COURSE OUTLINE "RECYCLING OF WASTE"

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
DEPARTMENT	CIVIL ENGINEERING DEPARTMENT		
LEVEL OF STUDIES	POSTGRADUATE		
COURSE CODE	662002	SEMESTER	2nd
COURSE TITLE	**RECYCLING OF WASTE**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	WEEKLY TEACHING HOURS	ECTS Credits
Lectures	3	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Scientific Area
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://www.environmentalprotection.gr/?page_id=152

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The specific learning outcome deriving from the topic "Recycling of Waste", has been designed and is expected to be as follows:

a) Making the students familiar with the basic ideas and terminology, relevant to recycling and the well established processes for waste recovery/recycling.

b) Making the students familiar with the current union and national legal framework, as well as of the related regulatory rules issued by the State or the local authorities.

c) Comparative evaluation of methodologies of Extended Producer Responsibility (EPR) Systems.

d) Knowledge of the legal obligations of operators that bear extended producer responsibility.

e) Identification of the basic cost elements associated with the EPR systems and methodologies to calculate the relevant fees

f) Establishment and capabilities of sharing of a sensitized approach regarding pollution prevention, reduction of waste, recycling and reuse of materials and energy, etc.

Upon the successful completion of the course, it is expected that the students will be able to:

In the area of knowledge, they know what is considered as recycling and extended producer responsibility, which are the main terms, which are main recycling operations per specific waste streams, which are the main direction of the waste management legislation and the possible changes in the near future, which are the available technologies, their environmental impacts and their operation and investment cost, as well as the operation cost of EPR systems.

Regarding the skills, the students will be able to record and understand a complex environment (mainly legal, but also techno-economic) for recycling and EPR systems, to evaluate recovery recycling techniques and basic principles for optimized management, based on the international and domestic experience.

In the level of capabilities, it is believed that the students' capabilities to identify, on a professional level, the critical problems associated with the operation of EPR systems and the producer's obligations, is strongly enhanced, **as well as their ability to make decisions and suggest solutions, to evaluate alternatives, to prepare dossiers for the approval of EPR systems, to understand and manage recycling issues** in small or large scale, as per national and EU legislation.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*

The capabilities and broader characteristics, that are expected to be obtained by the students, are:

- Respect for the natural environment
- Showing social and professional responsibility
- Adapting to new situations
- Decision-making
- Working independently
- Team work
- Project planning and management

- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking

(3) COURSE CONTENT

The Syllabus of the course "Recycling of Waste" is as follows:

- EU legal framework on waste recycling, EPR, direction of the EU acquis (circular economy), basic terms, main separation techniques and recycling/recovery technologies.
- General principles of alternative waste management – National legal framework.
- Recycling of packaging waste.
- Waste prevention.
- Biowaste and composting.
- Recycling of end-of-life-vehicles.
- Recycling of used tires.
- Recycling of waste oils.
- Recycling of waste of electrical and electronic equipment.
- Recycling of batteries and accumulators.
- Recycling of construction and demolition waste.
- Preparation of dossiers for the approval of EPR systems.
- Ship recycling.

(4) TEACHING & LEARNING METHODS – EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face, distance learning
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Access to data bases and special coding. software, for search and management of information Education using ICT. • Communication and electronic submission. • Support of teaching through the website. • Presentation in PP, video and linking with specialized websites through the Internet.

TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	*Activity*	*Semester workload*
	Lectures	39
	Study and analysis of bibliography	95
	Educational visits	6
	Exercises	10
	Course total	**150**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Written exams with multiple choice system (75%) Short answers question (25%)	

(5) ATTACHED BIBLIOGRAPHY

A. Prevention

I. European Commission

- www.generationawake.eu/el

- electronic journal "environment for Europeans"

http://ec.europa.eu/environment/news/efe/themes/waste/index_el.htm

- Green Week 2014 - circular economy

-ec.europa.eu/environment/greenweek/programme.html

- European Commission [DG Environment] «Waste Prevention – Handbook: Guidelines on waste prevention programs», October 2012

II. UNEP Green Pack

education.rec.org

III. National Prevention Plan (Π.Υ.Σ υπ΄αρ. 49/2015)

B. Circular Economy – Waste Management

http://ec.europa.eu/environment/circular-economy/index_en.htm

1. Preparing a Waste Management Plan – A methodological guidance note, European Commission – Directorate-General Environment, 2012.
2. Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, European Commission, Directorate-General Environment, Brussels 2012.
3. Use of Economic Instruments and Waste Management Performances – Final Report, Bio Intelligence Service, Contract ENV.G.4/FRA/2008/0112, 10 April 2012, European

Commission DG Env, Brussels.

