Basics of Environmental Engineering - BMEEOVKAT41

I. Subject Specification

1. Basic Data

1.1 Title

Basics of Environmental Engineering

1.2 Code

BMEEOVKAT41

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	2

1.5 Evaluation

Midterm grade

1.6 Credits

3

1.7 Coordinator

name	Dr. Zsolt KOZMA
academic rank	Associate professor
email	kozma.zsolt@emk.bme.hu

1.8 Department

Department of Sanitary and Environmental Engineering

1.9 Website

https://epito.bme.hu/BMEEOVKAT41
https://fiek2.mywire.org/course/view.php?id=459

1.10 Language of instruction

hungarian and english

1.11 Curriculum requirements

Compulsory in the Civil Engineering (BSc) programme

1.12 Prerequisites

1.13 Effective date

5 February 2020

Basics of Environmental Engineering - BMEEOVKAT41

2. Objectives and learning outcomes

2.1 Objectives

The aim of the course is to provide basic scientific and engineering background for further studies in environmental engineering. Main topics: the relationship of humanity and its environment, system dynamics, introduction to various environmental issues associated with human activities (such as classic water, air and soil pollution cases, disturbance of material cycles, climate change), ecosystem services, externalities, sustainability, environmental indices, energy consumption patterns and energy production technologies (with special focus on the renewables).

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. will be able to describe the relations between humans and the environment, as well as the relation between economy and the environment
2. will understand the working mechanism and building blocks of dynamic systems
3. will learn about the main geochemical material cycles and the effect of human activities on them
4. will learn about the most important pollutants, the process of pollution and the evolution of possible reactions to environment pollution
5. will know about the major water and air pollution issues
6. will understand the role and the importance of ecological systems and ecosystem services
7. will gain information about the evaluation of environmental disasters
8. will learn about the basic goals and the applicable tools of environmental management
9. will be informed about the environmental aspects of energy production and utilization

B. Skills

1. will be able to understand and differentiate various indicators used to characterize the state of the environment and well-being of human societies
2. will be able to identify the different types of smog and point out the primary causes that lead to their formation

C. Attitudes

1. will realize the importance of the effects of human activities on the environment
2. will broaden knowledge also by gathering information from various sources, including extracullicular sources (i.e. the Internet) as well

D. Autonomy and Responsibility

1. will apply a systematic approach in accomplishing tasks

2.3 Methods

Lectures, exercises, written and oral communications, application of IT tools and techniques.

2.4 Course outline

Week	Topics of lectures and/or exercise classes
1.	**Introduction**. The relation of humanity and the environment. Economy and the environment. Symptoms of a global environmental crisis, the birth of environment protection. The limits to growth, the idea of sustainability. The "Great acceleration" and the Holocene-Anthropocene transition.
2.	**System dynamics.** Building blocks, working mechanism and limitation of dynamic systems. System stability and transition between different stable states. Links between environment, sustainability and system dynamics. Planetary boundaries.
3.	**Materials management.** Selected material flows and their management issues. Anthropogenic perturbation of the nitrogen, phosphorus, carbon and water cycles and associated environmental issues.
4.	**Pollution (first part).** Definitions. The pollution process and its indicators. The evolution of environmental protection paradigms through examples of water pollution: plagues and sanitation, dissolved oxygen problem in rivers and wastewater treatment, eutrophication of water bodies and watershed management. Mixing and dilution of pollutants in water.
5.	**Pollution (second part).** Classification and sources of air pollutant substances. Health-related and environmental effects of air pollution. The evolution of environmental protection paradigms through examples of air pollution: dispersion of air pollutants from point sources, the effect of atmospheric stability, smog types. A summary of end-of-pipe solutions (flue gas cleaning) and the global success story of source-control measures: stopping the depletion of the stratospheric ozone layer.
6.	**Partial summary and conclusion.**
7.	**Ecology and ecosystem services.** The importance of protecting ecological systems. What are the ecosystem services? What is the theory behind and what are the actual experiences? Types of ecosystem services illustrated by examples. Answering the question: what should be protected and why?
8.	**Environmental disasters.** Environmental problems

