

ENHL221 (3 cr.): Management of Domestic and Hazardous Waste

Course Instructor: *Dr. May Massoud*

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Office Hours: Zoom/WebEx or in person. To set a meeting by appointment (please e-mail at mm35@aub.edu.lb)

Location and Time: Van Dyck, room 203; Tuesday and Thursday: 8:00 – 9:15 am

CATALOGUE COURSE DESCRIPTION

ENHL 221 (3 crs.): A course that introduces the elements of solid waste management: sources, characterization, generation rates, collection, transportation, and disposal technologies. Concepts are presented within the context of integrated management: reduction, reclamation, recycling, and disposal. Socioeconomic implications at the community and national levels are emphasized.



LEARNING OBJECTIVES (LOs)

- LO1. Discuss the spatial aspect of waste production, handling, processing and disposal.
- LO2. Assess sources, quantities generated, composition, and properties of solid and hazardous wastes.
- LO3. Explain waste disposal and transformation techniques.
- LO4. Explain ecological, land use and social impacts of landfilling, composting, incineration and recycling.
- LO5. Discuss the health effects of domestic and hazardous waste management.
- LO6. Evaluate the relative risks associated with management alternatives.
- LO7. Recognize the relevant regulations that apply for facilities used for treatment and disposal of solid waste.
- LO8. Formulate a sustainable and integrated solid waste management system.

COURSE RESOURCES

There is no required textbook for this course. Lecture handouts will be available on the **course Moodle**.

Reference Online Books

The books below can be accessed online via AUB Homepage, Libraries, [Ebrary Academic Complete](#). Supplementary sources are available on the LIBCAT.

Ramesha, C. and Bhusan Das, D. Solid Waste Management Principles and Practice. Berlin; New York: Springer, 2012.

Tchobanoglous, G., Theisen, H. and Vigil, S. Integrated Solid Waste Management. New York: McGraw Hill, 1993.

Hester, R. E. and Harisson, R. M. Environmental and Health Impact of Solid Waste Management Activities. The royal Society of Chemistry, Cambridge: UK, 2002.

Articles (related to solid waste management in Lebanon)

1. **Massoud, M.A.**, Mokbel, M. and Alameddine, I. (2023). Critical Analysis of Waste Management Systems Utilizing a Performance Assessment and Optimization Tool. *Environmental Development* 46, 100844.
2. **Massoud, M.A.**, Abdallah, C., Merhbi, F., Khoury, R. and Ghanem, R. (2023). Development and Application of a Prioritization and Rehabilitation Decision Support Tool for Uncontrolled Waste Disposal Sites in Developing Countries. *Integrated Environmental Assessment and Management* 19(2), pp. 436-445.
3. **Massoud, M.A.** and Mokbel, M. (2022). Determinants of Waste Characterization in Lebanon and Material Recovery Potential. *Journal of Material Cycles and Waste Management*. doi.org/10.1007/s10163-022-01445-2.
4. Bardus, M. and **Massoud, M.A.** (2022). Predicting the Intention to Sort Waste at Home in Rural communities in Lebanon: An application of the Theory of Planned Behavior. *International Journal of Environmental Research and Public Health* 19, 9383.
5. **Massoud, M.A.**, Khoury, R., Ghanem, R., Ghossainy, R. and Merhbi, F. (2022). Development of a Pragmatic Methodology for the Environmental Assessment of Uncontrolled Dumpsites in Developing Countries. *Environmental Earth Sciences* 81, 296.
6. **Massoud, M.A.**, Mokbel, M. Alawieh, S. and Yassin, N. (2019) Towards Improved Governance for Sustainable Solid Waste Management in Lebanon: Centralized Vs Decentralized Approaches. *Waste Management & Research Journal*, 37(7), pp. 686-697.

You might want to check out scholarly journals for current information. Access to some journals can be attained electronically. ([AUB Homepage](#), [Libraries](#), [Current Journals](#), [Select a Discipline](#), [Environmental Science](#))

ASSESSMENT OF STUDENT PERFORMANCE

Table 1. Assessment methods mapped to course Learning Objectives

Mode of Assessment of Students	Learning Objectives							
	LO1	LO2	LO3	LO4	LO5	LO6	LO7	L O8
Quiz I (10%)	X	X						
First Exam (35%)	X	X	X	X				
Quiz II (10%)					X	X	X	
Final Exam (40%)				X	X	X	X	X
Class Participation (5%)	X	X	X	X	X	X	X	X

Exams may include multiple choice, true/false, short answer questions, problems and/or case studies. Calculators are allowed during examinations, but sharing calculators is not allowed.

COURSE POLICIES

Exams and Quizzes

You are expected to take exams on scheduled time. Failure to take a scheduled exam will result in a zero. Make-up exams may be given to students who provide a valid reason and supporting documentation as determined by the instructor. The instructor reserves the right to change the format and increase the level

of difficulty on any make-up exam. Make-up exams must be scheduled within one week of the original examination date. There is **no** makeup for quizzes.

Withdrawal

The last day for a student to withdraw from this course is **Thursday April 11, 2024**. Any student with an average grade below 60, by that date, is recommended to consult with his/her academic and registration advisor and may consider withdrawing from the course.

Code of Conduct

All work submitted in this course must be your own. Anytime any material is utilized, it must always be correctly cited and quoted, regardless of the source - including AI sources.

