SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System Cluj-Napoca in English language
1.7	Form of education	Full time
1.8	Subject code	

2. Data about the subject

2.1	Subject name			Electromagnetic Field Theory II		
2.2	Course responsible/ lecturer			Prof.dr.ing. Calin Munteanu – Calin.Munteanu@ethm.utcluj.ro		
2.3	Teachers in charge of Seminars/ Laboratory/ Project					
2.4 Year of study	II	2.5 Semester	2	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	C	
2.7 Subject category	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DD	
	DI – compulsory, DO – elective, Dfac – optional				DI	

3. Estimated total time

3.1 Number of hours per week:	2	of which:	3.2 Course	2	3.3 Seminar		3.3 Laboratory		3.3 Project	
3.2 Total hours per semester	28	of which:	3.5 Course	28	3.6 Seminar		3.6 Laboratory		3.6 Project	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	10
(b) Supplementary study in the library, online and in the field	4
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	
(d) Tutoring	2
(e) Exams and tests	6
(f) Other activities	

3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	22
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	50
3.10 Number of credit points	2

4. Prerequisites (where applicable)

4.1	Curriculum	Special Mathematics, Basics of Electrotechnics, Theory of Electrical Circuits, Electromagnetic Field Theory I
4.2	Competences	

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

6. Specific competences

Professional competences	• Ability to identify, formulate, and solve engineering problems in a systems approach • Ability to approach and solve high-frequency electromagnetic field problems through methods and procedures specific to electrical engineering • Ability to know the particularities of electromagnetic waves and the main applications in electrical engineering • Ability to know and use the properties of high-frequency transmission lines in applications
Cross competences	• Flexibility in approaching and using in practice the latest existing technologies in the assumed areas of competence • ability to work in a team • flexibility to use the knowledge acquired in previous subjects • the flexibility to apply the knowledge acquired to the specialized subjects of the following years

7. Discipline objectives (based on specific competencies acquired)

7.1	General objective	Acquisition of fundamental theoretical and applied knowledge regarding the high frequency electromagnetic field
7.2	Specific objectives	• Ability to address specific electromagnetic wave problems • Ability to address specific problems of high-frequency transmission lines • Ability to address specific high-frequency electromagnetic field problems

8. Contents

8.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	General introduction. The laws of the electromagnetic field in differential form.	2	The course is taught using multimedia facilities, providing students with the necessary details to understand the aspects presented. Complementary, in certain parts of the course, the blackboard is used	
2	Scalar electric potential and vector magnetic potential. Governing equations. Properties, consequences and applications (1)	2		
3	Scalar electric potential and vector magnetic potential. Governing equations. Properties, consequences and applications (2)	2		
4	Electromagnetic energy theorem. The Poynting vector. Application. Electromagnetic wave in the dielectric medium. Consequences and applications	2		
5	Electromagnetic energy theorem. The Poynting vector. Application. Electromagnetic wave in the dielectric medium. Consequences and applications	2		
6	Electromagnetic wave in the conductive medium. Loss of power and depth of penetration into the conductor.	2		
7	Reflection and refraction of waves. Electromagnetic shielding. Examples and applications.	2		
8	The film effect. Examples and applications.	2		
9	Transmission lines. Telegraphers' equations. Permanent regime solutions. Direct wave and reverse wave on the line. Heaviside Lines. Equations in the form of a quadripole (1)	2		
10	Transmission lines. Telegraphers' equations. Permanent regime solutions. Direct wave and reverse	2		

	wave on the line. Heaviside Lines. Equations in the form of a quadripole (2)			
11	Stationary waves. Lines in transitional regime.	2		
12	Examples and applications of signal propagation on transmission lines (1).	2		
	Examples and applications of signal propagation on transmission lines (2).	2		
	Colloquium exam	2		

Bibliography

[1] E. Simion, T. Maghiar, *Electrotehnica*, EDP Bucharest, 1981
[2] C. Mocanu, *The Theory of the Electromagnetic Field*, EDP Bucharest, 1981
[3] M.N.O.Sadiku – *Elements of Electromagnetics* – Saunders College Publishing, 1989
[4] S. J. Orfanidis, *Electromagnetic Waves and Antennas*, https://www.ece.rutgers.edu/~orfanidi/ewa, 2016
[5] G.M. Kunkel, *Shielding of Electromagnetic Waves*, Springer Nature Switzerland AG, 2020
[6] H. Hayt, J.A. Buck, *Engineering Electromegnetics*, McGraw Hill, 2012
[7] F.T. Ulaby, U. Ravaioli, *Fundamentals of Applied Electromagnetics*, Pearson Education, 2015

9. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The discipline presents fundamental methods for solving electromagnetic field problems in different operating regimes in the high frequency range. Thus, its purpose is to constitute itself as part of the necessary basis for the further development of specialized disciplines

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade (%)
10.4 Course	Verification of theoretical knowledge	Grid test	100 %
10.5 Laboratory			
10.5 Project			
10.6 Minimum standard of performance: C ≥ 5; N = C ≥ 5			

Date of completion	Lecturers	Title/ Surname/ Name:	Signature
10.09.2024	Course	Prof.dr.ing. Calin MUNTEANU	
	Applications Seminar/ Laboratory/ Project		

Date of approval in the ETHM Department Council

September 2024

Head of Department:
Prof. Eng. MICU Dan Doru, PhD

Date of approval in the Faculty of Electrical Engineering Council

September 2024

Dean:
Assoc. Prof. Eng. CZIKER Andrei, PhD