

FISA DISCIPLINEI**1. Date despre program**

1.1	Institutiile de invatamint superior	Universitatea Tehnica din Cluj-Napoca
1.2	Facultatea	Inginerie Electrica
1.3	Departamentul	Electrotehnica si Masurari
1.4	Domeniul de studii	Inginerie Electrica
1.5	Ciclu de studii	Licenta
1.6	Programul de studii/Calificarea	ETH, I&AD, IMed-Cluj
1.7	Forma de invatamint	IF-invatomint cu frecventa
1.8	Codul disciplinei	57.20

2. Date despre disciplina

2.1	Denumirea disciplinei	Tehnologii în câmp electric și magnetic intens									
2.2	Limba de predare	Romana									
2.3	Responsabil de curs	Prof.dr.fiz.ing. Adrian SAMUILA									
2.4	Responsabil de laborator/seminar	Prof.dr.fiz.ing. Adrian SAMUILA									
2.5	Anul de studii	IV	2.6	Semestrul	2	2.7	Evaluarea	C	2.8	Regimul disciplinei	DS DO

3. Timpul total estimate

An/ Sem	Denumirea disciplinei	Nr. sapt.	Curs				Aplicații				Stud. Ind.	TOTAL	Credit
			[ore/săpt.]				[ore/sem.]						
			C	S	L	P	C	S	L	P			
IV/II	Tehnologii în câmp electric și magnetic intens	14	2		2		28		28		74	130	5
3.1	Numar de ore pe saptamina	4	3.2 din care curs				2	3.3 Aplicatii				2	
3.4	Total ore din planul de inv.	125	3.5 din care curs				28	3.6 Aplicatii				28	
Studiul individual												Ore	
Studiul dupa manual, suport de curs, bibliografie si notite												35	
Documentarea suplimentara in biblioteca, pe platformele electronice si pe teren												12	
Pregatire seminarii/laboratore, teme, referate, portofolii, eseuri												20	
Tutoriat													
Examinari												2	
Alte activitati													
3.7	Total ore studiul individual			69									
3.8	Total ore pe semestru			125									
3.9	Numar de credite			5									

4. Preconditii (acolo unde este cazul)

4.1	Obligatorii	Fizica, Teoria campului electromagnetic, Echipamente electrice
4.2	Recomandate	Fizica, Teoria campului electromagnetic, Echipamente electrice

5. Conditii (acolo unde este cazul)

5.1	De desfasurare a cursului	Cluj-Napoca
5.2	De desfasurare a aplicatiilor	Cluj-Napoca

6 Competente specifice acumulate

Competențe profesionale	<p>C3. Operarea cu concepte fundamentale din electrotehnica:</p> <p>C3.1 Descrierea teoriei si a metodelor de analiza a câmpului electromagnetic si a metodelor de analiza a circuitelor electrice.</p> <p>C3.2 Explicarea principiilor de functionare a echipamentelor electrice</p> <p>C3.4 Aprecierea calitatii si performantelor functionale ale sistemelor electrice prin metode specifice.</p> <p>C4. Analiza, modelarea si simularea sistemelor electrice:</p> <p>C4.1 Descrierea metodelor si algoritmilor de analiza, modelare si simulare a sistemelor electrice.</p> <p>C4.2 Explicarea tehnicilor specifice analizei, modelarii si simularii sistemelor electrice</p> <p>C4.3 Modelarea, simularea si proiectarea asistata de calculator a elementelor componente ale unui sistem electric utilizand programe software specializate.</p> <p>C4.4 Evaluarea si testarea performantelor unui sistem electric prin simularea pe model</p>
Competențe transversale	<p>CT1 Identificarea obiectivelor de realizat, a resurselor disponibile, conditiilor de finalizare a acestora, etapelor de lucru, timpilor de lucru, termenelor de realizare si riscurilor aferente Executarea responsabilă a sarcinilor profesionale.</p> <p>CT2 Identificarea rolurilor si responsabilitatilor într-o echipa pluridisciplinara si aplicarea de tehnici de relationare si munca eficienta în cadrul echipei. Comunicare și lucru în echipă.</p> <p>CT3 Utilizarea eficienta a surselor informationale si a resurselor de comunicare si formare profesionala asistata (portaluri Internet, aplicatii software de specialitate, baze de date, cursuri on-line etc.) atât în limba româna cât si într-o limba de circulatie internationala, conștient de nevoia de formare continuă.</p>