4. OECD/EEA database on instruments used for environmental policy and natural resources management, http://www2.oecd.org/ecoinst/queries/
5. EEA, Resource efficiency in Europe, Policies and approaches in 31 EEA member and cooperating countries, No 5/2011
6. EEA, 2011 Survey of resource efficiency policies in EEA member and cooperating countries, Country Profile Greece, May 2011
7. Naoko Tojo, Alexander Neubauer and Ingo Brauer, IIIEE, Waste management policies and policy instruments in Europe, Report written as part of project HOLIWAST, WP 1, 2006.
8. ETC/SCP working paper 4/2009, Green Public Procurement and Product performance

   requirements – Case study on selected energy using and non-energy using products, March 2009
9. ETC/RWM working paper 2006/1, Economic instruments to promote material resource efficiency, February 2006
10. UK, End of Waste, Quality protocols, https://www.gov.uk/turn-your-waste-into-a-new-nonwaste
11. European Commission, Indicative Roadmap of Waste Policy and Legislation, February 2013.
12. Ευρωπαϊκή Επιτροπή, «Πράσινη Βίβλος για τα διαχείριση των βιολογικών αποβλήτων στην Ευρωπαϊκή Ενωση», COM(2008) 811 final.
13. Οδηγός για τα Πράσινα Σημεία
14. Circular Economy: Resources and Opportunities, A. Mavropoulos & M. Brocklehurst, Brussels 2015, ISWA
15. Delivering the circular economy – A toolkit for policy makers, Ellen MacArthrur Foundation, Brussels, 7 Sept. 2015
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18. Milieu Ltd , WRc and Risk & Policy Analysts Ltd (RPA) 2008. Study on the environmental, economic and social impacts of the use of sewage sludge on land. Final Report Part II: Report on Options and Impacts, DG ENV.G.4/ETU/2008/0076r. Available: http://ec.europa.eu/environment/archives/waste/sludge/pdf/part_ii_report.pdf
19. Ødegaard 2013. State of the art of wastewater management in the Nordic countries. NORDIWA 2013 13de, Nordiska Avloppskonferensen. Available: http://www.svensktvatten.se/PageFiles/4083/2%20%C3%98degaard%20%20State%20of%20the%20art%20in%20the%20Nordic%20countries.pdf
20. Επιτυχημένες περιπτώσεις κομποστοποίησης και διαλογής στην πηγή, Γενική Διεύθυνση Περιβάλλοντος, Ευρ. Επιτροπή, Βρυξέλλες 2001.
21. Development of Guidance on Extended Producer Responsibility (EPR), Final Report, European Commission – DG Environment, Brussels 2014.

22. Bioplastics: Materials, Markets and Management, Conor McGovern, John Finegan, Louise Connolly, rx3, Dublin 2013
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24. End-of-Waste criteria for waste plastic: JRC technical proposal, Alejandro Villanueva, DG JRC-IPTS, Brussels, 17 November 2014.
25. Impact Assessment: The European Commission´s Proposed Changes to the Calculation Method for National Packaging Recycling Rates - Executive Summary -, Commissioned by The European Organization for Packaging and the Environment (EUROPEN), Prepared by ARGE cyclos / HTP, October 2014, Germany.
26. Πρότυπη Περιβαλλοντική Μελέτη Σ.Μ.Α.Υ. Νησιών, Έκδοση: Ε.Ε.Α.Α., Σύνταξη: Ε.Π.Τ.Α. Α.Ε., Σεπτέμβριος 2014, Αθήνα.
27. Competition among Producer Responsibility Organisations and role of municipalities in an EPR system - Case study of EPR for household packaging in Belgium, Germany and Austria, Bilyana Spasova (Supervisor Thomas Lindhqvist), Thesis for the fulfilment of the Master of Science in Environmental Management and Policy Lund, Sweden, September 2014.
28. END-OF-WASTE CRITERIA FOR WASTE PLASTIC FOR CONVERSION TECHNICAL PROPOSALS FINAL REPORT, IPTS (on behalf of JRC), MARCH 2013, Seville, Spain.
29. Energy recovery Efficiency in Municipal Solid Waste-to-Energy plants in relation to local climate conditions, Study conducted by Clerens Consulting with the collaboration of ESWET for the Eur. Commission JRC, Institute for Energy and Transport, May 2012Petten.
30. Preparing a Waste Prevention Programme Guidance document, Eur. Commission, Drafted by BioIntelligence Service S.A.S in association with Copenhagen Resource Institute (Copenhagen), Regional Environmental Center (Szentendre) with contributions from members of Umweltbundesamt GmbH, Vienna (AEE), BiPRO GmbH, Munich & Ekotoxikologické Centrum, Bratislava (ETC), October 2012 Paris.
31. STUDY ON THE PROGRESS OF THE IMPLEMENTATION AND IMPACT OF DIRECTIVE 94/62/EC ON THE FUNCTIONING OF THE INTERNAL MARKET: FINAL REPORT, Eur. Commission, drafted by *David Perchard and Gill Bevington (*Perchards, St Albans, UK), *Fred Soomers and Kees Wielenga (*FFact Management Consultants, Rijen, The Netherlands), *Raphael Veit (*SAGIS Ltd, Sliema, Malta), May 2005.
32. DG Competition Paper Concerning Issues of Competition in Waste Management Systems, Eur. Commission, Brussels 2006.