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	BN5	**SEMESTER**	**2ο**
COURSE TITLE	ELECTROMAGNETIC THEORY		

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	2	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*	*General Background, Specialised general knowledge, Skills development*
PREREQUISITE COURSES:	PHYSICS, MATHEMATICS I, 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/ED140/

(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 make students able to learn the basic concepts and the basic laws of electromagnetic theory, such as electric field, Gauss's law on electricity, magnetic field and magnetic induction, Biot-Savart's law and Gauss's law to magnetism as well as Faraday's law. Also, students will know and will study magnetic circuits. Finally, through this course they will learn the characteristics properties and the basic principles of electromagnetic wave propagation in matter.
In particular aim of the course to provide basic knowledges that will help in better understanding of Electromagnetic theory concepts such as laws governing the Electrostatic Field, such as Coulomb 's Law and the intensity of electrostatic field, Electric potential, Electric Flux and Gauss's Law, Magnetic Field and Lorentz's Force, Biot-Savart's Law, Magnetic Flux and Magnetic induction, Ampere 's and Gauss's Laws in magnetism. Maxwell's equations will be presented as well as Laplace's, Poisson's and Continuity equations in order to aware Electromagnetic Waves Propagation.
The modules of the course are:
Electric Charge and Electric Field, Gauss's Law, Electrostatic Potential, Magnetic Field and Magnetic

Force, Magnetic Field Source, Biot-Savart's Law, Ampere's Law, Electromagnetic Induction, Magnetism in Matter, Self Induction, Maxwell's Equations, Electromagnetic Waves

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

- Use laws governing the electrostatic field as Coulomb's and Gauss's law and to calculate Coulomb's Force, Electric Field Intensity and Electrostatic Potential of individual or distributed Chagres.
- To aware the type of charge that creates the field studying the electric field lines.
- To be able to calculate the electrical flux through a surface.
- To understand the nature and the origin of magnetic field.
- To realize the interactions of the moving charge with the magnetic field and can to calculate Lorentz's force vector.
- To use the laws governing magnetic field such as Biot-Savart's Law's, Ampere 's Law, Gauss's Law and Faraday's Law and to calculate the magnetic field created by moving electric charges or various current distributions as well as the induced electric or magnetic fields.
- To be familiar to Maxwell's equations and to realize their value.
- To know the basic principles of electromagnetic wave propagation in vacuum and other material.

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.*
- *Team work*
- *Production of new research ideas*
- *Criticism and self-criticism*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

1. Electric Charge and Electric Field
   - 1.1. Electric Charge – Gauss's Law
   - 1.2. Electric Field and Coulombs Force
   - 1.3. Electric Field Lines
   - 1.4. Electric Dipole
2. Gauss's Law
   - 2.1. Electric Flux
   - 2.2. Application of Gauss's Law
3. Electric Potential
   - 3.1. Electric Potential Energy
   - 3.2. Electric Potential – Equipotential Surfaces
   - 3.3. Potential Gradient
4. Magnetic Field, Magnetic Force
   - 4.1. Introduction to Magnetism
   - 4.2. Magnetic Field
   - 4.3. Magnetic Field Lines and Magnetic Flux
   - 4.4. Motion of Charged Particles in Magnetic Field
   - 4.5. Magnetic force acting on a Current-carrying conductor
   - 4.6. Torque and Force on a current loop in a magnetic field
5. Sources of Magnetic Field
   - 5.1. Magnetic Field of moving charged particle- Biot – Savard's Law
   - 5.2. Magnetic Field of Current-carrying conductor
   - 5.3. The Magnetic Force Between Two Parallel Conductors
   - 5.4. Magnetic Field of a current loop

5.5. Ampere's Law
5.6. Displacement Current and the General Form of Ampere's Law
6. Electromagnetic Induction, Faraday's Law
6.1. Faraday's Law
6.2. Motional emf
6.3. Lenz's Law
6.4. Induced Magnetic Fields
7. Magnetism in Matter
7.1. Magnetic Materials, Paramagnetic, Diamagnetic, Feromagnetic
7.2. Magnetization Vector and Magnetic Field Strength
7.3. Maxwell's Equations
7.4. Self-Inductance ,Mutual Inductance
7.5. Energy in a Magnetic Field
8. Electromagnetic Waves
8.1. Electromagnetic Waves
8.2. Electromagnetic Waves velocity
8.3. Sinusoidal Waves
8.4. Energy of Electromagnetic Waves
8.5. Electromagnetic Waves in Maters
8.6. Static Electromagnetic Waves
8.7. The Spectrum of Electromagnetic Waves
8.8. Production of Electromagnetic Waves by an Antenna (Antenna's radiation)

(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 using Power Point presentations. Website of the course in e-class with supporting and auxiliary material which is updated at regular intervals. 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: 26 Self study: 64 Course total (30 hours / ECTS): ***90***
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.*	I. Regular multiple choice questionnaires (20%). II. Final writing examination where students solve different problems concerning electromagnetic theory (80%).

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Electromagnetic Theory, Joseph A. Edminister , ISBN: 960-7610-07-5.
- Young H., Freedman R., vol 2, ISBN: 978-960-02-2473-3.
- Shen, Liang Chi, Kong, Jin Au, "Appling Electromagnetism", 2000.
- Jack,Vanderlinde, "Classical Electromagnetic Theory", Kluwer Academic Publishers Group, 2004.