EEE.9-1.3 LIGHTING TECHNOLOGY

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
DEPARTMENT	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDER GRADUATE		
COURSE CODE	EEE.9-1.3	**SEMESTER**	**9**
COURSE TITLE	LIGHTING TECHNOLOGY		

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**	**CREDITS**
Lectures	4	6
Laboratory Exercises	2	
Total	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*	Specialization Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (official)- English (optional)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/EEE246/

(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*

Upon completion of the course, students will have acquired:

1. In-depth knowledge and critical understanding of the mechanism of vision and concepts, sizes and laws of photometry.
2. Knowledge of the different technologies of lighting lamps and lighting fixtures.
3. Ability to apply this knowledge to the implementation of indoor, outdoor and streetlight lighting studies.

More specifically, they will be able to

1. describe the mechanism of vision and the concepts of visible radiation
2. measure phototechnical quantities and analyze the results.

3. understand the characteristic quantities of light sources - lamps.
4. choose the proper lighting and lighting fittings depending on the application and the particular operating conditions.
5. conduct interior lighting studies using approximate-empirical methods.
6. conduct interior lighting studies using specialized lighting programs in accordance with current European standards.
7. conduct outdoor lighting studies using approximate-empirical methods.
8. conduct outdoor lighting studies using specialized lighting programs in accordance with current European standards.
9. conduct street lighting studies using approximate-empirical methods.
10. conduct street lighting studies using specialized lighting programs in accordance with current European standards.

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 course aims at fostering the following capabilities:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision making
- Individual project
- Generating free creative and inductive thinking

(3) COURSE CONTENT

A. THEORY

The theory part of the course consists of the following modules:

A. THEORETICAL PART

The subject of THEORY consists of the following sections:

Module 1: Light - radiation, basic principles: Luminous radiation - Energy, power, flow, intensity of radiation - Visible spectrum - Vision - Colorimetry - Color systems.

Module 2: Photometry: Introduction to photometry - Solid angle - Luminous flux - Point sources - Illuminance - Light intensity - Luminance - Photometric laws (law of the inverse square, sinus law, Lambert law - non-point sources) - Reflection, transfer, absorption.

Module 3: Light sources & Luminaries: Incandescent Lamps - Fluorescent Lamps - Induction Lamps - High Intensity Discharge Lamps - Metal Halide Lamps - Sodium Discahrge Lamps - Luminaries - Distinction - Coding.

Module 4: Indoor Lighting: Introduction to Interior Lighting - Favie Method - Zonal Cavity Method - EN12464 based method.

Module 5: Indoor Glare: Glare Curve System - CIE Glare Restraint System - Reduce Glare with the Unified Glare Rating System (UGR).
Module 6: Road Lighting: Introduction to street lighting - Road lighting methodologies - Street lighting characteristics - Street lighting fixtures, average light intensity method or Lumen method, luminance method - Road lighting categories according to CEN 13201.

B. LABORATORY PART
The Laboratory part of the course consists of the following separate modules::

Module 1: Characteristic lamp quantities & key photometric quantities
Module 2: Polar diagrams of luminaries
Module 3: Ulbricht integration sphere
Module 4: Study of incandescent lamp characteristics
Module 5: Study of Fluorescent Lamp characteristics
Module 6: Study of mercury (Hg) characteristics
Module 7: Study of metal halide lamp characteristics
Module 8: Study of low pressure sodium (Na) lamp characteristics
Module 9: Study of high pressure sodium (Na) lamp characteristics
Module 10: Study of LED lamp characteristics
Module 11: Isolux Diagrams
Module 12: Utilization and Learning of a Lighting Software

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Lectures, laboratories , distance learning methods</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Teaching using ICT, Laboratory Education using ICT, Communication and Electronic Submission</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Lab exercises</td><td>26</td></tr>
<tr><td>Preparation for writing laboratory reports</td><td>26</td></tr>
<tr><td>Optional individual work- Self study - Preparation for examinations</td><td>76</td></tr>
<tr><td>Course total</td><td>180</td></tr>
</table>
</td></tr>
<tr><td>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</td><td>Evaluation Language : Greek

<u>Theory</u>

1. Written final exam including:
•questions of theoretical content and judgment questions
•Multiple choice questions
•Solving computer problems</td></tr>
</table>

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	2. Optional individual project **Laboratory** Individual technical report for each laboratory exercise including: •a description of the laboratory exercise and how it is performed, •presentation of test and measurement devices, •presentation of the results (calculations, diagrams, etc.); and •comment on the results with conclusions. The final grade of the course is as follows: Without the optional individual work 0.7 x written examination theory + 0.3 x final laboratory grade (average of grades of individual technical reports) With optional individual work 0.6 x written exam theory + 0.1 x work + 0.3 x final laboratory grade (average grades of individual technical reports

(5) ATTACHED BIBLIOGRAPHY

1. Α. Τσακίρης Α (2004), *Φωτοτεχνία*, Αθήνα
2. Φ. Τοπαλής, Λ. Οικονόμου (2014), *Φωτοτεχνία*, Εκδόσεις Τζιόλα
3. Philips (1993), *LIGHTING MANUAL*, 5η Έκδοση.
4. P. Boyce (2014), *Human Factors in Lighting*, CRC Press
5. S. Kitsinelis (2015), *Light Sources*, CRC Press
6. W. van Bommel (2015), *Road Lighting*, Springer
7. C. DeCusatis (1998), *Handbook of Applied Photometry*, Springer
8. R. Simons & A. Bean (2001), *Lighting Engineering*, Architectural Press