COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF ELECTRONICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	2603002	**SEMESTER**	3
COURSE TITLE	Electromagnetism and Electromagnetic Wave Propagation		

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 (ECTS)**
Lectures	2	4
Laboratory	0	
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 Course
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	http://electronics.teipir.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*

Upon successful completion of this course module students possess advanced knowledge, skills and competences in the subject of Electromagnetism and Wave Propagation that enable them to:

1. List the different types of EM field sources and explain what kind of Electric, Magnetic or Electromagnetic fields originate from each type of source.
2. Explain the qualitative conclusions arising from the Maxwell equations
3. Compute Electric, Magnetic or Magnetic fields using both the Integral and the Differential form of the Maxwell Equations.
4. Describe the wave equation in media with and without sources / losses.
5. Explain how a plane wave satisfies the wave equation in media with and without field sources / losses.
6. List the basic wave propagation mechanisms such as free space propagation, reflection, transmission, diffraction, scattering.

7. Explain the key characteristics of the above mentioned propagation mechanisms with respect to the field amplitude, the field phase and the direction of wave propagation.
8. Compute the field amplitude, the field phase and the direction of wave propagation taking into account the above mentioned propagation mechanisms.
9. Discuss the potential presence of the different propagation mechanisms in different types of radio links.

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

(3) COURSE CONTENT

Theory

1. Field Sources (electrical charges, magnetic dipoles, DC and AC currents) and Electric, Magnetic and Electromagnetic fields.
2. Integral Maxwell Equations: Gauss Law Electric and Magnetic Fields.
3. Integral Maxwell Equations: Faraday and Ampere - Maxwell Laws.
4. Computing Electric, Magnetic and Electromagnetic fields using the Integral Maxwell equations' formalism.
5. Differential Maxwell equations and Boundary Conditions.
6. Computing Electric, Magnetic and Electromagnetic using the differential Maxwell equations' formalism.
7. Wave Equation in lossless / lossy media with or without sources. The plain wave as a solution of the wave equation.
8. Overview Presentation of the basic EM wave propagation mechanisms
9. Free Space Propagation
10. Reflection and Transmission from a plane interface
11. Diffraction and Fresnel zones.
12. Scattering from small obstacles and rough surfaces
13. Radio link types and Propagation Mechanisms

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face lectures
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Use of electronic presentation with multimedia content in class, • Student support through the course webpage and the

<table>
<tr><td></td><td>departmental e-learning platform,
• Electronic communication of instructors and students, through the course webpage and by e-mail.</td></tr>
<tr><td>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</td><td>Lectures, assignments, study.

<table><tr><th>Activity</th><th>Semester workload (hours)</th></tr><tr><td>Lectures</td><td>26</td></tr><tr><td>Study for lectures</td><td>26</td></tr><tr><td>Homework Assignments</td><td>26</td></tr><tr><td>Study and preparation for exam</td><td>42</td></tr><tr><td>Course Total</td><td>120</td></tr></table></td></tr>
<tr><td>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.</td><td>Student evaluation is performed in the language of instruction.

Final written exam on all taught material (80%)
Homework Assignments turned in during the semester (20%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. S. P. Savaidis, A. Skountzos, Electromagnetism and Electromagnetic Wave transmission, Synchroni Ekdotiki Eds., Athens, Greece, 2010 (in greek).
2. S. Paktitis, A. Nasiopoulis, Introduction to Electromagnetic Wave Propagation, ION Eds., Athens, Greece, 2008 (in greek).
3. I. RFoumeliotis, I. Tsalamegkas, Electromagnetic Fields (Parts A & B), Tziolas Eds., Thessaloniki, Greece, 2010 (in greek).