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	48

2. Data about the subject

2.1	Subject name				Electromagnetic compatibility	
2.2	Course responsible/ lecturer				Assoc. prof. eng. Denisa Șteț	
2.3	Teachers in charge of Seminars/ Laboratory/ Project				Assoc. prof. eng. Denisa Șteț	
2.4 Year of study		4	2.5 Semester	7	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	E
2.7 Subject category		*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DS
		DI – compulsory, DO – elective, Dfac – optional				DI

3. Estimated total time

3.1 Number of hours per week:	4	of which	3.2 Course	2	3.3 Seminar		3.3 Laboratory	2	3.3 Project	
3.2 Total hours per semester	56	of which	3.5 Course	28	3.6 Seminar		3.6 Laboratory	28	3.6 Project	

3.7 Individual study:	
(a) Manual, lecture material and notes, bibliography	25
(b) Supplementary study in the library, online and in the field	15
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	15
(d) Tutoring	6
(e) Exams and tests	6
(f) Other activities	2
3.8 Total hours of individual study *[sum (3.7(a) to 3.7(f))]*	69
3.9 Total hours per semester *[sum of 3.4 and 3.8]*	125
3.10 Number of credit points	5

4. Prerequisites (where applicable)

4.1	Curriculum	Theory of Electrical Circuits, Electromagnetic Field Theory, Electronics, Electrical and Electronic Measurements
4.2	Competences	Knowledge and use of notions specific to electrical engineering

5. Requirements (where appropriate)

5.1	For the course	The existence of multimedia technologies
5.2	For the applications	Existence of multimedia technologies and specialized software Existence of measuring devices

6. Specific competences

Professional competences	C4. Analysis, modeling and simulation of electrical systems After completing the course, students will be able to: − determine the sources of electromagnetic perturbations (EMP) in electromagnetic devices − to design devices for the mitigation of electromagnetic interference − to use specific methods for calculating the level of electromagnetic perturbations − to use numerical analysis and modeling software tools specific to the EMC field − to choose the optimal solution for the protection of equipment and devices against the effects of electromagnetic interferences C6. Design of automatic control systems After completing the course, students will be able to: − Use the equipment specific to an Electromagnetic Compatibility Laboratory − Perform EMC measurements and tests Use tools and techniques to mitigate the effects of electromagnetic interferences
Cross competences	1. Assimilation of theoretical knowledge regarding the mechanisms of occurrence and respectively the methods of analysis and prediction of electromagnetic interferences as well as the main methods of suppression of electromagnetic perturbations 2. Obtaining skills for determining the sources generating PEM and designing devices for suppressing electromagnetic interference 3. Acquisition of skills in the use of devices used in EMC measurements and tests

7. Discipline objectives (based on specific competencies acquired)

7.1	General objective	Development of competences in the field of Electromagnetic Compatibility in support of professional training
7.2	Specific objectives	

8. Contents

8.1. Course (Lectures)		Number of hours	Teaching methods	Additional remarks
1	Introduction to EMC	2	Lecture ONSITE Problematization, debate	The course will be taught using multimedia means and presentation in .ppt format.
2	Concepts of EMC (The concept of EMI/EMI electromagnetic interference in the sense of EMC. Electromagnetic perturbations.Common mode and differential mode disturbances, etc.)	2		
3	Sources of electromagnetic perturbation (1/2)	2		
4	Sources of electromagnetic perturbation (1/2)	2		
5	Coupling mechanisms and mitigation measures (1/2): Conductive coupling (galvanic). Capacitive coupling (electrical)	2		
6	Coupling mechanisms and mitigation measures (2/2): Inductive (magnetic) coupling. Electromagnetic Radiation Coupling	2		
7	Mitigation methods and measures for conduction couplings	2		
8	Transmission lines (1/2)	2		
9	Transmission lines (2/2)	2		
10	Electromagnetic shielding	2		
11	EMC Measurement Techniques (1/2)	2		
12	EMC Measurement Techniques (2/2)	2		
13	Exposure to electromagnetic field	2		

