

Waste Management

Credits: 4
ECTS Credits: 6
Grading: 3, 4, 5
Language: English

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Industrial Ecology

Aim

The aim is to give practical and theoretical knowledge about waste management aspects such as waste prevention, recycling and reuse as well as different waste treatment systems.

Both municipal and industrial waste issues will be discussed.

The course will also discuss waste minimisation from a systems analysis approach.

The aim is to give deeper knowledge in the problems and possibilities of waste management from a national and global perspective.

Learning outcomes

Syllabus

1. Definition of waste; waste characterization, classification systems, waste flows in society, amounts and composition of waste.
2. Strategies for waste handling; waste minimization, recycling, etc.
3. Laws and means of control, international comparisons, scenarios.
4. Waste treatment; thermal and biological methods, recycling and reuse, landfill, treatment of hazardous waste.

After a passed course the student should be able to:

- Define and explain important concepts in the field of solid waste management, such as waste hierarchy, waste prevention, recirculation, municipal solid waste etc.
- Suggest and describe suitable technical solutions for biological and thermal treatment. The student should also be able to discuss the drawbacks and prerequisites for a chosen solution.
- From a given case, connected to a solid waste problem, suggest, motivate and describe a way to tackle the problem from a system analysis approach.
- Describe the construction and operation of a modern landfill according to the demands of the EU directive.
- Discuss social aspects connected to handling and recirculation of solid waste from a local as well as global perspective.
- Name and describe economical and legal means of control that affect waste management on a social and industrial level from a Bosnian and Herzegovinian perspective.

- Analyse and describe the potential as a secondary raw material, and thereby associated problems and possibilities in a sustainable society.
- Describe, analyse and discuss the connection between waste and consumption on a national and global level.
- Independently search for information connected to solid waste management, and make a compilation of this, and analyse it in a written report.
- Make an oral presentation of an individual work and actively participate in the discussion of other groups work.

CURRICULUM OF THE COURSE

The course is divided into 5 themes
(lectures, assignments, study visits)

Theme 1. WASTE MANAGEMENT AND RECYCLING

Course introduction and start of project work

L1:1 The consumption dimension of waste generation and management

L1:2 Design for recycling, upgrading and repair

L1:3 Polymers and the environment

L1:4 Hazardous waste

L1:5 State of waste management

Study visit 1

Assignment 1

Literature: Chapter 1, 2, 3 and 7

("Waste Treatment and Disposal", Paul T. Williams)

Theme 2. INCINERATION

L2:1 Incineration of waste

Study visit 2

Assignment 2

Literature: Chapter 5 ("Waste Treatment and Disposal", Paul T. Williams)

Theme 3. BIOLOGICAL TREATMENT

L3:1 Biological treatment

Study visit 3:

Assignment 3

Literature: Chapter 6.5 and 6.6 ("Waste Treatment and Disposal", Paul T. Williams)

Theme 4. LANDFILL

L4:1 Landfill

Study visit 4

Literature: Chapter 4

Theme 5. SYSTEM ANALYSIS

L5:1 System analysis

Assignment 4

TEACHING METHODS AND EXAMINATION FORM

This course calls for an individual responsibility as well as teamwork.

It consists of:

Lectures	18h
Study visits	4 visits
Assignments	4
Project work	

The lectures are complemented by study visits and, in some cases, show the present research in the area.

The study visits are important part of the course and are strongly recommended. At least one study visit is required in order to pass the course.

Assignments are delivered at 4 times during the course. They cover 4 of themes of the course and are to be delivered to the teacher during the course.

Assignment 4 is to be discussed at a seminar. The other 3 are written assignments. The assignments are individual assignments.

All assignments could be found on the homepage of the course.

Deliverance of written assignments is preferably done by using the e-mail

For the assignment, a grade of "passed" or "passed with distinction" can be achieved.

In order to achieve the grade "passed", the report should answer all the the questions given, be delivered due to the deadline and contain a reference list. Only one possibility for complementary additions is allowed in order to pass the assignment. If there is a need for complementary additions only the grade "passed" can be achieved. For the grade of "passed with distinction", additional to the requisites for "passed", well written own conclusions and a deep, critical analysis of the result is required.

The deadlines for deliverance of assignments will be outlined in the timetable of the course.

The project work is a teamwork of 3-4 students. Some of the projects are in co-operation with a company. Choice of project is made during the course introduction.

The grades of "passed" and "passed with distinction" can be achieved. Much weight is laid on the students creativeness, the way to address a problem, how the work is carried out and the capability to analyse and draw own conclusions of the results.

More information about the project will be found on the homepage of the course.

EXAMINATION FORM

Requirements: In order to pass the course the following is required:

At least one study visit (1p), At least one passed assignment (1p), passed project work (2p) and at least a grade of 3.

Grades of 3, 4 and 5 can be achieved.:

The grade are as follows:

- Attendance of lectures: 1p/2h lecture (no half points); 9 lectures = 9p
- Study visit (half day): 1p/visit; 3 visits = 3p
- Assignments: 2p for "passed" assignment, 3p for "passed with distinction"; 4 assignments = 12p
- Project work: 6p for "passed", 8p for "passed with distinction"; 6/8p

Maximal points are 32p. In order to reach a specific grade you need:

<u>Grade</u>	<u>Points</u>
3	16
4	22
5	28

Please observe!

In order to pass the course requirements that must be reached are:
a passed project work, at least one passed assignment and at least one study visit.

Required reading
Bibliography will be handed out at the start of the course.

Literature:

"Waste Treatment and Disposal", P. T. Williams, 2005
"Waste Treatment and Disposal", J.Sredojevic, 2003
"Waste Treatment – world experience", V. Potočnik, 1997