

COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	TECHNOLOGY		
DEPARTMENT	ENVIRONMENTAL SCIENCES		
LEVEL OF STUDY	<i>Undergraduate</i>		
COURSE UNIT CODE	NEW COURSE	SEMESTER	5, 6, 7
COURSE TITLE	LIFE CYCLE ASSESSMENT OF ENVIRONMENTAL SYSTEMS		
INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits		WEEKLY TEACHNG HOURS	CREDITS
THEORETICAL BACKGROUND		4	4
LABORATORY PRACTICE			
TOTAL		4	4
COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	SCIENTIFIC: AREA (α) ENVIRONMENTAL DESIGN (β) ENVIRONMENTAL SOCIOECONOMICS		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION & EXAMINATION/ASSESSMENT:	GREEK		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)			

(2) LEARNING OUTCOMES

<p>Learning Outcomes</p> <p><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:</i></p> <p>APPENDIX A</p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.</i> • <i>Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and</i> <p>APPENDIX B</p> <ul style="list-style-type: none"> • <i>Guidelines for writing Learning Outcomes</i>
<p>Life Cycle Assessment – LCA is the documentation and assessment of the environmental impact of a system or a product, of a system or a process (of energy or raw material, pollution of air, water, soil, etc) during the whole life cycle, from start to end.</p> <p>Life Cycle Analysis ή Assessment – LCA is a relatively new scientific method developed to face several recentl environmental problems. Its strength lies in its ability to evaluate objectively in quantitative</p>

terms of the environmental impact of a product or process during its life cycle from birth to death. The application of the method has been used mostly with products but it can be used with any other economic system like raw materials, services, business processes, and state policies. LCA is currently an important environmental management and decision making tool in cases of energy usage, processing of materials and waste disposal, and in the cost benefit analysis of environmental improvements in relation to the usage of energy and materials. LCA gives us the ability to compare objectively the possible alternative options or systems on the basis of several categories of environmental impacts.

The aim of the module is:

That students understand the notions of Life Cycle Assessment, Life Cycle Cost, Ecological Design and the methods that they could be applied in cases of a product, a system, or a process or a combination of the above.

At the conclusion of the module the students will be able to:

- Thoroughly collect and analyse the inputs of LCA.
- Form the energy and mass equilibriums within the LCA.
- Calculate the energy and the environmental footprint of raw materials, production, distribution and usage processes.
- Review the environmental impact in relation to energy and mass equilibriums.
- Review the environmental impact in relation to raw materials including waste.
- Propose better rational applications for materials and energy use.
- Take decisions for human activities that will improve the environmental footprint.

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

<i>Search for, analysis and synthesis of data and information by the use of appropriate technologies, Adapting to new situations</i>	<i>Project planning and management</i>
<i>Decision-making</i>	<i>Respect for diversity and multiculturalism</i>
<i>Individual/Independent work</i>	<i>Environmental awareness</i>
<i>Group/Team work</i>	<i>Social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Working in an international environment</i>	<i>Critical thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>Development of free, creative and inductive thinking</i>
<i>Introduction of innovative research</i>	<i>.....</i>
	<i>(Other.....citizenship, spiritual freedom, social awareness, altruism etc.)</i>
	<i>.....</i>

- Adjustment to new situations
- Work in a multi-disciplinary environment
- Development of new research ideas
- Respect for diversity and multiculturalism
- Project planning and management
- Respect for natural environment
- Apply critique to self and others' actions
- Promotion of free, creative and inductive reasoning

(3) COURSE CONTENT

<ol style="list-style-type: none"> 1. Introduction - Definitions 2. LCA Stages 3. LCA Developmental Stages. 4. LCA Methodology 5. The ISO 14040 standard 6. The ISO 14044 standard 7. Energy and material inputs and outputs in LCA stages 8. Impacts and improvements review. 9. LCA Review and application tools. 10. Environmental Product Statements 11. LCA Case Studies. 12. LCA Case Studies. 13. LCA Case Studies.

(4) TEACHING METHODS-ASSESSMENT

MODES OF DELIVERY Face-to-face, in-class lecturing, distance teaching and distance learning etc.	<ul style="list-style-type: none"> • Lectures • Group discussions • Casestudies 														
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY Use of ICT in teaching, Laboratory Education, Communication with students	<ul style="list-style-type: none"> • Powerpoint presentations • Video presentations • Communication via e-mail. • E-class platform 														
COURSE DESIGN Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><i>Activity/Method</i></th> <th style="text-align: center;"><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td style="text-align: center;">52</td> </tr> <tr> <td>Workshop</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Laboratory work</td> <td style="text-align: center;">18</td> </tr> <tr> <td>Theory study</td> <td style="text-align: center;">100</td> </tr> <tr> <td>Weekly individual evaluation reports for laboratory exercises</td> <td style="text-align: center;">52</td> </tr> <tr> <td>Course total (25 hours of workload per credit unit)</td> <td style="text-align: center;">30</td> </tr> </tbody> </table>	<i>Activity/Method</i>	<i>Semester workload</i>	Lectures	52	Workshop	30	Laboratory work	18	Theory study	100	Weekly individual evaluation reports for laboratory exercises	52	Course total (25 hours of workload per credit unit)	30
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STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS Detailed description of the evaluation procedures: Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory	<p><u>Evaluation can be done in either Greek or English language.</u> <u>The final grade is the outcome of the following evaluations:</u></p> <ul style="list-style-type: none"> • Written examinations: 70% of final grade (A) • Assignments: 30% of final grade (B) <p style="text-align: center;">Final Grade = 70% (A) + 30% (B)</p>														

work, other.....etc.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.

(5) SUGGESTED BIBLIOGRAPHY:

-Suggested bibliography

- Mousiopoulos N. & Boura, A., 1999, Life Cycle Assessment, Ziti Publications
- Karvounis S. & Georgakelos D., 2016, Varvarigou Publications
- Life Cycle Assessment (LCA): A Guide to Best Practice, 2014 Wiley-VCH Verlag GmbH & Co. KGaA
- Walter Klöpffer, Birgit Grahl, Life Cycle Assessment (LCA): A Guide to Best Practice, 2014 Wiley-VCH Verlag GmbH & Co. KGaA
- ISO 14040, Environmental management -- Life cycle assessment -- Principles and framework
- ISO 14044, Environmental management -- Life cycle assessment -- Requirements and guidelines
- Matthews, H. S., Hendrickson, C. T., & Matthews, D. H., 2015. Life cycle assessment: Quantitative approaches for decisions that matter. Retrieved June, 1, 2016.
- Curran, M. A. (Ed.), 2012. Life cycle assessment handbook: a guide for environmentally sustainable products. John Wiley & Sons.

-Complementary bibliography