SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject	**Analysis and modeling of microwave systems for industrial applications**						
2.2 Holder of the subject	prof.PhD.eng.Hathazi Francisc – Ioan						
2.3 Holder of the academic seminar/laboratory/project	--- / associate prof.PhD eng.Șoproni Vasile – Darie / associate prof.PhD eng.Molnar Carmen – Otilia						
2.4 Year of study	I	2.5 Semester	II	2.6 Type of the evaluation	Ex.	2.7 Subject regime	Imposed / Deepening discipline (I/DAP)

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	5	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	- / 2 / 1
3.4 Total of hours from the curriculum	70	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	- / 28/14

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	25
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	20
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	25
Tutorials	
Examinations	10
Other activities.	-

3.7 Total of hours for individual study	**80**
3.9 Total of hours per semester	**150**
3.10 Number of credits	**6**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Knowledge of Electrical Circuit Theory I and II, Electrotechnical Materials, Microwave Technology, Electrothermal
4.2 related to skills	Adequate selection of design methodology and characteristics of components and electrical systems

5. Conditions (where applicable)

5.1. for the development of the course	The course can be taken face-to-face or online. Laptop, video projector, magnetic board, free speech.
5.2. for the development of the academic seminary / laboratory / project	- / The laboratory can be carried out face to face or online. Smart board, computer network with workstation for each student, access to microwave equipment in the laboratory / The project can be carried out face to face or online. Smart board, computer network with workstation for each student, access to microwave equipment in the laboratory

6. Specific skills acquired

Professional skills	• C2. Operating with fundamental concepts in computer science and information technology • C2.1. – Modeling and design of electrical systems in electrothermal applications, which refers to the processing of dielectric materials in the microwave field; • C2.3. – Uses of modeling and designing electrical systems in electrothermal applications. • C2.4. – Correct solution and understanding of the operation of different microwave technologies. • C2.5. – The acquired knowledge is useful in solving the problems faced by a specialist in electrical engineering.

Transversal skills	• CT1 – Identify the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working times, the deadlines and the related risks; • CT2 – Identify roles and responsibilities in a multidisciplinary team and apply effective relationship techniques and teamwork; • CT3 – Efficient use of information sources and resources of communication and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in a language of international circulation.

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	• The course is addressed to students from the Advanced Systems in Electrical Engineering specialization and aims to present the phenomena of production, transport and use of microwave energy in various industrial applications. Project applications are based on the premise that microwave material processing is a relatively new technology that provides new opportunities to improve the physical properties of materials; provides alternatives for processing materials that are difficult to process; reduces the harmful effects of material processing on the environment; provides economic benefits by saving energy, space and time; and offers the opportunity to produce new materials and microstructures that cannot be obtained by other methods.
7.2 Specific objectives	• Starting from the preconditions imposed by each product subject to industrial microwave processing, the student will be able to analyze the variations of the monitored parameters and to design a microwave oven adapted to the product to be processed.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
Course 1 – 2 – Wave applicators with conveyor belt. Flat waves. Wave guides. Mutual impedance. Standing wave voltage ratio S. Examples of conveyor belt applicators	Laptop, video projector, IQ Board, free speech	4
Course 3 – 4 – Special applicator structures. Two-cavity TE10n applicator. Applicator: periodic, rectangular TEM, ridge, disc, dielectric, mobile resonant, spiral, radiant, ellipsoidal and spherical	Laptop, video projector, IQ Board, free speech	4
Course 5 – 6 – General aspects regarding the microwave heating circuit, the discharge phenomena in gaseous environment	Laptop, video projector, IQ Board, free speech	4
Course 7 – 8 – Pressure microwave processing of high temperature sensitive materials	Laptop, video projector, IQ Board, free speech	4
Course 9 – 10 – Automatic control, adjustment and adaptation of the drying process.	Laptop, video projector, IQ Board, free speech	4
Course 11 – 13 – Hybrid systems in industrial applications that use microwave technologies	Laptop, video projector, IQ Board, free speech	6
Course 14 – Safety rules adopted for microwave installations	Laptop, video projector, IQ Board, free speech	2

Bibliography

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2. Teodor Maghiar, Darie Şoproni – Tehnica încălzirii cu microunde, Editura Universităţii din Oradea, 2003
3. Rulea Gh. – Tehnica frecvenţelor foarte înalte, Ed. Tehnică, Bucureşti, 1966
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5. Drăgoi Gh. - Tehnica frecvenţelor foarte înalte, Ed. Militară, Bucureşti, 1979
6. Metaxas A. C. – Industrial Microwave Heating, Peter Peregrinus LTD., 1983
7. Manolescu P., ş. a. – Măsurări electrice şi electronice, Ed. Didactică şi Pedagogică, Bucureşti, 1980
8. Adrian Vârtosu – Măsurări cu microunde şi optoelectronice, Univ. Politehnica Timişoara, 1996
9. Tudor Palade – Tehnica microundelor, Univ. Politehnica Cluj, 1995
10. Carmen O. Molnar – Modelarea numerică a câmpului electromagnetic din instalaţiile electrotermice cu microunde, Editura Universităţii din Oradea, 2006, pg. 190, ISBN 973-613-969-7.
11. T. Leuca, Livia Bandici, Carmen O. Molnar - Aspecte privind încălzirea în câmp de microunde a materialelor dielectrice, Editura Mediamira, Cluj-Napoca 2006, pag.187, ISBN (13) 978-973-713-142-3.

12. Carmen O. Molnar - Teoria câmpului electromagnetic, Editura Universităţii din Oradea, 2005, pag.223, ISBN 973-613-833-X.		
8.2. Seminar	Teaching methods	No. of hours/ Observations

8.3. Laboratory	Teaching methods	No. of hours/ Observations
1. Laboratory protection rules specific to microwave installations	Free speech, use of computer network from the laboratory equipment	2
2 – 3 – Analysis of the components and the operation of the laboratory installation for drying or microwave treatment of dielectric materials	Free speech, use of computer network from the laboratory equipment	4
4. Analysis of the component parts and the mode of operation of the laboratory installation for soil decontamination. Measurement and interpretation of results	Free speech, use of computer network from the laboratory equipment	2
5. Analysis of the component parts and of the operation of the laboratory installation for the extraction of oils from seeds. Measurement and interpretation of results	Free speech, use of computer network from the laboratory equipment	2
6. Measurement and interpretation of process parameters for the extraction of beta-carotene from vegetables (carrots)	Free speech, use of computer network from the laboratory equipment	2
7. Analysis of the component parts and the operation of the laboratory installation for the extraction of oils from vegetable substrate. Measurement and interpretation of results	Free speech, use of computer network from the laboratory equipment	2
8. Measurement and interpretation of results in the extraction of oils from the floral substrate	Free speech, use of computer network from the laboratory equipment	2
9 – 10 – Analysis of the component parts and the operation of the laboratory installation for the study of microwave supporting ceramic materials. Measurement and interpretation of results	Free speech, use of computer network from the laboratory equipment	5
11 – 13 – Analysis of the component parts and the operation of the laboratory reactor in the microwave field in order to obtain hybrid materials (conductive, semiconductor or dielectric polymers) by spray pyrolysis processes. Measurement and interpretation of results	Free speech, use of computer network from the laboratory equipment	5
14. Recovery program for laboratory works	Free speech, use of computer network from the laboratory equipment	2
Bibliography 1. Soproni Vasile Darie, Hathazi Francisc Ioan, Molnar Carmen Otilia, Arion Mircea Nicolae - Analiza și modelarea sistemelor cu microunde pentru aplicații industriale (suport îndrumător laborator – format electronic), 2020, pp. 43 2. *** - Proiect PNII 51087, Tehnologii moderne utilizate la îmbunătățirea calității semințelor agricole depozitate, 2007-2010, director proiect – Șoproni Darie, Universitatea din Oradea 3. Manolescu P., ş. a. – Măsurări electrice şi electronice, Ed. Didactică şi Pedagogică, Bucureşti, 1980 4. Adrian Vârtosu – Măsurări cu microunde şi optoelectronice, Univ. Politehnica Timişoara, 1996 5. Carmen O. Molnar – Modelarea numerică a câmpului electromagnetic din instalaţiile electrotermice cu microunde, Editura Universităţii din Oradea, 2006, pg. 190, ISBN 973-613-969-7.		
8.4. Project	Teaching methods	No. of hours/ Observations
1. Theoretical considerations regarding microwave heating	Free speech, use of computer network from the laboratory equipment	2
2. Electromagnetic and thermal field in microwave electrothermal installations. Study of the behavior of dielectrics in the microwave field	Free speech, use of computer network from the laboratory equipment	2
3. Processing of dielectric materials in electromagnetic field	Free speech, use of computer network from the laboratory equipment	2
4. Use of microwave energy in the processing of electrical materials. Solutions for the design and optimization of microwave electrothermal installations	Free speech, use of computer network from the laboratory equipment	2

