F008	Elective 2nd Year	**General Physics II**	L	S	P	ECTS
			4	1	2	7

Course objective. Adopt the basic knowledge and concepts in the field of electricity and magnetism. Prepare for courses that follow and which require knowledge of natural laws in specified fields.

Prerequisites. Obtained competences in physics and mathematics at the previous levels of education; enrolled the university undergraduate study.

Course content.

1. Electricity. Coulomb's law. Electric field. Work in the electric field. Electric potential. Electric influence; induction. Gauss theorem. The distribution of charge on the conductor.
2. Capacitors and capacitance. Dielectric polarization. Electrostatic field energy.
3. Sources of electricity, electricity engines. Electromotive force. Electric current. Joule's law. Ohm's Law. Electric resistance. Connecting the resistors. Potentiometer. Kirchoff's rules. Shunting conductors. Electric current in electrolytes. Current in vacuum and gases. Current in semiconductors.
4. Magnetism. The magnetic field of electric current. The Biot-Savart law. Ampere's law. Magnetic force acting on a current-carrying conductor. Electrodynamics force. Lorentz force. The magnetic force between two parallel conductors; definition of ampere. Work due electrodynamics force. Magnetic flux. The current loop in a magnetic field. Galvanometer, ammeter, voltmeter.
5. Electromagnetic induction; induced currents. Faraday's law of electromagnetic induction. Lenz's rule. Induced electromotive force; alternating current generator, dynamo generator. Mutual inductance. Self-inductance.
6. Electric current in the RL, RC and LC circuits. Energy stored in a magnetic field. Energy on the capacitor; discharge of the capacitors in the LC circuit and the LRC circuits. Alternating electric current; resistor, Ohm's law, power.
7. Transformer. Inductor. Three-phase alternating current. Electric motors.
8. Magnetic properties of matter: permeability, diamagnetism, paramagnetism, ferromagnetism. Potential energy in a magnetic field. Magnetization. Hysteresis. Electromagnets. Electrodynamics microphone. Magnetic tape.
9. Maxwell's equations. Electromagnetic waves and their spectrum.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define and describe the basic concepts and laws of electricity and magnetism.
2.	Apply the fundamental laws of electrostatics (Coulomb's law, Gauss's law) to solving physical problems.
3.	Apply Ohm's law and Kirchoff's laws to the calculation of the elements of direct and alternating current circuits.
4.	Define and characterize the basic concepts and laws of conductivity of gases, liquids and metals.

5.	Describe the electrical and magnetic properties of materials and their application.
6.	Determine the distribution of electric and magnetic fields in space with a given distribution of charges and currents.
7.	Explain the cause-and-effect relationship of electric current and magnetic field.
8.	Describe Maxwell's equations.
9.	Derive and interpret the equation of the electromagnetic wave.
10.	Compare the laws of electrostatics and magnetostatics through Maxwell's equations.
11.	Interpret a graphical representation of the physical quantities and their mutual dependence.
12.	Describe and interpret demonstration experiments in the above areas.
13.	Evaluate the results obtained by solving tasks.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Class attendance	0.5	1-13	Class attendance	Evidence list (handwritten signature of the student)	5	10
Colloqium (midterm exams)	2	1-13	Expressions of definitions and physical laws. Performs mathematical expressions for certain physical quantities. Describing demonstration experiments performed in class. Solving numerical problems.	Written midterms (3 exams per semester).	15	30
Seminars	1	1-13	The research on a given topic and writing text seminars. Drawing up a presentation and	Rating of the written seminar (up to 5 points), and oral presentation score (up to 5	5	10

			an oral presentation of the seminar.	points).		
Homework	0.5	1-13	Solving numerical problems.	Checking and discussions on the following exercises or consultation.	5	10
Final exam	3	1-13	Numerical exercises as written and oral assessment test understanding of physical laws.	Written and oral examination.	20	40
TOTAL	7				50	100

Teaching methods and knowledge assessment.
Lectures (60 hours) with the use of Power Point presentations, interactive simulation, the performance of demonstration experiments, addressing selected sample assignments, individual and group work, discussions and tests to check knowledge. Numerical exercises instructed by an assistant (30 hours) with the lead of the assistant. Within the auditory exercises students receive additional tasks for the exercise, which are solved alone for the homework. Checking solutions and discussion on the tutorials. Student presentations and discussions of specific topics at the seminar (15 hours). Students have the opportunity to take the numerical problems and theories through three exams (colloquium) per semester. If for each area in each colloquium achieve more than 60% of the points are exempt from the written and oral examination.
Other students take a written and oral exam.

Can the course be taught in English: Yes

Basic literature:

1. Cindro, N., Fizika 2, Školska knjiga, Zagreb, 1988.
2. Kulišić, P., Lopac, V., Elektromagnetske pojave i struktura tvari, Školska knjiga, Zagreb, 1991.
3. http://www.fizika.unios.hr/of2/

Recommended literature:

1. Paić, M., Osnove fizike, III dio, Liber, Zagreb, 1989.
2. Purcell, M., Berkeleyski tečaj fizike, II dio (Elektricitet i magnetizam), Tehnička knjiga, Zagreb 1988.
3. Halliday, D., Resnick, R., Walker, J., Fundamentals of physics, John Wiley & Sons, Hoboken, 2003.
4. Young, H., Freedman, R., University Physics, Addison-Wesley Publ., New York, 1996.
5. E. Babić, R. Krsnik i M. Očko, Zbirka riješenih zadataka iz fizike, Školska knjiga, Zagreb 2004.
6. V. Lopac, P. Kulišić, V. Volovšek i V. Danani, Riješeni zadaci iz elektromagnetskih pojava i strukture tvari, Školska knjiga, Zagreb, 1992.