7 Obiectivele disciplinei (reiesind din grila competentelor specifice acumulate)

7.1	Obiectivul general al disciplinei	<ul style="list-style-type: none"> • Cunoasterea principalelor aplicatii industriale ale tehnologii electrostatice si ale tehnologiilor in camp magnetic intens
7.2	Obiectivele specifice	<ul style="list-style-type: none"> • Cunoasterea principiilor generale de utilizare ale campurilor electrice si magnetice intense • Dobandirea de cunostinte teoretice si practice referitoare la aplicatiile industriale ale principalelor tehnologii electrostatice : separare, ozonare, copiere, vopsire. • Dobandirea de cunostinte teoretice si practice referitoare la aplicatiile industriale ale tehnologiilor in camp magnetic intens: separare, prelucrari mecanice • Deprinderea de a utiliza planificarea activa a experimentelor in studiul proceselor industriale • Cunoasterea problemelor referitoare la riscurile electrostatice

8. Continuturi

8.1. Curs (programa analitica)		Metode de predare	Observatii
1	Notiuni de baza. Aspecte generale privind tehnologiile in camp electric si magnetic intens	Se utilizeaza mijloace multimedia, stil de predare interactiv, parteneriat cadru didactic student.	
2	Descarcarea corona. Incarcarea cu sarcina prin bombardament ionic.		
3	Comportatea materialelor granulare in camp electric intens.		
4	Tehnologii de separare corona - electrostatica a materialelor granulare.		
5	Echipamente de separare a materialelor granulare in camp corona-electrostatic. Analiza rezultatelor procesului de separare.		
6	Dispozitive de triboelectrizare. Tehnologii de separarea triboelectrostatica a materialelor granulare.		
7	Tehnologii și echipamente de ozonare. Aplicatii.		
8	Generatoare de raze X. Aplicatii.		