5. Numerical modeling of applicators used for microwave drying. Software tools in education and research.	Free speech, use of computer network from the laboratory equipment	2
6. Microwave field processing of light industry raw materials. Advantages and disadvantages	Free speech, use of computer network from the laboratory equipment	2
7. Applications using professional software. Current issues and trends in efficient drying of light industry raw materials	Free speech, use of computer network from the laboratory equipment	2

Bibliography

1.*** - Proiect PNII 51087, Tehnologii moderne utilizate la îmbunătățirea calității semințelor agricole depozitate, 2007-2010, director proiect – Șoproni Darie, Universitatea din Oradea
2. T. Leuca, Livia Bandici, Carmen Molnar – Aspecte privind încălzirea în câmp de microunde a materialelor dielectrice. Editura Mediamira Cluj-Napoca, 2006.
3. Silaghi M.A., Silaghi H. – Tehnologii cu microunde. Tehnici informatice. Editura Treira, Oradea, 2001.
4. Anca Tomescu – Sisteme cu microunde. Editura Matrix Bucureşti, 2001.
5. Miron D. Tucă M., Cuciureanu V.– Microundele în procesele industriale. Editura ICPE, Bucureşti, 1995
6. Carmen O. Molnar – Modelarea numerică a câmpului electromagnetic din instalațiile electrotermice cu microunde, Editura Universităţii din Oradea, 2006, pg. 190.

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline is adapted and satisfies the requirements imposed on the labor market, being agreed by the social partners, professional associations and employers in the field related to the license program. The content of the discipline is found in the curriculum of the specialization ADVANCED SYSTEMS IN ELECTRICAL ENGINEERING and from other university centers in Romania that have accredited this specialization, so knowledge of the basics is a stringent requirement of employers in the field.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Oral examination	The evaluation can be done face-to-face or online. Oral examination of students	50 %
10.5 Seminar	-	-	-
10.6 Laboratory	Final evaluation test	The evaluation can be done face-to-face or online. Oral examination of students	20 %
10.7 Project	Oral examination	Oral examination - Project presentation	30%

10.8 Minimum performance standard:

- Carrying out the works under the coordination of a teacher, in order to solve specific problems in the electrical field with the correct evaluation of the workload, resources available for the necessary time to complete the risks, under the conditions of application of occupational safety and health norms.

Completion date:
28.08.2023

Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:
29.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	**Master**
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering

2. Data related to the subject

2.1 Name of the subject	**Ethics and integrity in scientific research**						
2.2 Holder of the subject	**Lect. PhD jr. Anca PĂCALĂ**						
2.3 Holder of the academic seminar/laboratory/project	**Lect. PhD jr. PĂCALĂ**						
2.4 Year of study	I	2.5 Semester	2	2.6 Type of the evaluation	Continuous Assessment	2.7 Subject regime	SYD

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	1	of which: 3.2 course	1	3.3 academic seminar/laboratory/project	-
3.4 Total of hours from the curriculum	14	Of which: 3.5 course	14	3.6 academic seminar/laboratory/project	-
Distribution of time					
Study using the manual, course support, bibliography and handwritten notes					20
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					4
Tutorials					
Examinations					2
Other activities.					

3.7 Total of hours for individual study	**36**
3.9 Total of hours per semester	**50**
3.10 Number of credits	2

4. Pre-requisites (where applicable)

4.1 related to the curriculum	(Conditions)
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic laboratory/project	

6. Specific skills acquired
CT1. Responsibly apply the principles, norms and values of professional ethics in order to achieve the goals and identify the objectives, the available resources, the steps to be done and time spent for finishing the works, the deadlines, and the risks involved.

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general	Knowledge, understanding, explanation and interpretation of concepts specific to

objective of the subject	ethics and integrity in scientific research for their application in the development of a responsible professional career.
7.2 Specific objectives	The course aims to familiarize students with the notions of ethics, integrity in scientific research; acquiring the knowledge and skills necessary to apply the rules of ethics in scientific research

8. 8. Contents

8.1.Course	Teaching methods	No. of hours/ Observations
The concept of ethics; general aspect of the ethics in scientific research. Regulations on ethics in Romanian universities.	Free exposure, with the presentation of the course with video projector, on the board or online	4h
Integrity in the educational system: integrity standards, promotion of academic integrity, violations of academic integrity, good practices.	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Ethical issues of research and publication: plagiarism, forms of plagiarism. Other forms of academic dishonesty.	Free exposure, with the presentation of the course with video projector, on the board or online	4h
Justice and equity in academic organizations and research teams. Legal provisions applicable to the ethics and integrity of scientific research.	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Elaboration of a scientific paper according to the principles of ethics and academic integrity	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Bibliography 1. Ariely, D. (2012). *Adevărul (cinstit) despre necinste. Cum îi minţim pe toţi dar mai ales pe noi înşine*. Bucureşti: Editura Publica 2. Proiect PODCA 2013. Ghid practic privind cercetarea stiintifica 3. Pisoschi, A., Vacariu V, Ioana Popescu I. 2006. Etica în cercetare, 4. Singer, P. (2006), *Tratat de Etică*, Bucureşti: Editura Polirom 5. Șarpe, D., Popescu, D., Neagu, A., Ciucur, V., (2011**),** *Standarde de integritate în mediul universitar, UEFISCDI*, București. 6.Șercan, Emilia, (2017), *Deontologie academică. Ghid practic,* Editura Universității București 7. L.E.N- 1/2011 8. Legea 8/1996 privind drepturile de autor 9. Legea 206/2004 privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare		
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

Knowledge of these notions is a stringent requirement of vocational training. The content of the discipline is correlated with the need to train responsible adults, able to apply and respect the principles of ethics and integrity in personal and professional life.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: thorough knowledge of all subjects is	**Oral examination** Students receive for solving each a form with 2 subjects of theory and an application.	100 %

	required		
10.6 Minimum performance standard: Course: - Knowledge of the essential notions in the field of ethics and integrity in scientific research; - Ability to know and recognize the extent of one's rights and obligations as a researcher;			

Completion date:

Date of endorsement in the department:

Date of endorsement in the Faculty Board:

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Departament	**Electrical Engineering**
1.4 Field of study	**Electrical Engineering**
1.5 Study cycle	**MASTER(2nd cycle)**
1.6 Study program/Qualification	**ADVANCED SYSTEMS IN ELECTRICAL ENGINEERING/ MASTER Of SCIENCE IN ENGINEERING**

