COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	ELECTRICAL AND COMPUTER ENGINEERING DEPT.		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**ECE_ENE910**	**SEMESTER**	**9**
COURSE TITLE	TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY		

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	
Seminars / Practice exercises	1	
Laboratory		
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (4).	4	5

COURSE TYPE *general background, special background, specialised, general knowledge, skills development*	Specialised, Skills Development
PREREQUISITE COURSES:	No. Students are advised to have already attended the courses: Electrical CircuitsI&II, Electrical Machines I
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://www.ece.uop.gr/

(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 main goal of the course is the specialized knowledge in the field of the transmission and distribution of the electrical energy.

Learning Outcomes

After the successful completion of the course, the students will:

At the knowledge level:

1. Understand the main principles of the design of the transmission grids.
2. Be fully aware of the materials used in high voltage electrical grids.
3. Understand the basic parameters of electrical grids such as reactive and capacitive resistance.
4. Be informed of the voltage drop issue at all levels of voltage.
5. Know the mathematical models used for the analysis of grids.
6. Apply specialized techniques for short-circuit analysis.
7. Be aware of the protection systems in the transmission systems.

At the skill level:

1. Use the mathematical models for the analysis of high voltage lines.
2. Know the parameters that constitute an electrical grid.
3. Know the nature and the consequences of short-circuits in the grids.
4. Define the protection systems.

At the level of abilities:

1. Calculate all the parameters in high voltage lines.
2. Define the necessary reactive power for the stabilization of the voltage.
3. Calculate the short-circuit current in high voltage grids.
4. Calculate the nominal values of the protection systems in the transmission and distribution grids.

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…*
	…….

1. Search for, analysis and synthesis of data and information, with the use of the necessary technology
2. Working independently
3. Team work
4. Decision – making

(3) SYLLABUS

Theory

1. Calculation of the L and C parameters in high voltage lines.
2. Analysis of high voltage lines with mathematical models.
3. Reactive power compensation.
4. Description and analysis of underground cables.
5. Short-circuit analysis in electrical grids.
6. Design of protection systems in transmission and distribution lines.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face in-class lecturing, Laboratory exercises
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Slides (ppt) of the presentation of the theoretical part of the course, which will be available from the beginning of semester through e-Class. • Support of teaching procedure through the e-Class platform (notification of the teaching procedure, distribution of slides, supplementary material, announcements, relative links and literature, provision of test and the final examination)
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*	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Practical examples and exercises – focusing on problem solving</td><td>13</td></tr><tr><td>Laboratory practice</td><td></td></tr><tr><td>Study for lectures</td><td>20</td></tr><tr><td>Study and analysis of bibliography</td><td>53</td></tr><tr><td>Course Total</td><td>125 hours (5 ECTS)</td></tr></table>
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 **Theory Grade** Final exams grade (short answer questions, problem solving): 100% Intermediate exams grade (short answer questions, problem solving): 0% **Laboratory Grade** Minimum pass grade 5/10.

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

1. Π. Μαλατέστα, Συστήματα Ηλεκτρικής Ενέργειας, Εκδόσεις Τζιόλα, 2014.
2. D. Glover, T. Overbye, M. Sarma, Power System Analysis and Design, Cengage, 2015
3. H. Saadat, Power System Analysis, PSA Publishing, 2010
4. C. Gross, Power System Analysis, Willey, 1986
5. A. Bergen, V. Vittal, Power System Analysis, Prentice-Hall, 2000
6. P. Murty, Electrical Power Systems, BSB, 2017
7. N. Tleis, Power System Modelling and Fault Analysis, Newnes, 2008
8. J. Das, Power System Analysis, CRC Press, 2012
9. J. Grainger, W. Stevenson, G. Chang, Power System Analysis, McGraw-Hill, 2016
10. O. Elgerd, Electric Energy Systems, McGraw-Hill, 1982
11. A. Keyhani, design of Smart Power Grid Renewable Energy Systems, IEEE-Willey, 2011.
12. H. Cotton, H. Barber, The Transmission and Distribution of Electrical Energy, HAS, 1970.

- *Related academic journals:*

1. IEEE Transactions on Energy Conversion
2. IET Proceedings – Electric Power Applications
3. Electric Power Systems Research, Elsevier
4. Applied Energy, Elsevier
5. Energy Systems, Springer