	resulting in catastrophic events – how do we interpret them? What are the common properties of environmental disasters? Spatial and temporal scales. Rethinking the usual classification based on causes and effects: "extraordinary" pondering on the extraordinary.
9.	**Benchmarking of environmental effects and well-being.** From economic to environmental indices. HDI and SDG as new socio-economic indicators of human well-being. The ecological, water and carbon footprints as integrated indicators of the effect of human activities on the environment. Introduction to ecological footprint analysis. Presentation and evaluation of global and local ecological footprints. Conclusions and criticism. Where we now and where are we heading?
10.	**Environmental regulations and management.** Externalities, regulatory toolset, legislative milestones, environmental impact assessment, life cycle analysis, voluntary decisions, "green washing".
11.	**Energy and the environment (first part).** The evolution, status and future of the "carbon economy". The alternatives of carbon-based sources: nuclear energy and renewable resources. Discussion of hydrostatic and wind energy utilization technologies in electricity generation.
12.	**Energy and the environment (second part).** Discussion of solar, biomass and geothermal energy utilization technologies in electricity generation and in direct forms. Possibilities of decreasing the carbon dependence of households.
13.	**Climate change.** Discussion about the role and magnitude of human activities in forming the Earth's Holocene climate system. What is known and how sure that knowledge is? What kind of reactions are possible and which of these are implemented? What are the possible outcomes in the future?
14.	**Final summary and conclusion.**

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

- Textbooks

1. Dr. Péter Budai– Dr. Zsolt Kozma: Basics of Environmental Engineering (electronic textbook, 2017)
2. BME Department of Sanitary and Environmental Engineering (2021): Basics of Environmental Engineering - Textbook for Civil Engineer (BMEEOVKAT41) and Environmental Engineer (BMEEOVKAKM1) students (electronic textbook)

- Online materials

1. WWF Living Planet Report (2016)
2. WWF Living Planet Report (2018)

3. Lecture slides

2.6 Other information

2.7 Consultation

The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail from the lecturers:
kardos.mate@epito.bme.hu, kozma.zsolt@epito.bme.hu

This Subject Datasheet is valid for:

2023/2024 semester I

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs in either of the following forms:

- via one written test (MT)

- via student's presentation (SP).

Each student have to choose no later than the 4th week one of the above assessment methods.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm test	MT	A.1-A.9; B.1-B.2; C.1-C.2; D.1
2. student presentation	SP	A.1-A.9; B.1-B.2; C.1-C.2; D.1

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Abbreviation	Score
MT	100%
SP	100%
Sum	**100%**

Criterion for completion of the subject is to collect at least 50% of the total points of the written test (WT1).

3.4 Requirements and validity of signature

Signature can't be obtained.

3.5 Grading system

If the student satisfies the attendance criteria, his/her mark will be determined as follows.:

Grade	Points (P)
excellent (5)	80%<=P
good (4)	70%<=P< 80%
satisfactory (3)	60%<=P< 70%
passed (2)	50%<=P< 60%
failed (1)	P<50%

The final mark is calculated based on the midter test (MT) or the student's presentation (SP) according to the student's choice.

3.6 Retake and repeat

The midterm test can be repeated – once without paying a fee – at a previously determined date given in the course schedule. If the first repetition is also unsatisfactory (failed), then the test can be repeated once more, during the repetition week, by paying a fee.

The student's presentation can not be repeated. In case the presentation fails, the student will be evaluated according to the MT assesment method.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×2=28
preparation for the courses	14×1=14
home studying / preparation	18
preparation for the test / presentation	30
Sum	**90**

3.8 Effective date

5 February 2020

This Subject Datasheet is valid for:

2023/2024 semester I