2. Date despre disciplină

2.1 Name of the subject				**INTERFERENCES AND ELECTROMAGNETIC PROTECTION**			
2.2 Holder of the subject				**Prof.Dr.Ing.Ec. Silaghi Alexandru Marius**			
2.3 Holder of the academic seminar/laboratory/project							
2.4 Year of study	**I**	2.5 Semester	**1**	2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**DAP**

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	**2**	of which: 3.2 course	**2**	3.3 academic seminar/laboratory/project	
3.4 Total of hours from the curriculum	**28**	of which: 3.5 course	**28**	3.6 laboratory /project	

Distribution of time	72h
Study using the manual, course support, bibliography and handwritten notes	30
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	14
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	24
Tutorials	
Examinations	4
Other actvities	

3.7 Total of hours for individual study	**72**
3.9 Total of hours per semester	**100**
3.10 Number of credits	4

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Knowledge of mathematics and physics, Electrotechnics, Electrotechnical materials, Electrical measurements ,Electronics, Microwave
4.2 related to skills	Electrical measurements, Microwave technique, Microwave technologies, New energy sources

5. Conditions (where applicable)

5.1. for the development of the course	- attending at least 50% of the course - the course can be held face to face or online.
5.2.for the development of the academic seminary/laboratory/project	- mandatory presence at all laboratory and seminar hours; - students will perform the hours with the lab work; - maximum 2 works (30%) can be recovered during the semester; - frequency at laboratory less than 70% leads to the restoration of discipline. - the laboratory or seminars can be held face to face or online.

6. Specific skills acquired

Professional skills	□ knowledge of the main existing regulations in the field □ ensuring competences in the field of electromagnetic field study, at a higher level with direct applicability in the technical design. □ designing equipment in the field of electrical engineering and systems for conversion and use of non-conventional sources □ development of management skills of specific projects in electrical engineering.
Transversal skills	□ the ability to analyze and solve disruptive phenomena in electrical systems □ identification of roles and responsibilities in a multidisciplinary team and the application of communication techniques and effective work within the team □ identification of the objectives to be achieved, the available resources, the conditions for their completion, work stages, working times, related completion deadlines and related risks □ the effective use of information sources and resources for communication and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in an international language.

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The "Electromagnetic Interference" course proposes a familiarization of electrical engineering students with the introductory notions of the electromagnetic field and some applications related to electromagnetic field interference
7.2 Specific objectives	Being a specialized discipline in electrical engineering, its objective is to present calculation methods in a unitary framework of problems of general interest, necessary to solve various specific electrical problems. The design part familiarizes students with practical aspects regarding the operation of electrical systems at high frequencies.

8. Contents

8.1 Course	Teaching methods	No. of hours/ Observations
Chapter 1. INTRODUCTORY CONSTITUENTS	Free exposure, with the presentation on-line and live, video projector	2h
Chapter 2. NON-QUALITY OF ELECTRICAL ENERGY	Free exposure, with the presentation on-line and live, video projector	4h
Chapter 3. TREATMENT MONITORING ELECTRIC ENERGY	Free exposure, with the presentation on-line and live, video projector	8h
Chapter 4. INDICATORS FOR EVALUATING THE QUALITY OF ELECTRICAL ENERGY ISO 9000	Free exposure, with the presentation on-line and live, video projector	4h
Chapter 5. TECHNOLOGY AND MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY	Free exposure, with the presentation on-line and live, video projector	6h
Chapter 6. ANALYSIS OF THE TECHNICAL LEVEL AND QUALITATIVE OF ELECTROMAGNETIC INTERFERENCES	Free exposure, with the presentation on-line and live, video projector	4h
Total		28h

Bibliography

1. R. Badoudal, C. Martin, S.Jacquet - "Les micro-ondes", Masson, Paris, 1993
2. A. De Sabata - Măsurări cu microunde şi optoelectronice, Lit. Universităţii "Politehnica" Timişoara, 1996
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4. R. E. Collin - Foundations for microwave engineering, New York: McGraw-Hill, 1992
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6. U.L. Rohde, M. Rudolph - RF/Microwave Circuit Design for Wireless Applications, 2nd ed., Hoboken, NJ,USA: John Wiley& Sons, 2012, ISBN 978-0-470-90181-6
7. G. Rulea - Bazele teoretice şi experimentale ale tehnicii microundelor, Ed. Şt. şi Enc., Bucureşti, 1989.
8. D.D. Sandu - Dispozitive electronice pentru microunde, Ed. Şt. şi Enc., Bucureşti, 1982.
9. M.A.Silaghi,Helga Silaghi -Tehnologii cu microunde.Tehnici informatice,Treira 2001, ISBN 973-8159-12-1
10.G.D. Vendelin,A. M.Pavio, U.L.Rohde – Microwave Circuit Design Using Linear and Nonlinear Techniques, 2nd ed, John Wiley& Sons, 2005, ISBN 0-471-41479-4
11. Helga Silaghi - *Calitatea energiei in sistemele de actionare electrica cu masina de inductie, Editura Treira , Oradea, 2000, ISBN 973-99649-3-1*
12.. Bruce R. Archambeault - *PCB Design for Real-World EMI Control, Springer, ISBN: 978-1-4020-7130-0*

9. Corroboration of the contents of the discipline with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program

The content of the discipline can be found in the curricula of the specialization and in other university centers in Romania that have accredited these specializations, thus knowledge of the basic notions and design of this discipline is a strict requirement of employers in the field (Celestica, Connectronics, Faist Mekatronics, Comau, GMAB etc) from the Oradea Industrial Park area.

10. Assessment

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can take place face to face or online.	10.3 Weight of the final grade
10.4 Course	- for grade 5, it is necessary to know the fundamental notions required in the subjects, without presenting details about them - for grade 10, thorough knowledge of all subjects is required, according to the exam grid	**Online or written exam** Each students receive a form with questions with 3 answer options (10 points in total).	100%

10.5 Final exam grade: **Nfe=Nse**
10.6 Minimum Performance Standard
Course: Knowledge of the constructive parts and the principle of operation of various electrical equipment. Solving and explaining some problems of medium complexity, associated with fundamental and engineering disciplines, specific to engineering sciences.
E110, tel.:+40 259 408 458 , masilaghi@uoradea.ro, **hhtp://masilaghi.webhost.uoradea.ro**

Date of completion Signature of the course holder
28.08.2023

Prof.univ.dr.ing. ec. Alexandru Marius Silaghi
e-mail: masilaghi@uoradea.ro

Date of approval in the department

29.08.2023

Signature of the director of the department

S.l.dr ing. Mircea Arion

e-mail: mnarionan@uoradea.ro

Date of approval in the Faculty Council

29.09.2023

Dean's signature

Prof.dr ing.info.habil. Francisc Hathazi

e-mail: francisc.hathazi@gmail.com

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Departament	**Electrical Engineering**
1.4 Field of study	**Electrical Engineering**
1.5 Study cycle	**MASTER(2nd cycle)**
1.6 Study program/Qualification	Advanced Systems In Electrical Engineering/ Master Of Science In Engineering

2. Date despre disciplină

2.1 Name of the subject	INTERFERENCES AND ELECTROMAGNETIC PROTECTION -PROJECT						
2.2 Holder of the subject	**Prof.Dr.Ing.Ec. Silaghi Alexandru Marius**						
2.3 Holder of the academic seminar/laboratory/project							
2.4 Year of study	**I**	2.5 Semester	**1**	2.6 Type of the evaluation	**Vp**	2.7 Subject regime	**DAP**

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	**1**	of which: 3.2 course		3.3 academic seminar /laboratory/project	**1**
3.4 Total of hours from the curriculum	**14**	of which: 3.5 course		3.6 laboratory /project	**14**
Distribution of time					36h
Study using the manual, course support, bibliography and handwritten notes					12
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					10
Tutorials					
Examinations					4
Other actvities					

3.7 Total of hours for individual study	**36**
3.9 Total of hours per semester	**50**
3.10 Number of credits	2

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Knowledge of mathematics and physics, Electrotechnics, Electrotechnical materials, Electrical measurements ,Electronics, Microwave
4.2 related to skills	Electrical measurements, Microwave technique, Microwave technologies, New energy sources

5. Conditions (where applicable)

5.1. for the development of the course	
5.2.for the development of the academic seminary/laboratory/project	- mandatory presence at all laboratory or seminar hours; - students will perform the hours with the lab work; - maximum 2 works (30%) can be recovered during the semester; - frequency at laboratory less than 70% leads to the restoration of discipline. - the project can be held face to face or online.

