COURSE OUTLINE

(1) GENERAL

Name and surname of lecturer	PAPADOPOULOU PANAGIOTA		
SCHOOL	SCHOOL OF TECHNOLOGICAL ENGINEERING		
ACADEMIC UNIT	ELECTRICAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	BN3	**SEMESTER**	**2ο**
COURSE TITLE	ELECTRIC CIRCUITS II		

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
LABORATORY EXERCISES	2	1
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*	*General Background, Specialised general knowledge, Skills development*
PREREQUISITE COURSES:	ELECTRIC CIRCUITS I
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES, on demand
COURSE WEBSITE (URL)	http://eclass.teikav.edu.gr/ED195/

(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 aim and scope of the course is to bring students into first contact with the theory of electrical circuits and to present them in a unified way the study and analysis of electrical circuits in order to help students understand basic concepts of electricity and all the consequent such as Generation, Transmission and Distribution.

In particular aim of the course is to provide basic knowledge that will help to better understand the operation of electric circuits in ac current, such as ac Electric Current, Complex Impedance, Electric Power in ac, Reactive Power Control (Power Factor Optimization), Polyphase (3 phase)Network and Analysis of Polyphase (3 phase)Networks. At the same time for better understanding of electric circuits presented students have the opportunity to analyze the various circuits with the help of simulation programs (Electronics Workbench, etc.) during lectures and laboratory exercises. The modules of the course are:

Basic concepts of ac Current, Complex Impedance, Circuits Power in AC, Power Factor Optimization Electric circuits Analysis and Theorems in ac, Polyphase Networks and Analysis in ac, Coupled

circuits.

Upon successful completion of this course the students will be able to:

- To identify basic concepts in alternative current such as complex magnitudes like current, voltage, impedance etc.
- To perform complex vector calculations in order to calculate electric circuits magnitudes.
- To recognize basic electric circuits and be able to understand their function in ac.
- To solve theoretically an electric circuit applying laws rules and methodologies that have been taught.
- To calculate characteristic ac magnitudes of electric circuits considering the design requirements and to propose circuits optimization for better outputs.
- To recognize basic polyphase networks concepts.
- To analyze polyphase networks and to handle Y –Delta configurations.
- To identify basic concepts of coupled circuits.
- To propose the best methodology in order to analyze a circuit based on the specifications given by the problem.
- To design, analyze and otherwise handle complex electric circuits.

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…*
	…….

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology.*
- *Working independently*
- *Team work*
- *Production of new research ideas*
- *Criticism and self-criticism*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

1. BASIC AC THEORY
   - 1.1. alternating current
   - 1.2. AC waveforms – AC in ideal resistor, ideal capacitor, ideal inductor
   - 1.3. COMPLEX NUMBERS
   - 1.4. Vectors and AC waveforms
   - 1.5. Polar and rectangular notation
2. IMPEDANCE
   - 2.1. Basic concepts –Complex Impedance
   - 2.2. RL in AC series circuits
   - 2.3. RC in AC series circuits.
   - 2.4. RLC in AC series circuits.
3. Electric Power in AC
   - 3.1. Electric Energy in capacitors, C, and inductors, L, – Electric Power in resistors, R
   - 3.2. Active and Reactive Power in AC
   - 3.3. Complex and Apparent Power an in AC
   - 3.4. Power Balance calculations
4. Reactive Power Control (Power Factor Optimization)
5. Resonance
   - 5.1. Series RLC Resonance
   - 5.2. Quality Factor Q and Bandwidth
   - 5.3. Parallel RLC Resonance
6. Electric circuits analysis in AC

6.1. Mesh current method
6.2. Node voltage method
6.3. Branch current method (Kirchhoff's law)
6.4. Symmetric Circuits in AC
7. Introduction to Electric Network Theorems
7.1. Kennelly's Theorem
7.2. Superposition Theorem
7.3. Thevenin's Theorem
7.4. Norton's Theorem
7.5. Maximum Power Transfer Theorem - Millman's Theorem
7.6. Replacement Theorem
8. Polyphace networks – 3 phase networks
9. Polyphace Networks Analysis
10. Coupled Circuits

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	In classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Lectures and Laboratory Exercises using Power Point presentations. Website of the course in e-class with supporting and auxiliary material which is updated at regular intervals. Software simulation Application. E-mail contact.
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	39
Laboratory practice	26
Self study	100
Course total (27,5 hours / ECTS)	***165***

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.*	**Theory**: Final writing examination where students solve different problems concerning electric circuits. Laboratory Exercise: I. Individual project work (30%). II. Regular multiple choice questionnaires (20%). III. Final multiple choice writing examination (50%).

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Chatzarakis G. «Electrical Ciecuits» vol. A, 2002, ISBN: 960 – 8129 – 09-5.
- Kolliopoulos N., Lois I2003, ISBN :978-960-411-291-3.

- Vafiadis P. 2000, ISBN: 960-7559-11-8, ISBN: -13-978-960-7559-11-1.