9	Echipamente pentru tomografie computerizata. Principii, functionare.		
10	Copierea electrostatica – principii, echipamente. Imprimanta laser		
11	Echipamente si tehnologii de vopsire electrostatica si acoperire electrostatica.		
12	Echipamente de Imagistica prin Rezonanta Magnetica. Principii, functionare.		
13	Separarea materialelor granulare in camp magnetic intens. Principii.		
14	Separatoare cu camp magnetic redus. Separatoare cu camp magnetic intens.		
8.2. Aplicatii (seminar/lucrari/proiect)		Metode de predare	Observatii
1	Norme de tehnica Securitatii Muncii. Fenomene de electrizare.	Lucrarile practice se desfasoara cu participarea studentilor la pregatirea montajului experimental si efectuarea masuratorilor Se redacteaza un raport tehnic privind rezultatele obtinute si interpretarea lor.	
2	Surse reglabile de înaltă tensiune. Studiul descărcării corona		
3	Electroseparatorul corona – electrostatic cu cilindru purtator		
4	Recuperarea metalului si a materialelor plastice din deseuri de cabluri electrice		
5	Incarcarea cu sarcina a a materialelor granulare. Seria triboelectrică.		
6	Masurarea sarcinii electrice. Electrometrul si cusca Faraday		
7	Separatoare electrostatice cu cadere libera. Dispozitive de triboelectrizare		
8	Recuperarea materialelor plastice prin separare triboelectrostatica		
9	Ozonatorul cu descărcare în barieră dielectrică		
10	Tehnologii pe bază de ozon pentru potabilizarea apei și epurare		
11	Tehnici experimentale. Planificarea activa a experimentelor multifactoriale		
12	Optimizarea unui proces electrostatic utilizand planificarea activa a experimentelor		
13	Studiul robustetei unui proces electrostatic multifactorial		
14	Referat de sinteza pe tema <i>Tehnologii si echipamente moderne in electrostatica aplicata</i>		
Bibliografie			
1. Samuila, A., Dascalescu, L. <i>Comportarea materialelor granulare in camp electric</i> , Cluj-Napoca, Editura Mediamira, 1999.			
2. Morar, R., Muntean, I. O., Cugleşan, I., Almasan I. <i>Tehnologii de depoluare a mediului</i> , Cluj-Napoca, Editura Dacia, 2004.			
3. Neamțu, V. <i>“Separarea materialelor granulare”</i> , Cluj-Napoca, Editura Casa Cartii de Stiinta, 1997.			
4. Suarasan, I.. <i>Generarea și utilizarea ozonului</i> . Cluj-Napoca, Editura Eta, 2000.			
5. Popescu, C.si Popescu, M.O: <i>Electrotehnologii</i> , Ed. Matrix Rom, Bucuresti, 1997.			
6. Lucian Ciobanu. <i>Tratat de inginerie electrica. Electrotehnologii</i> . Ed. Matrixrom, Bucuresti, 2003.			
7. D.M. Taylor, P.E.Seker, <i>Industrial Electrostatics: Fundamentals and Measurements</i> . Research Studies Press Ltd., 1994			
8. J.S. Chang, A.J. Kelly, J.M. Crowley <i>Handbook of electrostatic processes</i> Marcel Dekker, Inc. 1995			
9. J.M. Crowley <i>Fundamentals of Applied Electrostatics</i> Laplacian Press, 1991			

9. Coroborarea continuturilor disciplinei cu asteptarile reprezentantilor comunitatii epistemice, asociatiilor, profesionale si angajatori din domeniul aferent programului

Conținutul disciplinei este în concordanță cu ceea ce se preda în cadrul altor facultati de profil electric din alte centre universitare din tara si din străinătate.

Pentru o mai buna adaptare a conținutului disciplinei la cerințele pieței muncii au loc întâlniri si discutii periodice cu reprezentati ai mediului de afaceri clujean, pe tematica cursului.

10. Evaluare



Tip activitate	10.1	Criterii de evaluare	10.2	Metode de evaluare	10.3	Ponderea din nota finala
Curs		- Nivelul cunostintelor teoretice asimilate. - Capacitatea de a utiliza informatia primita la curs.		Lucrare scrisa, cu acces la bibliografie		50 %
Aplicatii		Nivelul cunostintelor si abilitatilor practice asimilate.		Test final si lucrare de sinteza		50 %
10.4 Standard minim de performanta						
Nota examen > 5, Nota aplicatii > 5.						

Data completarii
01.09.2022

Responsabil de curs
Prof.dr.fiz.ing. Adrian SAMUILA

Responsabil de seminar/laborator
Prof.dr.fiz.ing. Adrian SAMUILA

Data avizarii in departament
Septembrie 2022

Director departament
Prof.dr.ing. Calin MUNTEANU

Data avizării în consiliul facultății
Septembrie 2022

Decan

Conf.dr.ing. Andrei Cziker

SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	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	ETH, I&AD, IMed-Cluj
1.7	Form of education	Full time
1.8	Subject code	55.1

2. Data about the subject

2.1	Subject name	Technologies using high intensity electric and magnetic fields									
2.2	Teaching Language	Romanian									
2.3	Course responsible/lecturer	prof. Adrian SAMUIILA, PhD.									
2.4	Teachers in charge of applications	prof. Adrian SAMUIILA, PhD.									
2.5	Year of study	IV	2.6	Semester	II	2.7	Assessment	C	2.8	Subject category	Optional