6. Specific skills acquired

Professional skills	□ knowledge of the main existing regulations in the field □ ensuring competences in the field of electromagnetic field study, at a higher level with direct applicability in the technical design. □ designing equipment in the field of electrical engineering and systems for conversion and use of non-conventional sources □ development of management skills of specific projects in electrical engineering.
Transversal skills	□ the ability to analyze and solve disruptive phenomena in electrical systems □ identification of roles and responsibilities in a multidisciplinary team and the application of communication techniques and effective work within the team □ identification of the objectives to be achieved, the available resources, the conditions for their completion, work stages, working times, related completion deadlines and related risks □ the effective use of information sources and resources for communication and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in an international language.

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The "Electromagnetic Interference" course proposes a familiarization of electrical engineering students with the introductory notions of the electromagnetic field and some applications related to electromagnetic field interference
7.2 Specific objectives	Being a specialized discipline in electrical engineering, its objective is to present calculation methods in a unitary framework of problems of general interest, necessary to solve various specific electrical problems. The design part familiarizes students with practical aspects regarding the operation of electrical systems at high frequencies.

8. Contents

8.1 Course	Teaching methods	No. of hours/ Observations
Design stages: 1. Statistical methods with application to monitoring the quality of electricity 2. The problem of the quality of electricity 3. Improving the quality of electricity 4. The information system of the quality of electricity 5. Designing the electromagnetic compatibility of electrical systems 6. Simulation of specific electromagnetic interference problems 7. Analysis of the circuits that model electromagnetic interference problems	The students receive the design theme and the design methodology and under the guidance of the teaching staff they carry out the stages of the project. Free presentation and discussions based on the homework that the students have to prepare for that class or on line.	2h
1.Metode statistice cu aplicatie la monitorizarea calitatii energiei electrice 2.Problematica calitatii energiei electrice 3.Ameliorarea calitatii energiei electrice 4.Sistemul informational al calitatii energiei electrice 5.Proiectarea compatibilitatii electromagnetice a sistemelor electrice 6.Simulare problemelor specifice de interferente electromagnetice 7. Analiza circuitelor care modeleaza problemele de interferente electromagnetice	Free exposure, with the presentation on-line and live, video projector	4h
Chapter 3. TREATMENT MONITORING ELECTRIC ENERGY	Free exposure, with the presentation on-line and live, video projector	8h
Chapter 4. INDICATORS FOR EVALUATING THE QUALITY OF ELECTRICAL ENERGY ISO 9000	Free exposure, with the presentation on-line and live, video projector	4h
Chapter 5. TECHNOLOGY AND MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY	Free exposure, with the presentation on-line and live, video projector	6h
Chapter 6. ANALYSIS OF THE TECHNICAL LEVEL AND QUALITATIVE OF ELECTROMAGNETIC INTERFERENCES	Free exposure, with the presentation on-line and live, video projector	4h
Total		28h

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6. U.L. Rohde, M. Rudolph - RF/Microwave Circuit Design for Wireless Applications, 2nd ed., Hoboken, NJ,USA: John Wiley& Sons, 2012, ISBN 978-0-470-90181-6
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10.G.D. Vendelin,A. M.Pavio, U.L.Rohde – Microwave Circuit Design Using Linear and Nonlinear Techniques, 2nd ed, John Wiley& Sons, 2005, ISBN 0-471-41479-4

9. Corroboration of the contents of the discipline with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program

 The content of the discipline can be found in the curricula of the specialization and in other university centers in Romania that have accredited these specializations, thus knowledge of the basic notions and design of this discipline is a strict requirement of employers in the field (Celestica, Connectronics, Faist Mekatronics, Comau, GMAB etc) from the Oradea Industrial Park area.

10. Assessment

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can take place face to face or online.	10.3 Weight of the final grade
10.4 Course	- for grade 5, it is necessary to know the fundamental notions required in the subjects, without presenting details about them - for grade 10, thorough knowledge of all subjects is required, according to the exam grid	**Online or oral exam** Presentation of the project in the presence of colleagues and discussions on each topic. Finally, each student receives a grade, separate from the exam grade, which represents 20% of the final grade. The evaluation can take place face to face or online.	100%
10.5 Final exam grade: **Nfe**=**Np**≥6			
10.6 Minimum Performance Standard			
Project: Carrying out a work / a project, as a leader in a multidisciplinary team and responsibly distributing specific tasks to subordinates, with the adoption of a positive attitude and respect towards team members.			

E110, tel.:+40 259 408 458 , masilaghi@uoradea.ro, **hhtp://masilaghi.webhost.uoradea.ro**

Date of completion 28.08.2023

Signature of the course holder

Prof.univ.dr.ing. ec. Alexandru Marius Silaghi
e-mail: masilaghi@uoradea.ro

Date of approval in the department

29.08.2023

Signature of the director of the department

S.l.dr.ing. Mircea Arion

e-mail: maarion@uoradea.ro

Date of approval in the Faculty Council

29.09.2023

Dean's signature

Prof.dr ing.info.habil. Francisc Hathazi

e-mail: francisc.hathazi@gmail.com

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master / 2nd Cycle
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject				Modern command and control systems for alternating current electric machines			
2.2 Holder of the subject				Lecturer phd.eng. ARION MIRCEA NICOLAE			
2.3 Holder of the academic seminar/laboratory/project				-/ -/ Lecturer phd.eng. GAL TEOFIL OVIDIU			
2.4 Year of study	1	2.5 Semester	1	2.6 Type of the evaluation	Ex – Exam Continuous Assessment	2.7 Subject regime	Thoroughgoing Disciplines

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	3	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-/-/1
3.4 Total of hours from the curriculum	42	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-/-/14

Distribution of time	58 hours
Study using the manual, course support, bibliography and handwritten notes	14
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	14
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	14
Tutorials	8
Examinations	8
Other activities.	

