

COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	8.007	SEMESTER	8 th
COURSE TITLE	Earthing and Lightning Protection		
COURSEWORK BREAKDOWN		TEACHING WEEKLY HOURS	ECTS Credits
Theory (Lectures)		3	3
Tutorial/Exercises		1	1
TOTAL		4	4
COURSE UNIT TYPE	Specialized knowledge/Skills development		
PREREQUISITES			
LANGUAGE OF INSTRUCTION/EXAMS	Greek		
COURSE DELIVERED TO ERASMUS STUDENTS	No		
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE179/		

(2) LEARNING OUTCOMES

Learning Outcomes
<p>A) Upon successful completion of the course, the student will:</p> <ul style="list-style-type: none"> ▪ know the mechanism of lightning strikes and the effects they can have on people and structures ▪ be able to assess the potential lightning hazard in accordance with applicable international standards ▪ be able to select and design lightning protection systems ▪ will know the basic principles of earthing systems ▪ will be able to select, design and test earthing systems <p>B) The skills, which the students will obtain upon successful completion of the course are:</p> <ol style="list-style-type: none"> a) understanding of the relationship between lightning strikes and related hazards b) understanding the influence of parameters such as landscape, materials etc. and the concept of possibility c) understanding the fundamental principles of lightning protection d) understanding of fundamental principles of earthing systems e) writing a project based on literature review from papers in Greek and English, that includes Introduction, Main Body, Conclusions, and References f) utilization of a computer in writing and presenting a project <p>C) The abilities, which the students will get upon the successful completion of the course are:</p> <ol style="list-style-type: none"> a) the explanation and prediction of lightning hazards b) estimate the lightning possibility and further impact c) design protection systems d) design earthing systems e) the cooperation with other people, as part of a team, in writing project
General Skills
<ul style="list-style-type: none"> ▪ Search, analysis and synthesis of data, using the necessary technologies ▪ Autonomous work ▪ Working in an international environment ▪ Working in an interdisciplinary environment ▪ Exercising critical and self-critical thinking ▪ Respect for the natural environment

(3) SYLLABUS

The aim of the course is to understand the mechanism of lightning strikes in installations and structures, the risks they pose to people and structures and the protection techniques applied according to international standards. To achieve this objective the structure is as follows:

1. Basic concepts
Electrical atmospheric phenomena, theories of lightning generation, basic electrical characteristics of lightning.
2. Lightning strokes, principles of lightning, basic principles of lightning strikes, Consequences of lightning strikes on electrical networks and on buildings, sports, industrial, telecommunication and other technological installations. Lightning risk assessment (IEC 62305-2:2006)
3. Lightning protection theory and systems (LPS), Protection of buildings, high-rise structures, hazardous installations and special technological structures against lightning. Applicable regulations and standards. Methods of protecting buildings, sports and industrial facilities from lightning. Materials for the construction of lightning protection installations. Protection of boats and aeroplanes. Protection of telecommunications installations. Selection of lightning protection system. Protection of sensitive electronic equipment.
4. Earthing systems
Electrical characteristics of ground at DC, industrial frequency and shock surges, grounding theory and general regulations, grounding of transmission lines and substations, resistivity and earth resistance measurements.

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face													
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	<ul style="list-style-type: none"> ▪ Use of ICTs in lecturing ▪ Use of ICTs for the communication with students via the e-class platform 													
TEACHING ORGANIZATION	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9ead3;">Method description/Activity</th> <th style="background-color: #d9ead3;">Semester Workload</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Project (journal/paper reading and theoretical study)</td> <td style="text-align: center;">20</td> </tr> <tr> <td>Projects</td> <td style="text-align: center;">20</td> </tr> <tr> <td>Non-guided personal study</td> <td style="text-align: center;">50</td> </tr> <tr> <td>Total Contact Hours</td> <td style="text-align: center;">120</td> </tr> </tbody> </table>		Method description/Activity	Semester Workload	Lectures	30	Project (journal/paper reading and theoretical study)	20	Projects	20	Non-guided personal study	50	Total Contact Hours	120
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ASSESSMENT METHODS	<p>All announcements for the course regulations and complementary reading material are permanently posted in the course web page. The course grade incorporates the following evaluation procedures:</p> <ul style="list-style-type: none"> (A) Final Written examination (65%) <ul style="list-style-type: none"> • Problem solving. • Targeted multiple-choice questions (B) Written individual work (35%) 													

(5) RECOMMENDED BIBLIOGRAPHY

Recommended Bibliography:

1. Pyrgioti Eleftheria, "Lightning Protection of Structures", University of Patras, Patras, 2012. (In Greek)
2. Mikropoulos Pantelis, "Lightning Protection Systems", Aristotle University of Thessaloniki, Thessaloniki, 2005. (In Greek)
3. Stathopoulos Ioannis, "Protection of Technical Installations against Surges", Simeon Publications. (In Greek).
4. R.H. Golde: "Lightning, Vol. 1,2: Physics of lightning", Academic Press, 1977
5. IEC 62305, Protection against lightning.
6. IEEE Std 1410, IEEE Guide for Improving the Lightning Performance of Electric Power Overhead Distribution Lines.
7. 1243 IEEE Guide for Improving the Lightning Performance of Transmission Lines
8. IEEE Std 998 Direct Lightning Stroke Shielding of Substations
9. IEEE Guide for Safety in AC Substation Grounding
10. IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System
11. Jinliang He Rong Zeng Bo Zhang, Methodology and Technology for Power System Grounding, John Wiley & Sons Singapore, 2013
12. Power System Grounding and Transients: An Introduction, R. R. Sakis Meliopoulos, Marcel Dekker, 1988

Relevant Scientific Journals:

- IEEE DEIS Society Transactions
- IEEE Electrical Insulation Magazine
- IET High Voltage