14	Aspects of EMC in Electrical Engineering	2		

Bibliography

1. A.J. Schwab și W.W. Kürner, “Compatibilitate electromagnetică”, Ed. Agir, București, 2013.
2. J.M. Jin, “Theory and computation of electromagnetic fields”, Ed. Wiley, IEEE Press, 2010;
3. H.W. Ott, Electromagnetic Compatibility Engineering, Ed. A. John Wiley $ Sons Inc., Hoboken, New Jersey, 2009;
4. P. Rosca, “Masuratori si teste in compatibilitate electromagnetica”, Sibiu, 2000;
5. G. Hortopan: Principii şi tehnici de Compatibilitate Electromagnetică. Ed. Tehnică, Bucureşti, 1998.
6. P. Degauque, J. Hamelein: Electromagnetic Compatibility, Ed. Oxford University Press, Oxford, UK, 1993.
7. E. Simion: Compatibilitate Electromagnetică, Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca, România, 1998.
8. Băran, I., Surse de perturbaţii electromagnetice, Ed. Tehnică, Bucureşti, 2001.
9. M Chindris M., Cziker A., Sudria i Andreu A., Ștefănescu S., Reducerea poluării armonice a rețelelor electrice industriale, Ed. Mediamira, Cluj-Napoca, 2003.
10. Ignea A., Compatibilitate Electromagnetica, Editura de Vest, Timișoara, 2007.
11. Sotir, A., Moşoiu T., Compatibilitate electromagnetică, Ed. Militară, Bucureşti, 1997.
12. Stet Denisa, Contribuţii la metode de modelare şi predicţie a interferenţelor electromagnetice în curent alternative – teza de doctorat, 2010.
13. Şurianu, F.D., Compatibilitate electromagnetică. Aplicaţii în ingineria sistemelor electroenergetice, Ed. Orizonturi Universitare, Timişoara, 2005.

8.2. Applications - Seminar /Laboratory/Project		Number of hours	Teaching methods	Additional remarks
1	Simulation of overvoltages on data transmission lines	4	Practical application (4 hours to 2 weeks)	The laboratory works are based on the interactive teacher-student partnership.
2	Attenuation of harmonics using passive filters	4		
3	Shielding Efficiency Analysis	4		
4	Study of electromagnetic interference between overhead power lines and nearby metallic pipes	4		
5	Designing an IPTE	4		
6	Probleme de interferenta elecromagnética in GIS	4		
7	Electromagnetic coupling problems	4		

Bibliography

1. A.J. Schwab și W.W. Kürner, “Compatibilitate electromagnetică”, Ed. Agir, București, 2013.
2. J.M. Jin, “Theory and computation of electromagnetic fields”, Ed. Wiley, IEEE Press, 2010;
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6. P. Degauque, J. Hamelein: Electromagnetic Compatibility, Ed. Oxford University Press, Oxford, UK, 1993.
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9. M Chindris M., Cziker A., Sudria i Andreu A., Ștefănescu S., Reducerea poluării armonice a rețelelor electrice industriale, Ed. Mediamira, Cluj-Napoca, 2003.
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9. Alignment of course content with expectations of the epistemic community, professional associations, and representative employers in the field

The skills acquired will be necessary for employees who work in the field of electrical engineering in the analysis, modeling, simulation and design of electrical systems.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade (%)
10.4 Course	Knowledge of the specific CEM notions taught during the courses	Combined theory test: multiple-choice and free-response grid type	70%
10.5 Laboratory	Knowledge of the specific EMC notions taught in the laboratories	Laboratory test	30%
10.5 Project			
10.6 Minimum standard of performance: minimum grade 5 in both evaluations			

Date of completion	**Lecturers**	**Title/ Surname/ Name:**	**Signature**
30.08.2024	Course	Assoc. prof. eng. Denisa Șteț	
	Applications Seminar/ Laboratory/ Project	Assoc. prof. eng. Denisa Șteț	

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