3.7 Total of hours for individual study	**58**
3.9 Total of hours per semester	**100**
3.10 Number of credits	4

4. Pre-requisites (where applicable)

4.1 related to the curriculum	(Conditions) – Minimum knowledge on fundamental notions of thermodynamics, electromagnetic field theory, electric machines, constituent elements of electrical circuits and how they work.
4.2 related to skills	-Knowledge of the graphics symbols, specific to electrical diagrams

5. Conditions (where applicable)

5.1. for the development of the course	The course will be presented face to face, in the amphitheater with modern techniques available: Video projector, Screen, Blackboard, Oral speech

5.2.for the development of the academic seminary/laboratory/project	The project will be conducted face to face The practical applications will be made using the existing modern means of work, using numerical modeling software FEMM and/or ANSYS 2D and 3D.) Matlab Simulink. Attendance is mandatory at all project meetings An amount of 30% of the total project meetings may be recovered during the semester; The frequency of the project hours below 70% or the non-completion of the project received through the project theme leads to the restoration of the discipline
6. Specific skills acquired	
Professional skills	C.2. The use of modern techniques of acquisition, data processing and their use in complex electrical engineering equipment systems C.3. Analysis and development of applications regarding the optimization of industrial processes of electricity using specific software
Transversal skills	C.T.1. Identification of the objectives to be achieved, the available resources, the conditions for their completion, work stages, working times, deadlines and related risks

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	▪ The "Modern systems of command and control of electric machines" course aims to present the principles and modern methods of command and control of asynchronous machines. The course focuses on modern command (PWM system) and control (scalar and vector control) methods applied to asynchronous machines. Modern trends in the use of alternating current electric machine command and control systems have recently been imposed due to the desire to replace direct current machines in variable speed drive systems with asynchronous machines in more and more fields. ▪ The course focuses on the impulse control principle of AC machines, on the scalar and vector control methods of these machines and on the basic configurations of the control and force schemes (the structure of static voltage-frequency converters).
7.2 Specific objectives	▪ The objectives of the discipline are to know and understand the functional relationships in order to create the theoretical and functional models corresponding to the command and control systems of electric machines, by explaining and interpreting their behavior and performing calculations starting from the basic relationships for the physical systems studied with specialized software. ▪ The project activity is focused on specific applications and aims at the formation of skills regarding the physical and numerical modeling of alternating current electric machines.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
Chapter I. Vector control methods in drive systems with asynchronous machines. Application of the theory of spatial phasors in control systems of asynchronous machines. The model of the asynchronous machine with spatial phasors. The model of the machine in a common reference d-q so-lidar with the stator, equivalent diagram.	Free speaking, presentation of the course by using video projector and blackboard	8

The model of the machine in a common reference d-q solid with the rotor, equivalent diagram, the model in a reference solid with the rotating field, equivalent diagram		
Chapter II. Control of asynchronous motors in pulse duration modulated (PWM). The principle of generating PWM pulses for controlling asynchronous motors. PWM generators. PWM inverters, configurations (single-phase, two-phase, three-phase). Scalar control of asynchronous machine in adjustable drive systems.	Free speaking, presentation of the course by using video projector and blackboard	8
CHAPTER 3. Chapter III. Scalar speed control of asynchronous motors. Open loop control systems (control systems without internal reactions, control systems with internal voltage and current reactions). Closed-loop control systems (closed-loop speed control with current feedback, constant-flow speed control with programmable current).	Free speaking, presentation of the course by using video projector and blackboard	6
CHAPTER 4. Field control of the synchronous machine. The analogy between the direct current machine and the asynchronous machine. Principle of field orientation of the asynchronous machine. Control with orientation by the field in the gap. Static field oriented control. Control with orientation by rotor field. Control with the orientation according to the excitation field.	Free speaking, presentation of the course by using video projector and blackboard	6

Bibliografie:

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2. I.F.Hantila, N. Vasile, B. Crânganu-Creţu, M Silaghi, T. Leuca, "Elemente de circuit cu effect de câmp", Editura ICPE Bucuresti, 1998
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11. VLAD Simona, VLAD Radu: Modelarea si simularea sistemelor discrete. Cluj-Napoca, 2007.
1. ***: Ansys EM - Users Guide.

8.3 Project	Teaching methods	No. of hours/ Observations
DESIGN OF ASYNCHRONOUS MACHINE WITH SHORT CIRCUIT ROTOR. Introduction Choice of basic dimensions Determination of Z_(1),W and the section of the stator winding. Calculation of dimensions of the stator notch area and air gap. Rotor calculation. Calculation of the magnetizing current. Operating mode parameters. Calculation of losses. Operating characteristics. Calculation of starting characteristics. Thermal calculation.	The students get the design theme and the design methodology and under the guidance of the teaching staff they carry out the stages of the project.	14

Bibliography
1 Ambros Tudor „Proiectarea maşinilor asincrone”. Chişinău, Universitas, 1992.
2 I.P. Kopylov "Proiectarea maşinilor electrice" Moscova, Energie, 1980, 495 p.
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5 KELEMEN A. , “Acţionări Electrice “ , E.D.P., Bucureşti , 1979
6 TUNSOIU Gh. , “Acţionări Electrice “ , E D.P , Bucureşti , 1982
7 SELACIN E., POPOVICI D.,“ Tehnica Acţionărilor Electrice “ , E.T. , Bucureşti , 1985
8 DOBREF V., GHEORGHIU S., “ Maşini Electrice “, E.T. “Gheorghe Asachi “,Iaşi 2003
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11 ***, “*MATLAB User Guide*”, The Mathworks
12 ***, “*SIMULINK User Guide*”, The Mathworks

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline is adapted and meets the requirements imposed on the labor market, being approved by the social partners, professional associations and employers in the field related to the master's program.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	- For the minimum promotion grade - 5 it is necessary to know the fundamental notions required in the topics without presenting detailed details on their content. - For the maximum grade -10, a thorough knowledge of the treated subjects is required	Oral examination	60,00%
10.5 Seminar	---	---	---
10.6 Laboratory	-		
10.7 Project	Calitatea proiectului realizat, corectitudinea documentaţiei proiectului, justificarea soluţiilor alese	Project prezentattion. Oral examination	40%
10.8 Minimum performance standard: - Definition of the basic concepts regarding the dynamic model of the asynchronous machine, of scalar and vector control applied to asynchronous machines in adjustable speed drive systems; The acquisition of basic knowledge, necessary for the design, operation and maintenance of asynchronous machines and electronic command and control equipment in speed regulation schemes. Minimum performance standard:			

Completion date:
28.08.2023

Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:
29.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	DEPARTMENT OF ELECTRICAL ENGINEERING
1.4 Field of study	ELECTRICAL ENGINEERING
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject				**MODERN ELECTROTHERMAL SYSTEMS**			
2.2 Holder of the subject				**Conf.dr.ing. BANDICI LIVIA**			
2.3 Holder of the academic seminar / laboratory / project							
2.4 Year of study	I	2.5 Semester	2	2.6 Type of the evaluation	Ex	2.7 Subject regime	I

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-
3.4 Total of hours from the curriculum	28	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	14
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	13
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	14
Tutorials	3
Examinations	3
Other activities.	-

3.7 Total of hours for individual study	**47**
3.9 Total of hours per semester	**75**
3.10 Number of credits	3

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Special issues of electrical engineering, Electrothermal, Electrical installations
4.2 related to skills	Knowledge of how classic heating systems work

5. Conditions (where applicable)

5.1. for the development of the course	- Video projector, computer. - The course can be held face to face or online platform https://e.uoradea.ro/..
5.2.for the development of the academic seminary/laboratory/project	- Preparation of the project after choosing a theme - The project can be carried out face to face or online on the platform https://e.uoradea.ro/.
6. Specific skills acquired	

Professional skills	**C3. Analysis and development of applications for the optimization of industrial electrical energy processes using specific software.**
Transversal skills	**CT1** Identifying the objectives to be achieved, the available resources, the conditions for their completion, the working steps, the working times, the related implementation deadlines and the related risks. Undertaking coordinated projects to solve specific problems in the field with the correct assessment of the workload. Managerial skills in multidisciplinary teams engaged in solving large complex projects.

