COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL		
DEPARTMENT	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDER GRADUATE		
COURSE CODE	EEE.9-1.7	SEMESTER	8o
COURSE TITLE	LIGHTNING AND SURGE PROTECTION		

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	3	5
Total	3	
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 / English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English for the ERASMUS students)
COURSE WEBSITE (URL)	http://moodle.teipir.gr/course/view.php?id=415

(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:

1. Knowledge of lightning generating mechanisms and the risks and impacts they have.
2. Knowledge of the principles and technical regulations governing surge and overvoltage protection of systems and live beings.
3. Knowledge of the methods and procedures made during the study and design of surge protection systems, and the specification of the materials used there.
4. Ability to apply this knowledge in the preparation and design of surge and lightning protection studies. The ability to use the above mentioned knowledge to inspect surge and lightning protection installations. They will be able to analyze and understand the risk due to lightning strokes and surges in different types of applications, to detect potential risks from non – conformed to the standards installations and to propose and implement technical solution targeting the reduction

of risk and failure prevention.

More specifically the students will:

1. Be able to understand the phenomenon of lightning stroke and surge.
2. Be able to apply the appropriate measures in the event of lightning stroke.
3. Be able to carry out inspections of lightning and surge protection installations for compatibility with the applicable regulations.
4. Be able to design and construct lightning and surge protection installations.

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

The course aims at fostering the following capabilities:

1. Search for, analysis and synthesis of data and information, with the use of the necessary technology
2. Decision making
3. Independent work
4. Work in a multidisciplinary environment
5. Project planning and management
6. Production of free, creative and inductive thinking

(3) COURSE CONTENT

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

1st Module: Introduction to lightning and surge protection: Basic concepts and definitions, legislation related to surge and lightning protection.

2nd Module: Lightning Phenomenon: Basic physics related to lightning. Lightning stroke. Thermal and electromagnetic effects. Types of strokes and types of harm. Methods of protection for live beings and structures when lightning strokes.

3rd Module: Methods for Design of the Protection of Installations: Lightning stroke risk assessment - risk analysis. Determination of the basic design parameters, quantification. Defining risk zones in a building, lightning stroke collection system design.

4rd Module: Equipotential bonds design: Voltage step up increment during lightning stroke and methods of protection. Equipotential connections and structures. Insulating spacers. Earthing systems for surge protection facilities.

5th Module: Surge Protection Devices: Surge arresters type I, II, III, type I + II. Surge arresters installation based on the system and device under protection. Lightning stroke collection system - Equipotential Bonding - Earthing – Surge Arresters coordination in installations.

6th Module:	Lightning and Surge Protection Systems – Case Studies: Lightning and surge protection in typical installations, small, medium, large scale, or event plant size case studies.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures and exercises, Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Teaching using ICT, Communication and Electronic Submission
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: 26 Individual project: 26 Personal Study: 13 Excersises/Interactive Teaching: 10 Course total: *75*
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.*	Evaluation Language : Greek English for Erasmus students **Theory** Final Written Exams: 100% **Individual Project** Final report + presentation : 100% The grade of the course is 70% x Theory + 30% x Individual project

(5) ATTACHED BIBLIOGRAPHY

1. DEHN, (2007), Lightning Protection Guide, 3rd Edition, Neumarkt
2. Stathopoulos I., (2002), Protection of technical installations against surges, Symeon publications, Athens
3. Pappas P., (1987), Lightning phenomena and early modern lightning protection, Gold Series Publications, Athens.
4. Kreuger F., (1964), Discharge detection in high – voltage equipment, Heywood, London.
5. Uman M.A., (2008), The art and Science of Lightning protection, Cambridge University Press, New York, USA
6. Cooray V. (Ed.) , (2012), Ligthning Electromagnetics, IET, London, UK
7. Betz H.D., Schumann U., Laroche P.,(Eds), (2009), Lightning: Principle, Instruments and Applications, Springer, Netherlands
8. Hasse P., (2000), Overvoltage Protection of Low-voltage Systems, 2nd Edition, IET, London.
9. Meliopoulos A.P., (2006), Standard Handbook for Electrical Engineers, Section 27, Lightning and Overvoltage Protection, McGraw-Hill, New York, USA