                |
|-------------------------|---|--------------------------------|
| <b>Course Code</b>      | <b>Course Title</b>                     | <b>ECTS Credits</b>            |
| CEE-467                 | Industrial Waste Treatment Technologies | 5                              |
| <b>Prerequisites</b>    | <b>Department</b>                       | <b>Semester</b>                |
| CEE-260, CHEM-121       | Engineering                             | Fall, Spring                   |
| <b>Type of Course</b>   | <b>Field</b>                            | <b>Language of Instruction</b> |
| Elective                | Civil & Environmental Engineering       | English                        |
| <b>Level of Course</b>  | <b>Lecturer(s)</b>                      | <b>Year of Study</b>           |
| 1 <sup>st</sup> Cycle   | Dr Nicolas Kathijotes                   | 4 <sup>th</sup>                |
| <b>Mode of Delivery</b> | <b>Work Placement</b>                   | <b>Corequisites</b>            |
| Face-to-face            | N/A                                     | None                           |

### Course Objectives:

The main objectives of the course are to:

- introduce students to the different types of engineering technologies and systems commonly used in twenty-first century industrial sector to effectively treat and remove pollutants from liquids, gases, and solids;
- identify the fundamental chemical and physical characteristics of each target pollutant;
- identify the mechanisms by which the target pollutant is held in suspension by the waste stream;
- determine the most efficient and effective method by which each target pollutant can be isolated and removed from the waste stream;
- provide students valuable information on different case studies (industries) explaining the most effective engineering mechanisms used for waste treatment (solids, gases, and liquids);
- expose students to a real-case scenarios with on-site visits to local industrial partners.

### Learning Outcomes:

After completion of the course students are expected to be able to:

- identify and evaluate the performance of different types of waste treatment systems found in industry;
- use appropriate system technologies and equipment (e.g., cyclones, filters) for pollution control and prevention;

- demonstrate thorough knowledge on the characteristics of pollutants in different waste streams;
- explain the laws and regulations that are in place which concern water pollution, groundwater pollution, and air pollution;
- apply engineering methods of waste (air, solids, liquids) treatment in different types of industry;
- evaluate the performance of an installed system of waste treatment and provide sustainable solutions to pollution hazards.

**Course Content:**

- Evaluating and selecting industrial waste treatment systems.
- Treatment evaluation process for industrial wastewater, air emissions, and solid wastes.
- Laws and regulations concerning water pollution, groundwater pollution, and air pollution
- Pollution prevention (air, groundwater, etc.).
- Characteristics of industrial wastewater, discharges to the atmosphere, and solid waste streams from the factories.
- Methods of treating wastewater from industry including waste equalization, pH control, chemical methods of treatment, biological methods of treatment, aerobic technologies, and physical methods.
- Methods of treating air discharges to the atmosphere.
- Solid waste treatment methods (e.g. the method of composting industrial wastes, solid waste incineration, solid waste landfill cover and cap systems, etc.).
- Case studies from different industries (e.g., manufacture of lead acid batteries, synthetic rubber industries, cement industries, wine/beer making industries, etc.).
- Educational visits to a number of local industries for evaluation and further study of the waste treatment methods and technologies used.

**Learning Activities and Teaching Methods:**

Lectures, in-class examples and exercises, discussion, projects, on-site visits

**Assessment Methods:**

Homework assignments, project reports, in-class presentations, mid-term exam, and final exam.

**Required Textbooks / Readings:**

| <b>Title</b>  | <b>Author(s)</b> | <b>Publisher</b>      | <b>Year</b> | <b>ISBN</b>             |
|---|------------------|-----------------------|-------------|-------------------------|
| Industrial Waste Treatment Handbook – 2 <sup>nd</sup> Edition | Woodard & Curran | Butterworth-Heinemann | 2011        | 978-0750679633 (e-book) |

**Recommended Textbooks / Readings:**

| <b>Title</b>  | <b>Author(s)</b>  | <b>Publisher</b> | <b>Year</b> | <b>ISBN</b>             |
|---|-------------------|------------------|-------------|-------------------------|
| Industrial Wastewater Treatment – 1 <sup>st</sup> Edition | Joseph D. Edwards | CRC Press        | 2019        | 978-1315894409 (e-book) |