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The course "Modern electrothermal systems" aims to familiarize students with the study and usefulness of modern electrothermal equipment. As an advanced knowledge discipline, its object is the presentation in a uniform framework of modern electrothermal equipment for the conversion of electric energy into heat, especially those specific to the industrial field. Master's degree students have the opportunity to familiarize themselves with various modern electrothermal installations, to acquire practical skills in the designing, building, sizing and operating of electrothermal installations, with the possibility to execute, maintain, exploit and repair them.
7.2 Specific objectives	Project themes are designed to provide future master's degree engineers practical skills in designing, building, researching, operating, repairing and maintaining modern electrothermal installations. Students have the opportunity to choose the project theme from those proposed by the coordinating teacher or they can come up with their own project themes, which should correspond to the themes of the subject of the course. Students have the opportunity to know the latest trends in the evolution of modern electrothermal systems. Knowledge is useful in forming skills to address specific issues encountered by a specialist in the field.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
I. Energy problems of electrothermal systems 1.1. Establishing the permissible limits of disturbances caused by the operation of electrothermal systems on the power supply network 1.2. Causes and effects of reactive power circulation	Projector. Intercalated student contributions are requested on subject-specific topics. Some courses take place by teaching subjects and student debates.	2
II. Thermal transfer in electrothermal systems 2.1. Heat transfer by thermal conduction 2.2. Heat transfer by thermal convection	Idem	2
2.3. Heat transmission by thermal radiation 2.4. Heat transfer in complex structures	Idem	2
III. Modern heating systems with electrical resistance 3.1. Calculation of the parameters of the furnace with resistors	Idem	2
3.2. Electric furnaces with resistors for thermal treatments 3.3. Continuous furnaces 3.3.1. Continuous furnaces for burning thick layers	Idem	2
3.4. Heating and drying installations with infrared radiation 3.5. Modern home appliances 3.6. Instant water heating installation	Idem	2
IV. Electromagnetic induction heating equipment and specific technologies 4.1. Induction heating equations 4.2. Electrical equipment for electromagnetic induction heating	Idem	2

4.3. Applications of electromagnetic induction heating		
4.4. Applications of electromagnetic induction heating 4.4.1. Induction furnaces for melting	Idem	2
4.4.2. In-depth heating systems by electromagnetic induction 4.4.3. Surface hardening by electromagnetic induction of moving parts	Idem	2
4.4.4. Gluing parts by electromagnetic induction	Idem	2
V. Modern systems for radio frequency and microwave field processing of dielectric materials 5.1. Physical processing mechanisms 5.2. Numerical analysis of the electromagnetic field	Idem	2
5.3. Systems for processing biscuits and cookies in a radio frequency field 5.4. Systems for drying pasta in a radio frequency and microwave field 5.5. Systems for processing food packed in a radio frequency field	Idem	2
5.6. Systems for the pasteurization and sterilization of liquid products in a radio frequency field 5.7. Systems for rapid heating and defrosting products in a radio frequency field	Idem	2
5.8. New technologies for drying and straightening bent wood using microwaves 5.9. Systems for drying bundles of yarn and combed wool	Idem	2

Bibliography

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2. F.I. Hănţila, T. Leuca, **Livia Bandici** - *Tehnici informatice utilizate în ingineria electrică*. Editura Universităţii din Oradea, 2011.
3. **Livia Bandici**, D. Hoble, St. Nagy - *Tehnologii inovative în procesarea materialelor*. Editura Universităţii din Oradea, 2011.
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5. **Livia Bandici** - *Electrotermie – Aplicaţii*. Editura Universităţii din Oradea, 2003
6. **Livia Bandici** – *Modelarea numerică a câmpului electromagnetic şi termic cuplat în instalaţiile de încălzire în câmp de microunde*. Editura Mediamira – Cluj - Napoca, 2005.
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9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

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10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard	The evaluation can be done face to face or online.	
10.5. Project	Minimum required conditions for promotion (grade 5): in accordance		

	with the minimum performance standard		
10.6. Minimum performance standard: Carrying out works under coordination, in order to solve some problems specific to the field, with the correct evaluation of the workload, the available resources, the necessary completion time and the risks, in conditions of application of the norms of safety and health at work; Adequate use of basic knowledge of technological methods and processes used in the machine building and electrical engineering industries.			

Completion date:
28.08.2023

Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:

29.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	DEPARTMENT OF ELECTRICAL ENGINEERING
1.4 Field of study	ELECTRICAL ENGINEERING
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject		**MODERN ELECTROTHERMAL SYSTEMS**					
2.2 Holder of the subject							
2.3 Holder of the academic seminar / laboratory / project		**Conf.dr.ing. BANDICI LIVIA - PROJECT**					
2.4 Year of study	I	2.5 Semester	2	2.6 Type of the evaluation	Cv	2.7 Subject regime	I

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course	-	3.3 academic seminar/laboratory/project	2
3.4 Total of hours from the curriculum	28	Of which: 3.5 course	-	3.6 academic seminar/laboratory/project	28

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	**4**
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	**7**
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	**7**
Tutorials	**2**
Examinations	**2**
Other activities.	**-**

3.7 Total of hours for individual study	**22**
3.9 Total of hours per semester	**50**
3.10 Number of credits	**2**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Special issues of electrical engineering, electrothermics, electrical installations
4.2 related to skills	Knowledge of how classic heating systems work

5. Conditions (where applicable)

5.1. for the development of the course	- Video projector, computer. - The course can be held face to face or on the online platform https://e.uoradea.ro/. - Attendance: at least 50% of the courses.
5.2.for the development of the academic seminary/laboratory/project	- Elaboration of the project after choosing a theme - The project can be presented face to face or online

6. Specific skills acquired	
Professional skills	**C3. Analysis and development of applications for the optimization of industrial electrical energy processes using specific software.**
Transversal skills	**CT1** Identifying the objectives to be achieved, the available resources, the conditions for their completion, the working steps, the working times, the related implementation deadlines and the related risks. Undertaking coordinated projects to solve specific problems in the field with the correct assessment of the workload. Managerial skills in multidisciplinary teams engaged in solving large complex projects

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The course "Modern electrothermal systems" aims to familiarize students with the study and usefulness of modern electrothermal equipment. As an advanced knowledge discipline, its object is the presentation in a uniform framework of modern electrothermal equipment for the conversion of electric energy into heat, especially those specific to the industrial field. Master's degree students have the opportunity to familiarize themselves with various modern electrothermal installations, to acquire practical skills in the designing, building, sizing and operating of electrothermal installations, with the possibility to execute, maintain, exploit and repair them.
7.2 Specific objectives	Project themes are designed to provide future master's degree engineers practical skills in designing, building, researching, operating, repairing and maintaining modern electrothermal installations. Students have the opportunity to choose the project theme from those proposed by the coordinating teacher or they can come up with their own project themes, which should correspond to the themes of the subject of the course. Students have the opportunity to know the latest trends in the evolution of modern electrothermal systems. Knowledge is useful in forming skills to address specific issues encountered by a specialist in the field.