The faculty expects from its students a high level of responsibility and honesty. You are expected to abide by the following honor code in all work associated with this course. While you are encouraged to discuss the course topics with faculty members and with other students, submitted reports must be unequivocally your own work. Where material is taken from other sources, the work in question must be clearly acknowledged in your report or your presentation. Otherwise, your action constitutes plagiarism. The course instructor takes a serious view of both plagiarism and collusion and imposes serious penalties for these offences which can vary from failing the course to disciplinary procedures at University level.

Please review all rules and regulations set forth in the current edition of the Student Code of Conduct (<https://aub.policytech.edu/dotNet/documents/?docid=147&public=true>).

Course Evaluation

At the end of the semester you will be asked to fill a course evaluation form. Your objective opinion is highly solicited to get accurate data.

Students' Comments about Course Policies and Procedures

I welcome and encourage students' comments concerning any aspect of this course. It is recommended to submit your comments first in writing and discuss them with me outside of class time.

STUDENTS WITH SPECIAL NEEDS

AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you are encouraged to contact the Accessible Education Office: accessibility@aub.edu.lb; +961-1-350000, x3246; West Hall, 314.

NON-DISCRIMINATION AND ANTI-DISCRIMINATORY HARASSMENT, INCLUDING SEXUAL HARASSMENT AT AUB

In line with its commitment to the principle of equal opportunity in education and employment, AUB policies protect you from discrimination on the basis of protected characteristics, including discriminatory harassment and sexual harassment. Protected characteristics include: race, color, religion, age, national or ethnic identity, sex, gender or gender identity, sexual orientation, pregnancy, marital status, disability, genetic predisposition or carrier status, alienage or citizenship status, and political affiliation.

The policies are applicable to all the AUB Community including: officers, faculty, staff, academic appointees, students (including medical interns and residents), visiting students, alumni, trainees, visitors, contractors, subcontractors, suppliers, located on campus and at AUB Medical Center,

Advancing Research Enabling Communities Center (AREC), or any other facility or program affiliated with the University. The “AUB community” also includes the dependents and domestic employees of faculty and staff dwelling on campus and at AREC.

If you think you have experienced discrimination, discriminatory harassment, or sexual harassment, we encourage you to inform the Equity/Title IX Coordinator, Mitra Tauk at 01-350000 ext. 2514, titleix@aub.edu.lb, report to a Title IX deputy at your faculty or at any other faculty (www.aub.edu.lb/titleix), or report online (www.aub.ethicspoint.com). Reports may be submitted anonymously or not. Please know that the University will maintain the confidentiality of the complaint and privacy of the persons involved to the greatest extent possible, consistent with its goal of conducting a thorough and complete investigation and to the extent permitted by law.

You need to also know that the University has designated academic and administrative department/unit heads, managerial level staff, academic advisors, protection officers, and residence hall staff/monitors, as responsible employees or “mandatory reporters”, and may designate others at its discretion. These individuals are obligated to report actual or suspected discrimination or discriminatory harassing conduct to the Equity/Title IX Coordinator, unless they are a “confidential” resource. The following have been designated as confidential resources: on campus counselors in the Counseling Center of the Office of Student Affairs and AUB Medical Center counselors, and healthcare providers at the University Health Services (UHS) and at the AUB Medical Center. Confidential resources are not required to report actual or suspected discrimination or harassment to appropriate university officials, except in cases of suspected abuse of a minor, in the event of an external investigation or prosecution, or in the event of imminent danger to the reporting party or others.

DETAILED COURSE OUTLINE*

Date	Topic	Course Objectives
Jan. 18	Course content and requirements	
Jan. 23	Introduction/ Evolution of solid waste management	1
Jan. 25	Sources, composition, and properties of solid waste	1
Jan. 30	Physical, chemical and biological properties of municipal solid waste	1-2
Feb. 01	Sources, types and properties of hazardous waste	3
Feb. 06	Problem solving session	2, 5
Feb. 08	Solid waste generation and collection rates	1-3
Feb. 13	Waste handling and separation, storage and processing at the source	2
Feb. 15	Collection of solid waste	4-6
Feb. 20	Quiz I/ Separation and processing and transformation of solid waste	3-6
Feb. 22	Separation and processing and transformation of solid waste (cont’d)	3-6
Feb. 27	Separation and processing and transformation of solid waste: Thermal conversion techniques	3-6, 8

* The following is a general outline of material to be covered during the semester.

Note: the schedule is subject to changes in response to progress and opportunities that may arise in a given semester. Any changes to the schedule will be announced in class.

Feb. 29	Separation and processing and transformation of solid waste: Biological and chemical conversion techniques	3-6, 8
Mar. 05	Problem solving session	
Mar. 07	Transfer and transport/ Disposal of solid waste	3-6
Mar. 12	Exam I	
Mar. 14	The landfill method of solid waste disposal; Composition and characteristics, generation, movement and control of landfill gas Problem solving session	3-6
Mar. 19	Exam correction	
Mar. 21	Case Study Composition, formation, movement, and control of leachate in landfills	
Mar. 25	Environmental quality monitoring at landfills/ Materials separation and processing technologies	4-6
Mar. 28	Hazardous Waste Management	3-6
Apr. 02	Hazardous Waste Management (cont'd)	3-6
Apr. 04	Quiz II/ Health Care Waste Management	
Apr. 09	Hazardous Waste Management at AUB	4-8
Apr. 11	Health Care Waste Management (cont'd)	4-8
Apr. 16	Reduce, reuse, recycle: the zero waste approach	8
Apr. 18	Integrated solid waste management	8
Apr. 23	Review session	
Exam II		

Enjoy the course!