COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF MATHEMATICS		
LEVEL OF STUDIES	UNDERGRADUATE PROGRAM		
COURSE CODE		**SEMESTER**	**H**
COURSE TITLE	PHYSICS II		
INSTRUCTOR			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
		4	6
COURSE TYPE	Special background		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs		

(2) LEARNING OUTCOMES

Learning outcomes

The purpose of the course is to bridge the gap between the basic concepts and principles of Electromagnetism with different branches of Mathematics. Students are expected, by developing a general problem-solving strategy, to learn how to approach and solve complicated problems in real life.

After completing this course, students should demonstrate competency in the following skills:

- Define the fundamental and derived quantities of Electromagnetism.
- State and understand the principles of Electromagnetism.
- Discover the limitations of physical laws in applications.
- Apply the physical laws to solve idealized problems and problems in real life as well.
- Analyze and interpret specific physical phenomena.
- Model and make predictions about the evolution of a physical phenomenon by solving an ordinary differential equation.
- Evaluate the limitations of the applied mathematical method.
- Propose alternative approaches and decide which method is more effective.
- Devise simple experiments to measure physical quantities.

General Competences

Production of free, creative and inductive thinking. Working independently. Team working. Working in an interdisciplinary environment. Production of new research ideas.

(3) SYLLABUS

- Electric charge. Coulomb's law. Discrete and continuous charge distributions. The electric field intensity. Flux lines. Quantization of electric charge. Motion of a point electric charge into a uniform electric field.

- Electric flux. Gauss's law in integral and differential form. Applications to standard charge configurations. Conductors in electrostatic equilibrium.
- Potential energy and electric potential for discrete and continuous charge distributions. The electric potential of a charged conductor.
- Current density, continuity equation and Ohm's law. A model of electric conductivity. Superconductors.
- Laplace and Poisson equations. Boundary conditions and the first uniqueness theorem. The methods of images and separation of variables.
- Conductors, insulators semiconductors. Charge induction, conductors in electrostatic field, the second uniqueness theorem. Applications to charged conductors.
- Magnetic field, magnetic force, motion of electric charge into a magnetic field. Ampère's law.
- Biot-Savard law, forces between parallel conductors, magnetic flux. Ferromagnetism, paramagnetism and diamagnetism.
- Electrodynamics and special theory of relativity. Transformation of electromagnetic field, electromagnetic tensor, invariance of electric charge.
- Electromagnetism and the principle of relativity, the electromagnetic field of a moving charge, interaction among moving charges.
- Faraday's law, Lenz's rule, displacement current, charge conservation and the Ampère-Maxwell law.
- Maxwell's equations in differential and integral form, scalar and vector potentials, magnetic monopoles.
- The wave nature of light, electromagnetic theory of light, the electromagnetic spectrum, speed of light, Doppler's phenomenon.

TEACHING MATERIAL DISTRIBUTION	The teaching material of the course is uniformly distributed during the semester.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Communication with students via e-mail • Uploading course material on moodle system.
TEACHING METHODS	see table below
STUDENT PERFORMANCE EVALUATION	• Students evaluation is based on written exams. There are two schemes of evaluation: 1st method: final exam paper 2nd method: two interim-exam papers, one during the semester and the other at the end of the semester. • Students with learning disabilities or suffering from serious health problems can alternatively be evaluated through oral exams. • The language of evaluation is Greek. • The exam papers consist of short-answer questions and problem solving.

TEACHING METHODS:

Activity	***Semester workload***
Lectures	52
Independent study	98
Course total (25 per ECTS)	***150***

(5) ATTACHED BIBLIOGRAPHY

1. Halliday, D., Resnick, R., Walker, J., (2014). “Physics” Vol. 2, 8th Edition, Publisher: John Wiley & Sons.
2. Serway, R., Jewett, J, (2013). “Physics for Scientists and Engineers with Modern physics”, 8th

Edition, Publisher: Brooks/Cole.

3. Young, H., Freedman, R. (1994). “University Physics”, 13th Edition, Publisher: Pearson.
4. Alonso, M., Finn, E., (1981). “Fundamental University Physics, Vol. 2, Mechanics and Thermodynamics”, Publisher: Addison-Wesley.
5. Griffiths, D., (1998). “Electrodynamics”, Vol. 1, Publisher: Prentice-Hall.

- Related academic journals:

1. http://aapt.scitation.org/journal/ajp.