8. Contents*

8.1 Project	Teaching methods	No. of hours/ Observations
Suggested themes: 1. The calculation of the parameters of an electric furnace with resistors for thermal treatments. 2. The calculation of the parameters of an electric furnace with resistors for food processing. 3. The calculation of the parameters of continuous heating system with infrared radiation. 4. The calculation of the parameters of an infrared heating installation for heating a vat. 5. The calculation of the parameters of an induction boiler for heating acids. 6. The calculation of the parameters of a transformer-type boiler for overheating non-conductive liquids. 7. Induction heating of a magnetic steel bar under the Curie point. 8. The calculation of the parameters of an inductor using two frequencies for heating magnetic steel bars. 9. The calculation of the parameters of an inductor with transverse magnetic flux. 10. The calculation of the parameters of an electromagnetic induction melting furnace. 11. The calculation of the parameters of an installation for gluing wood rods by radio frequency heating. 12. The calculation of the parameters of an equipment for microwave field processing of wood products. 13. The calculation of the parameters of an equipment for microwave field processing of granular products.	Choice of theme. Discussions on how to elaborate the project.	2

14. The calculation of the parameters of an equipment for microwave field processing of medicinal plants and forest fruits. 15. The calculation of the parameters of an equipment for microwave field processing of grapes.		
I. General notions on the heating process **II**. Materials used in the construction of the installation	A brief approach to the main issues related to the design and choice of materials used in the construction of the installation	2
III. The theoretical foundations of equipment calculation	A brief approach to the main issues related to the design and choice of materials used in the construction of the installation	2
IV. Determining the parameters of the heating equipment 4.1. Methods of calculation of electrical equipment parameters	Explanations on how to calculate the main electrical quantities and methods of determination.	2
4.2. Determination of thermal parameters 4.3. The influence of material parameters on the heating process	In the first part of the meeting, a review of the theoretical part presented by the students will be made. In the second part, a presentation of the concepts related to the calculation of the electrical parameters of the system will be made.	2
4.4. Determination of the equivalent parameters of the heating assembly and energy indicators	In the first part of the meeting, a review of the theoretical part presented by the students will be made. In the second part, a presentation of the concepts related to the calculation of the electrical parameters of the system will be made.	2
V. Numerical modelling of the heating system using specialized software 5.1. General concepts on numerical modelling	In the first part of the meeting, a review of the calculations presented by the students until this stage will be carried out. In the second	2

	part, a presentation of how to calculate the equivalent parameters and the energy indicators of the heating equipment is made	
5.2. Numerical modelling (HFSS, Cenos, Elta).	During the first part of the meeting, a review of the calculations presented by the students will be made. In the second part, a presentation of how to calculate the efficiency of the processing, respectively the mode of drawing the equivalent electric scheme will be made.	4
Numerical modeling using dedicated software (HFSS, Cenos, Elta)	Numerical modeling using specialized software.	4
Numerical modeling / simulations. Conclusions	Modeling, drawing up the equivalent electrical diagram of the electrothermal system.	4
Final project evaluation. Conclusions	Defence and handing out of the elaborated project.	2

Bibliography

1. **Livia Bandici** – *Sisteme electrotermice moderne*. Editura Universităţii din Oradea, 2014.
2. **Livia Bandici** - *Electrotermie – Aplicaţii*. Editura Universităţii din Oradea, 2003.
3. **Livia Bandici** – *Modelarea numerică a câmpului electromagnetic şi termic cuplat în instalaţiile de încălzire în câmp de microunde*. Editura Mediamira – Cluj - Napoca, 2005
4. V. Fireţeanu - *Procesarea electromagnetică a materialelor*. Editura Politehnică Bucureşti, 1995.
5. V. Fireţeanu, T. Leuca, *Inducţia electromagnetică şi tehnologii specifice,* Ed. Mediamira, Cluj -Napoca, 1997.
6. N. Golovanov, ş.a. – *Electrotermie şi electrotehnologii*, vol.I. Editura Tehnică, Bucureşti,1997.
7. F. I. Hănţilă, E. Demeter - *Rezolvarea numerică a problemelor de câmp electromagnetic*, Ed. Ari Press, ICPE-ME, Bucureşti, 1995.
8. T.Leuca – *Câmp electromagnetic şi termic cuplat. Curenţi turbionari*. Editura Mediamira, Cluj-Napoca, 1996.
9. Teodor Leuca, Livia Bandici, Carmen Molnar – *Aspecte privind încălzirea în câmp de microunde a materialelor dielectrice*. Editura Mediamira – Cluj - Napoca, 2006.
10. Şt. Nagy, ş.a. – *Procesarea materialelor în camp electromagnetic aplicaţii utilizând tehnici informatice*. Editura Universităţii din Oradea, 2002.
11. C. Samoilă, ş.a. - *Tehnologii moderne de încălzire*. Editura Tehnică, 1986.
12. Softuri: Flux 2D, 3D
13. Softuri HFSS 8.0, 10.0, 15.0
14. Soft Comsol
15. Soft Cenos

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

The content of the subject is adapted and satisfies the requirements imposed by the labor market, being agreed by the social partners, professional associations, and employers in the field related to the bachelor's degree program.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.1 Project	The project will be handed in during the last week of classes. Students will present the project in front of the teacher, the other students having the opportunity to intervene during the presentation.	The evaluation can be done face to face or online.	Different grade from the one obtained at the exam.
10.6. Minimum performance standard: Carrying out works under coordination, in order to solve some problems specific to the field, with the correct evaluation of the workload, the available resources, the necessary completion time and the risks, in conditions of application of the norms of safety and health at work; Adequate use of basic knowledge of technological methods and processes used in the machine building and electrical engineering industries. $N=0,70\ Pr+0,30A_i$.			

Completion date:
28.08.2023

Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:

29.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Departament	**Electrical Engineering**
1.4 Field of study	**Electrical Engineering**
1.5 Study cycle	**MASTER(2nd cycle)**
1.6 Study program/Qualification	**ADVANCED SYSTEMS IN ELECTRICAL ENGINEERING/ MASTER Of SCIENCE IN ENGINEERING**

2. Date despre disciplină

2.1 Name of the subject				**SPECIAL ELECTROTECHNICAL MATTERS**			
2.2 Holder of the subject				**LEUCA TEODOR**			
2.3 Holder of the academic seminar/laboratory/project				**LEUCA TEODOR**			
2.4 Year of study	**I**	2.5 Semester	**1**	2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**DAP**

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	**3**	of which: 3.2 course	**2**	3.3 academic project	**1**
3.4 Total of hours from the curriculum	**42**	of which: 3.5 course	**28**	3.6 project	**14**
Distribution of time					h
Study using the manual, course support, bibliography and handwritten notes					10
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					10
Tutorials					
Examinations					3
Other actvities					

3.7 Total of hours for individual study	**33**
3.9 Total of hours per semester	**75**
3.10 Number of credits	**3**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	- Attendance at a minimum of 50% of courses
5.2.for the development of the academic seminary/laboratory/project	- Mandatory attendance at all seminars; - A maximum of 4 seminars (30%) can be made up during the semester; - Attendance at seminars below 70% leads to retaking the subject

6. Specific skills acquired

Professional skills	• C2. Operating with advanced concepts and techniques in computer science and information technology • C2.1 Describe the operation and structure of computer systems and their applications in electrical engineering using knowledge of programming languages, environments and technologies • C2.2 Explain and interpret analysis and optimisation software packages • C2.3 Make appropriate use of software packages to model and solve a new electrical engineering problem. • C3. Creative use of fundamental electrical engineering concepts, modelling and simulation methods to build modules of electrical systems. • C3.1 Describe models and methods for analysing electromagnetic fields and electrical circuits • C3.2 Interpret numerical data obtained from modelling and simulation of new modules (electrical, electronic) of a system.
Transversal skills	• CT1. Apply, in the context of compliance with legislation, intellectual property rights (including technology transfer), product certification methodology, principles, rules and values of the code of professional ethics as part of own rigorous, efficient and responsible working strategy • CT2. Identify roles and responsibilities in a multi-specialist team, making decisions and assigning tasks, applying effective teamwork and interpersonal techniques • CT3. Identify opportunities for further training and make effective use of resources and learning techniques for own development

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	• Understand how to solve electromagnetic field problems encountered in practical applications. • Direct determination of electrical quantities using measuring devices. • Solving electromagnetic field problems, electrical circuit problems, electromagnetic field and electrical circuit problems using professional numerical analysis software.
7.2 Specific objectives	• The course "Special Issues in Electrical Engineering" aims to present electromagnetic phenomena from the point of view of technical applications and is addressed to master's students in the field of electrical engineering, specializing in "Advanced Systems in Electrical Engineering", and its objective is to present in a unified framework of computational methods of general interest, necessary to solve various problems specific to classical or modern electrical engineering. • The seminar activity is focused on specific applications of the chapters taught in the course and aims at the formation of electrical skills, the use of physical and numerical modelling, the dimensioning of assemblies, the evaluation of errors in experimental determinations.

