SYLLABUS

Discipline name	Fundamentals of Electrotehnics
Profile	Electronics and Telecommunications Engineering
Specialization	Telecommunications Technologies and Systems
Code	51321809
Course leader	Professor Vasile TOPA, Ph.D – vtopa@et.utcluj.ro
Collaborators	Assistant Claudia PACURAR – Claudia.Racasan@et.utcluj.ro
Department	Electrotechnics
Faculty	Electrical Engineering

Sem.	Type of discipline	Course	Applications			Course	Applications			Ind. study	TOTAL	Credits	Form of assessment
		[hours/week]				[hours/sem.]							
			S	L	P		S	L	P				
3	**Engineering**	**2**	**2**	**-**	**-**	**28**	**-**	**28**	**-**	**64**	**120**	**4**	**Exam**

Acquired competences :

Acquired skills (what the student is able to do):

After completing the discipline, the students will be able to:

- ♦ understand electrostatic, magnetostatic, and electromagnetic fields and their interaction with matter;
- ♦ compute the electromagnetic local (E, D, B, H) and global (R, L, C) quantities;
- ♦ identify, formulate and solve practical engineering problems.

Acquired abilities: (what type of equipment/instruments/software the student is able to handle)

After completing the discipline, the students will be able to:

- ♦ use the lab instrumentation for experimental study of electromagnetic phenomena;
- ♦ electromagnetic field computation using analytical and numerical approaches.

Prerequisites (if necessary)

Knowledge about: mathematical analysis, derivatives, integrals, Laplace/Poisson equations, vector analysis, physics.

	A. Course/Lecture (course/lecture titles)
1	Electrostatics. Electric field in vacuum. Electric charges. Coulomb's Law and definition of the electric force and electric field intensity.
2	The electric field for discrete and continuous distributions. Gauss Law. Applications.
3	Electric potential. Potential due to discrete and continuous distribution of charges. Laplace and Poisson equations in electrostatics field.
4	Electric field in conductors. Dielectric materials and polarization. Electric field in dielectric materials.
5	Laws of electrostatics. Boundary conditions in electrostatics. Capacitance. Electrostatic field energy and forces.
6	Electrokinetic fields. Electric current definition. Convection electrical current. Ohm's law. Charges conservation law.
7	Resistance. Analogy between the electrostatic field and electrokinetic field. Power density and Joule's law.
8	Magnetostatics fields. Magnetic forces. Biot-Savart-Laplace's formula. Ampere's law.
9	Magnetic flux. Laws of magnetostatics. Boundary conditions in magnetostatics.
10	Vector magnetic potential. Laplace and Poisson equations in magnetic field.
11	Flux linkage. Self and mutual inductances. Magnetostatic field energy and forces.
12	Electromagnetic field. Faraday's law. Applications.
13	Maxwell's equations. Electromagnetic waves.
14	Transmission lines (TL). Distributed parameters. The first and second order equations of the TL. Steady-state TL equations. Derivation of power equations. Equivalent TL. Heaviside conditions.

	B1. Applications – Seminar (contents)
1	Elements of vector analysis. Electrostatic field computation using the direct method.
2	Electrostatic field computation by Gauss's law.
3	Electric potential computation. Laplace & Poisson equations.
4	Electric field computation in dielectric materials. Boundary conditions.
5	Electric energy and force computation.
6	Electrokinetic field computation. Applications of Ohm's law.
7	Earths/grounding's system computation.
8	Magnetic field computation using Biot-Savart-Laplace method and Ampere's law.

9	Magnetic field computation. Boundary conditions. Magnetic energy and force computation.
10	Vector magnetic potential computation. Laplace and Poisson equations in magnetic field.
11	Inductance and magnetic circuits computation.
12	EMF computation.
13	Solution of electromagnetic waves for partially conducting media.
14	Evaluation of the distributed parameters. Steady-state TL equations.

C. Individual study (reference study contents, synthesis materials, projects, applications etc.)						
Individual study structure	Course study	Problem solving, seminars	Applications preparation	Examination time	Additional reference study	Total no. of individual study hours
Hours	28	6	18	3	9	64

References (Textbooks, courses, laboratory manual, exercise book)

1. N.O Sadiku, *Elements of Electromagnetics*, Oxford University Press 3rd, 2000.
2. J.A.Edminister, *Schaum's Interactive Electromagnetics*, McGraw Hill, Inc. 2005.

On – line references

1. Topa Vasile, Electromagnetism, Lecture Notes, PowerPoint slides, http://www.et.utcluj.ro/curs2009.htm
2. Pacurar Claudia, Seminars/exercises in pdf. http://www.et.utcluj.ro/seminar2009.htm

Final evaluation	
Evaluation method	Written exam (E): problem solving (70%) and theoretical subjects (30%).
Mark components	Exam (E: 0…10 points); Seminary(S: 0…10 points); Homework (H: 0…10 points);
Mark computation	M = 0.6E + 0.2S + 0.2H. Pass if: E≥4 and L≥4 and M≥4.5

Course leader,

Professor Vasile TOPA, Ph.D.