3. Estimated total time

Year / Sem.	Subject name	No. of weeks	Course				Applications				Indiv. study	TOTAL	Credits
			[hours/week]				[hours/sem.]						
			C	S	L	S	C	S	L	S			
IV/II	Technologies using high intensity electric and magnetic fields	14	2		2		28		28		74	130	5
3.1	Number of hours per week	4	3.2 of which, course				2	3.3 applications				2	
3.4	Total hours in the curriculum	130	3.5 of which, course				28	3.6 applications				28	
Individual study												Hrs	
Books, lecture material and notes, bibliography													40
Supplementary study in the library, online and in the field													12
Preparation for seminars/laboratory works, homework, reports, portfolios, essays													20
Tutoring													
Exams and tests													2
Other activities													
3.7	Total hours of individual study				74								
3.8	Total hours per semester				130								
3.9	Number of credit points				5								

4. Pre-requisites (where appropriate)

4.1	Compulsory	Physics, Theory of electromagnetic field, Electric equipment
4.2	Recommended	Physics, Theory of electromagnetic field, Electric equipment

5. Conditions (where appropriate)

5.1	For the course (where/when)	Cluj-Napoca
5.2	For the applications	Cluj-Napoca

6. Specific competences (Learning Outcomes)

Professional competences	<p>C3. Using fundamental concepts in electrotechnics: C3.1 Description of theory and methods for analysis of electromagnetic field and electrical circuits. C3.2 Explanation of operating principles of electrical equipment C3.4 Assessing the quality and performance of electrical systems by specific methods.</p> <p>C4. Analysis, modeling and simulation of electrical systems: C4.1 Description of methods and algorithms for analysis, modeling and simulation of electrical systems. C4.2 Explanation of specific techniques for analysis, modeling and simulation of electrical systems C4.3 Modeling, simulation and CAD of the components of an electrical system using specialized software. C4.4 Evaluating and testing the performance of an electrical system by model simulation</p>	
Cross competences	<p>CT1 Identification of the objectives to be achieved, the available resources, the conditions for completion, the working steps, the working times, the implementation deadlines and the related risks. Responsible execution of professional tasks.</p> <p>CT2 Identifying roles and responsibilities in a multidisciplinary team and applying relationship techniques and effective work within the team. Communication and teamwork.</p> <p>CT3 Effective use of information sources and communication resources and assisted professional training (Internet portals, specialized software applications, databases, on-line courses, etc.) both in Romanian and in an international language, aware of the need for continuous training.</p>	

7. Discipline objectives (according to the Specific competences)

7.1	General objectives	<ul style="list-style-type: none"> Knowing the main industrial applications of electrostatic technologies and high intensity magnetic field technologies 	
7.2	Specific objectives	<ul style="list-style-type: none"> Knowing the general principles of high intensity electric and magnetic fields applications. Theoretical and practical knowledge regarding the industrial applications of the main electrostatic technologies: separation, ozonation, copying, painting, medical application. Theoretical and practical knowledge regarding the industrial applications of high intensity magnetic field technologies: separation, medical applications. Using the Design of Experiments method in the study of industrial processes. Knowledges in the field of electrostatic hazard. 	

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Basic concepts. General aspects concerning the high intensity electric and magnetic fields technologies	Uses of multimedia tools, interactive teaching, student - teacher partnership.	
2	Corona discharge. Corona charging by ion bombardment.		
3	Behaviour of granulat materials in high intensity electric fields.		
4	Separation of granular materials by corona-electrostatic technologies		
5	Equipment for corona-electrostatic separation of the granular materials Analysis of the separation results.		
6	Tribocharging devices. Technologies for the triboelectrostatic separation of the granular materials.		
7	Ozone technologies and equipment. Applications.		
8	X-ray Generators. Applications.		
9	Computed tomography equipment. Principles, operation.		

