UCLouvain

# lmapr2647

*2024*

# Sustainable treatment of industrial and domestic waste: Fundamentals

| 5.00 credits | 30.0 h + 15.0 h | Q1 |
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| Teacher(s) | Françoisse Olivier ;Luis Alconero Patricia ;Noiset Olivier ;Stenuit Benoît ; |
| Language : | English<br>> French-friendly |
| Place of the course | Louvain-la-Neuve |
| Main themes | • Sustainability in the industry<br>• Treatment methods and technology for gaseous effluents<br>• Treatment methods and technology for liquid effluents (waste water)<br>• Treatment methods and technology of solid waste |
| Learning outcomes | **At the end of this learning unit, the student is able to :**<br>Given the AA of the program of "Master ingénieur civil en chimie et science des matériaux", this course contributes to the development, acquisition and evaluation of the following learning outcomes:<br>• AA1.1,<br>• AA2.1, AA2.2, AA2.3, AA2.4, AA2.8<br>1 More concretely, at the end of the course, the student will be able to :<br>• understand and to explain the origin, the nature, the amounts and volumes of waste;<br>• acquire a global view on basic concepts on the treatment and on the valorisation of residues;<br>• propose and discuss suitable techniques to characterise critically the flows of effluents;<br>• establish a strategy of treatment in the framework of environmental standards and of sustainable development;<br>• integrate all the processes in a plant with a view toward their optimisation. |
| Evaluation methods | The students will be evaluated by means of a continuous evaluation and a written exam, unless the context requires otherwise.<br>The exam involves reflection questions on the topics given during the course.<br>The continuous assessment includes assignments, which will result in a single overall grade, communicated at the end of the last assignment. Failure to comply with the methodological instructions defined on moodle, in particular with regard to the use of online resources or collaboration between students, for any work/assignment will result in an overall mark of 0 for the continuous assessment.<br>A minimum of 8/20 has to be reached in the written exam so that the average with the continuous evaluation part is done. Students that do not reach this minimum in the exam will have to repeat the exam in the session in August. The mark on the continuous evaluation part is kept for August.<br>The use of generative AI such as ChatGPT, Consensus, Perplexity, etc. is tolerated for the search for information or clarification of concepts but its use is prohibited for the elaboration of reports, presentations or any material which is part of the course evaluation by the teachers. The student must declare on their honor that the AIs were not used. |
| Teaching methods | Lectures, practical cases, works in groups and flipped classes, with the aim of putting the material into practice and practicing on concrete examples.<br>One or two visits to waste treatment plants are organized each year, depending on the availability of the facilities.<br>This course addresses issues related to sustainable development and transition through the following activities:<br>• Sessions dedicated to indicators of sustainable development, water issues, plastic pollution and sending waste to less developed countries, climate change and greenhouse gas emissions, etc.;<br>• Practical work aimed at deeper reflection by the student in the Belgian, European and global context. |
| Content | This course is a basis course for a wide public of engineering and science students. Its main aim is to initiate the students to the methods of treatment of industrial and domestic effluents, either gaseous, liquid or solids. It shall also place the problem of waste, residue and effluent treatment in the scope of sustainable development.<br>The student will acquire knowledge on the main treatment methods that are used to process/recover/reuse streams in a gas, liquid or solid waste. The following topics will be discussed:<br>Cours 1. Introduction to sustainability in the industry (2 hours)<br>Cours 2.1a. Pollutants gas high T : Dust collectors (2 hours)<br>Cours 2.1b. Pollutants gas high T : Acid gas removal (2 hours)<br>Cours 2.1c. Pollutants gas high T : Acid gas removal (cont.) and micropollutants removal (2 hours)<br>Cours 2.1d. Pollutants gas high T : NOx removal and CO2 capture & storage (2 hours) |

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| | Cours 2.2a. VOCs and Odours low T : Solvents and other VOCs (2 hours)<br>Cours 2.2b. VOCs and Odours low T : Odours (2 hours)<br>Cours 2.2c. Treatment techniques (2 hours)<br>Cours 3.1. Composition of wastewater (2 hours)<br>Cours 3.2. Primary wastewater treatment: Physic-chemical treatment (2 hours)<br>Cours 3.3a. Secondary wastewater treatment: Biological treatment I (2 hours)<br>Cours 3.3b. Secondary wastewater treatment: Biological treatment II (2 hours)<br>Cours 3.4a. Tertiary wastewater treatment: General technologies (2 hours)<br>Cours 3.4b. Tertiary wastewater treatment: Membrane technology (2 hours)<br>Cours 4.1. Solid waste treatment : Incineration (2 hours)<br>Cours 4.2. Solid waste treatment: Polymers (2 hours)<br>Cours 4.3. Specific waste (2 hours) |
| Inline resources | Site Moodle du cours |
| Bibliography | Des notes de cours, diapositives |
| Other infos | All the course material will be available in the Moodle platform. |
| Faculty or entity in charge | FYKI |

## Programmes containing this learning unit (UE)

| Program title | Acronym | Credits | Prerequisite | Learning outcomes |
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| Master [120] in Environmental Science and Management | ENVI2M | 5 | | |
| Master [120] in Chemical and Materials Engineering | KIMA2M | 5 | | |
| Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development | ENVI2MC | 5 | | |
| Master [120] in Chemistry and Bioindustries | BIRC2M | 5 | | |