



UNIVERSITY OF MISKOLC

**FACULTY OF
EARTH AND ENVIRONMENTAL
SCIENCE AND ENGINEERING**

**Subject name:
CHEMICAL TECHNOLOGIES IN ENVIRONMENTAL PROTECTION**

**FACULTY OF EARTH AND ENVIRONMENTAL SCIENCES & ENGINEERING
MSc education**

Course communication dossier

**UNIVERSITY OF MISKOLC
FACULTY OF EARTH AND ENVIRONMENTAL SCIENCES & ENGINEERING
Institute of Raw Materials Preparation and Environmental Technology**

Recommended semester: 3.

Contents

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1. COURSE DESCRIPTION

Course Title: Chemical technologies in environmental protection	
Type of course: compulsory	Neptun code: MFEET730016
Type (lec. / sem. / lab. / consult.) and Number of Contact Hours per Week: 1 lec. + 1sem.	
Type of Assessment (exam. / pr. mark. / other): pr. mark During the semester the following tasks should be completed: laboratory work and report, written test. Grading Limits: > 80%: excellent, 70-79%: good, 60-69%: medium, 50-59%: satisfactory, < 50%: unsatisfactory.	
Position in Curriculum (which semester): 3rd	
Pre-requisites (<i>if any</i>):	
Course Description:	
Acquired store of learning: <u>Study goals:</u> To introduce the chemical techniques on environmental pollution treatment, waste recycling and treatment, as well as on pollution control. <u>Course content:</u> Theory of mass transfer, laws, relationships. Diffusion equations. Principles and fundamentals of design of chemical techniques. Reactors. Solid-liquid extraction as a technique for the treatment of solid wastes. Methods and equipment. Treatment of contaminated fluids: adsorption, precipitation (cementation). Ion exchange, liquid-liquid separation. Thermal techniques: rectification, thermal oxidation. Pyrolysis and gasification. Bioremediation of sites contaminated by organic pollutants. Bioremediation of sites contaminated by non-organic pollutants. <u>Education method:</u> Lectures, seminars and lab practice.	
The 3-5 most important compulsory, or recommended literature (textbook, book) resources:	
<ul style="list-style-type: none">• Lecture notes• Prof. Dr J. Clifford Jones Thermal Processing of Waste ISBN: 978-87-7681-590-5• Robert Noyes Unit Operations in Environmental Engineering.• Basic research of the strategic raw materials in Hungary (ed.: János Földessy)ISSN: 2064-3195 ISBN: 978-615-80073-5-1• PAUL T. WILLIAMS. Waste Treatment and Disposal. ISBN 0-470-84912-6	
Competencies to evolve: Knowledge Knows and applies scientific and technical theory and practice related to the profession of environmental engineering Skills Can apply the acquired general and specific mathematical, natural and social science principles, rules, connections and procedures in solving problems arising in the field of environmental protection.	

Able to design, implement and operate environment-focused management systems

Competence in terms of attitude

Seeks to plan and carry out tasks independently or in a working group at a professional level.

Competence in terms of autonomy and responsibility

Can solve environmental engineering tasks independently, takes decisions carefully, in consultation with the representatives of other (mainly legal, economic, energy) fields, independently, takes responsibility for the decisions.

Shares the acquired knowledge and experience with formal, non-formal and informal information transfer with practitioners in their field.

Responsible Instructor (*name, position, scientific degree*):

Ljudmilla Bokányi Dr., Associate Professor, PhD, CSc

Other Faculty Member(s) Involved in Teaching, if any (*name, position, scientific degree*):

2. COURSE TOPICS

Course topics (WEEKLY SCHEDULE)
Actual semester:3 semester
Environmental Engineer Msc, Waste management

1.	Fundamentals of mass transfer
2.	Diffusion equations.
3.	Principles and fundamentals of design of chemical techniques and reactors. Solid-liquid extraction as a technique
4.	Solid-liquid extraction as a technique for the treatment of solid wastes, methods and equipment.
5.	Bioremediation. Design of tailings processing.
6.	Treatment of contaminated fluids 1: adsorption, biosorption, precipitation (cementation).
7.	Treatment of contaminated fluids 2: ion exchange, liquid-liquid separation, electrolyses
8.	Case studies.
9.	Thermal techniques1: rectification, thermal oxidation.
10.	Thermal techniques2: pyrolysis and gasification.
11.	Thermal techniques 3: plasma treatment.
12.	Bioremediation of sites contaminated by organic pollutants.
13.	Bioremediation of sites contaminated by non-organic pollutants.
14.	Design and case studies.

Seminar works:

Students make their own presentation about a chosen and checked topic, one hour consultation time is offered every week.

3. EXAM questions

1. Biotreatment of soils contaminated by organic pollutants: biodegradation phenomena and processing systems.

2. Chemical treatment of soils contaminated with heavy metals: techniques applied for the removal of pollutants from solid matrix, solution treatment techniques and flowsheet in accordance with the target strategy regarding final products.

3. What is the main phenomenon in the biological soil remediation?

A: venting out of pollutants

B: dissolving the pollutants in ground-water

C: biodegradation of organic and non-organic pollutants

4. To remove heavy metals from the soil

A: the anaerobic degradation can be applied

B: the bio sorption followed by ion exchange can be applied

C: the bio leaching and/or bio immobilisation can be applied

5. What is the mechanism of bio solubilisation (bio leaching)?

A: oxidation and precipitation

B: bio oxidation and chemical oxidation

C: bio oxidation and bio sorption

6. What is the principal difference between the bio degradation of the organic and the metal-containing contaminants?

4. OTHER REQUIREMENTS

Presentation

Using mobile phones during the exam is forbidden.

Miskolc, 2023.

<p>Dr. Sándor Nagy Head of Institute, Associate Professor</p>	<p>Dr. Ljudmilla Bokányi Lecturer</p>
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