10	Electrostatic copying - principles, equipment. The laser printer.		
11	Equipment and technologies for electrostatic painting and electrostatic coating.		
12	Equipment for Magnetic Resonance Imaging. Principles, operation.		
13	High intensity magnetic fields separation of the granular materials. Principles.		
14	Low Intensity and High Intensity magnetic field separators.		
8.2. Applications (lab)		Teaching methods	Notes
1	Safety rules. Materials charging phenomena.	The students participate in the preparation of the experimental setup and measurements A technical report is produced on the obtained results and their interpretation.	
2	Variable High Voltage generators. Study of corona-discharge.		
3	Roll carrier corona-electrostatic separator.		
4	Recovery of metals and plastics from electric cables waste.		
5	Charging of granular materials. Triboelectric series.		
6	Electric charge measurement. Faraday pail and Keithley electrometer.		
7	Tribocharging devices. Free fall electrostatic separators.		
8	Plastic granular materials recovery by triboelectrostatic separation		
9	Dielectric barrier discharge ozonator		
10	Ozone-based technologies for water treatment		
11	Experimental technics. Design of Experiments (DoE) method for multifactorial processes.		
12	Optimisation of electrostatic processes using DoE method.		
13	Study of the robustness of a multifactor electrostatic process		
14	Scientific report concerning modern equipment and technologies for applied electrostatics and high intensity magnetic fields applications.		
References (Bibliography)			
<ol style="list-style-type: none"> Samuila, A., Dascalescu, L. <i>Comportarea materialelor granulare in camp electric</i>, Cluj-Napoca, Editura Mediamira, 1999. Morar, R., Muntean, I. O., Cugleşan, I., Almasan I. <i>Tehnologii de depoluare a mediului</i>, Cluj-Napoca, Editura Dacia, 2004. Neamţu, V. "<i>Separarea materialelor granulare</i>", Cluj-Napoca, Editura Casa Cartii de Stiinta, 1997. Suarasan, I.. <i>Generarea și utilizarea ozonului</i>. Cluj-Napoca, Editura Eta, 2000. Popescu, C.si Popescu, M.O: <i>Electrotehnoigi</i>, Ed. Matrix Rom, Bucuresti, 1997. Lucian Ciobanu. <i>Tratat de inginerie electrica. Electrotehnoigi</i>. Ed. Matrixrom, Bucuresti, 2003. D.M. Taylor, P.E.Seker, <i>Industrial Electrostatics: Fundamentals and Measurements</i>. Research Studies Press Ltd., 1994 J.S. Chang, A.J. Kelly, J.M. Crowley <i>Handbook of electrostatic processes</i> Marcel Dekker, Inc. 1995 J.M. Crowley <i>Fundamentals of Applied Electrostatics</i> Laplacian Press, 1991 			

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The content of this course is correlated with other faculties of electrical engineering in other university centers in Romania and abroad. Regular meetings and discussions are held with representatives of the Cluj business environment, on the subject of this course.
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10. Evaluations

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		- Level of theoretical knowledges. - Ability to use these knowledges.		Written exam with access to the bibliography.		
Applications		Level of knowledges and practical skills.		Final test and scientific report.		



10.4 Minimum standard of performance

written exam note > 5, Final test note > 5

Date
23.10.2017Course responsible
Prof. Adrian SAMUILATeachers in charge of applications
Prof. Adrian SAMUILA

Date of approval in the department

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Head of department
Prof. Calin MUNTEANU



FACULTATEA de INGINERIE ELECTRICA

str. George Baritiu nr. 26-28, 400027 Cluj-Napoca, România
tel. 40-(0)264-401228, fax +40-264-596285, secretariat tel. 40-(0)264-401229
e-mail: Decanat.FIE@staff.utcluj.ro, SecretarFIE@staff.utcluj.ro; <http://ie.utcluj.ro>

