

## COURSE DESCRIPTION

### 1. Program identification information

1.1 Higher education institution	Politehnica University of Bucharest
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Electrical Engineering Department
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of studies	Bachelor
1.6 Program of studies/Qualification	Technologies and Systems of Telecommunications – TST (English)

### 2. Course identification information

2.1 Name of the course				<b>Electrical Engineering 2 (Basic Electrotechnics 2)</b>			
2.2 Lecturer				Assoc. Prof. PhD. Eng. Oana Drosu,			
2.3 Instructor for practical activities				Lecturer PhD. Eng. Marilena Stanculescu			
2.4 Year of studies	1	2.5 Semester	II	2.6 Evaluation type	Exam	2.7 Course choice type	compulsory

### 3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	3	3.3 practical activities	1
3.4 Total hours in the curricula, out of which	56	3.5 course	42	3.6 practical activities	14
Distribution of time					hours
Study according to the manual, course support, bibliography and hand notes					46
Supplemental documentation (library, electronic access resources, in the field, etc)					5
Preparation for practical activities, homeworks, essays, portfolios, etc.					20
Tutoring					0
Examinations					3
Other activities					0
3.7 Total hours of individual study		74			
3.9 Total hours per semester		130			
3.10 Number of ECTS credit points		5			

### 4. Prerequisites (if applicable)

4.1 curricular	Algebra, Mathematical analysis, Physics, Circuit theory
4.2 competence-based	It is not the case

### 5. Requisites (if applicable)

5.1 for running the course	It is not the case
5.2 for running of the applications	It is not the case

### 6. Specific competences

Professional competences	<p><b>C1.5</b> Theoretical grounding of the characteristics of the designed systems</p> <p><b>C2.1</b> Identifying and describing the structural elements of hardware and communications systems.</p> <p><b>C2.2</b> Explaining the specific steps of the development of hardware and communications systems.</p> <p><b>C5.1</b> Appropriate use of the principles of operation of electronic devices and circuits, as well as methods for measuring electrical quantities</p> <p><b>C5.2</b> Interpretation, design, execution and measurement of the electronic circuit of low / medium complexity.</p>
Transversal Competences	Honorable, responsible, ethical behavior within the law in order to ensure the reputation of the profession

### 7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	<p>-For the course: Basic knowledge of electromagnetic field theory through the applications of high interest in electronics, telecommunications and information technology is presented. Students develop skills in understanding the assumptions of the theory of electrical circuits field and electric and magnetic field phenomena.</p> <p>- For applications: Learning and research the methods to solve simple applications of electromagnetic field.</p>
4.2 Specific objectives	Students' skills are developed in order to apply basic knowledge of electromagnetic field theory to understanding, modeling and analysing the field problems, as well as understanding the limits of the used models

### 8. Content

8.1 Lectures	Teaching techniques	Remarks
The laws of electromagnetism. Theorems. Behavior of the field quantities in the vicinity of the surfaces.	Teaching is based on oral presentation.	15 hours
Electrostatics. Theorems of electrostatics. Relationships between charges and potentials (Maxwell). The capacitor. Capacitors networks. The energy and co-energy of the electric field.	Expositive and questioning methods are used. Course materials are lecture notes and presentations, as well as exercise books.	6 hours
Electrokinetics. Theorems of Electrokinetics . Analogy with Electrostatic. The resistor.		3 hours
Stationary magnetic field. Theorems of the stationary		6 hours

magnetic field. The flux of a wire. Ideal coil. Relations between fluxes and currents (Maxwell). The inductances of fascicles of coils. Energy and co-energy of magnetic field produced by a system of wires. Generalized forces within the magnetic field. Vector magnetic potential. Biot-Savart-Laplace formula.		
Magnetic circuits. The branch of the magnetic circuit. The reluctance. Kirchhoff's Laws for magnetic circuits. Solving methods for magnetic circuits. Permanent magnets. The magnetic field produced by permanent magnets. Maximum energy of the magnetic field produced by permanent magnets. Magnetic circuits with permanent magnets		6 hours
Quasistationary sinusoidal magnetic field. Penetration of the electromagnetic field in the conductive space. Eddy current losses.		3 hours
The variable state of the electromagnetic field. The electromagnetic field energy. Electromagnetic power transfer through a closed surface. Volume energy density of the electromagnetic field. Warburg's theorem. (Losses by hysteresis.)		3 hours
8.2 Practical applications	Teaching techniques	Remarks
Problems of electrostatics (Coulomb's integrals, Gauss Method)	Oral communication	4 hours
Problems of capacitors		2 hours
Applications of Faraday's law of induction		2 hours
Applications of Ampere Theorem		2 hours
Problems of stationary magnetic field (magnetic circuits, Biot-Savart-Laplace formula)		4 hours
<p>Bibliography</p> <p><b>O. Drosu</b>, "Electrical Engineering 2-Electromagnetics":  <a href="http://elth.pub.ro/~oanad/cursuri%20online/ElectromagneticsBE2/">http://elth.pub.ro/~oanad/cursuri%20online/ElectromagneticsBE2/</a>  F.M.G. Tomescu – Fundamentals of electrical engineering. Electromagnetic field, electromagnetic systems, Editura Matrix Rom București, 2011.  3. Hantila F. s.a. Electrotehnica teoretica, Editura Electra, 2002,<a href="http://ferrari.lce.pub.ro/studenti/">http://ferrari.lce.pub.ro/studenti/</a>  4. Hantila F., Vasiliu M., Campul electromagnetic variabil in timp, Editura Electra, 2005, <a href="http://ferrari.lce.pub.ro/studenti/">http://ferrari.lce.pub.ro/studenti/</a>.  A.Cazacu, E Cazacu, A. Amuzescu, Bazele Eletrotehnicii 1-Electromagnetism-Seminar, Editura Printech Bucuresti, 2000</p>		