8. Contents

8.1 Course	Teaching methods	No. of hours/ Observations
INTRODUCTORY CONCEPTS Usefulness of the course Recap some knowledge of Algebra and Vector Analysis	Free exposition, with course presentation on projector and blackboard	2
CHAPTER 1. ELECTRICAL QUANTITIES Electric field in vacuum. Electric field strength in vacuum Electric charge Electric field in bodies. Electric field strength **E.** Electric induction **D** Electric polarisation Law of the connection between electric induction **D** and electric field strength **E** Electric potential V. Scalar electric potential theorem Electric flow. Law of electric flux	Free exposition, with course presentation on projector and blackboard	2
CHAPTER 2. MAGNETIC QUANTITIES Magnetic induction in vacuum $\mathbf{B_v}$ Magnetic field in bodies. Magnetic induction b. Magnetic field strength **H** Magnetic polarisation. Magnetization **M** Law of the connection between magnetic induction **B** and magnetic field strength **H** Scalar magnetic potential V_m. Scalar magnetic potential theorem Magnetic flux. Magnetic flux law Law of electromagnetic inductionlaw of electromagnetic induction		2
CHAPTER 3. ELECTROKINETIC QUANTITIES Electric current intensity i Electric current volume density j Magnetic circuit law Law of electrical conduction Law of transformation of energy from electromagnetic to other forms by conduction		2
CHAP.4. BEHAVIOUR OF FIELD QUANTITIES IN THE VICINITY OF SURFACES Behaviour of magnetic induction **B** in the vicinity of surfaces Behaviour of electric induction **D** in the vicinity of surfaces Behaviour of electric current volume density **J** in the vicinity of surfaces Electric field strength behaviour **E** in the vicinity of surfaces Magnetic field strength behaviour **H** in the vicinity of surfaces		2
CHAPTER 5. ELECTROMAGNETIC FIELD EQUATIONS Electrostatic regime		2
Electrokinetic regime		2
Stationary magnetic regime		2
Quasi-stationary electromagnetic regime		2
General variable electromagnetic regime		2
CHAPTER 6. PRINCIPLE OF ELECTROMAGNETIC FIELD HEATING		3
Mechanism of induction heating		2
Mechanism of heating in R.F.		3
Bibliography		

1.T. Leuca, F. I. Hantila, L. Bandici, C Molnar "Basics of Electrical Engineering", Mediamira Publishing House, 2007 2.F. Hantila, T. Leuca, C. Ifrim, "Electrotehnica teoretica", vol. I, Electra Publishing House, 2002, 3.F. Hantila, "Magnetic field in structures with permanent magnets", Electra Publishing House, 2004.		
8.2 Project	Teaching methods	No. of hours/ Observations
1. Presentation of the FEMM programming language	Free exposition, with presentation of how to solve the problems on the board	2
2. Modeling electromagnetic fields in electrostatic regime/modeling Laplacian fields using FEMM		2
3. Modeling the electromagnetic field in steady and variable magnetic regime using FEMM		2
4. Presentation of the Flux 2D programming package. Electromagnetic field modelling to solve thermal field problems in induction heating processes.		2
5. Electromagnetic field modelling to solve thermal field problems in high-frequency electromagnetic heating processes.		2
6. Presentation of the HFSS programming package. Electromagnetic field modelling in microwave heating processes.		2
7. Verification of acquired knowledge and conclusion of the seminar situation		2
Bibliography 1.T. Leuca, F. I. Hantila, L. Bandici, C Molnar "Basics of Electrical Engineering", Mediamira Publishing House, 2007 2.F. Hantila, T. Leuca, C. Ifrim, "Electrotehnica teoretica", vol. I, Electra Publishing House, 2002, 3.F. Hantila, "Magnetic field in structures with permanent magnets", Electra Publishing House, 2004.		

* The content, i.e. the number of hours allocated to each course/seminar/workshop/project during the 14 weeks of each semester of the academic year will be detailed.

9. Corroboration of the contents of the discipline with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the program

- The content of the subject is adapted and meets the requirements of the labour market, being agreed by social partners, professional associations and employers in the field related to the study programme.

10. Assessment

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight of the final grade
10.4 Course	- for a mark of 5, knowledge of the fundamental concepts required in the subjects is required, without giving details of them - for a mark of 10, detailed knowledge of all the topics is required	Written exam Students each receive a form with 3 theory topics and an application.	70%
10.5 Project	- minimum knowledge of problem solving is required for grade 5.		30%
10.6 Minimum Performance Standard			
- Critically evaluate the strategic performance of teams. - Demonstrate autonomy in choosing a learning route and demonstrate understanding of learning processes. - Communicating project outcomes, methods and key principles to specialist and non-specialist audiences using appropriate techniques. - Observing carefully, reflecting and taking action to change social norms and interpersonal relationships. - Solving problems by integrating complex, sometimes incomplete, sources of information in new and unfamiliar contexts. - Demonstrate experience in operational interactions for change management in a complex context. - Demonstrate an active attitude towards a range of social, scientific and ethical issues arising in work or study			

Completion date:
28.08.2023
Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:
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SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject		**Technical electromagnetism**					
2.2 Holder of the subject		prof.PhD.eng.Hathazi Francisc – Ioan					
2.3 Holder of the academic seminar/laboratory/project		--- / lecturer PhD eng. Arion Mircea – Nicolae / lecturer PhD eng. Novac Cornelia – Mihaela					
2.4 Year of study	I	2.5 Semester	I	2.6 Type of the evaluation	Ex.	2.7 Subject regime	Imposed / Synthesis discipline (I/DSI)

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	5	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	- / 2 / 1
3.4 Total of hours from the curriculum	70	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	- / 28/14

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	15
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	15
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	15
Tutorials	
Examinations	10
Other activities.	---

3.7 Total of hours for individual study	**55**
3.9 Total of hours per semester	**80**
3.10 Number of credits	**5**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Electromagnetic field theory, superconductors and superconducting systems Electrotechnical Materials, Microwave Technology, Electrothermal
4.2 related to skills	Competences corresponding to the first 3 years of preparation for the degree in Electrical Engineering

5. Conditions (where applicable)

5.1. for the development of the course	The course can be taken face-to-face or online. Laptop, video projector, magnetic board, free speech.
5.2.for the development of the academic seminary /laboratory/project	- / The laboratory can be carried out face to face or online. Computer network with workstation for each student, access to software that is studied in the course, network access to the Internet / Project can be carried out face to face or online. Computer network with workstation for each student, access to software that is studied in the course, network access to the Internet

6. Specific skills acquired

Professional skills	• C.1. Ensuring skills in the field of electromagnetic field study, at a higher level with direct applicability in technical design, especially in matters of energy quality assurance; • C.3. Analysis and development of applications for optimizing industrial processes of electricity using specific software

Transversal skills	• CT1 – Identify the objectives to be achieved, the available resources, the conditions for their completion, the working stages, the working times, the deadlines and the related risks; • CT2 – Identify roles and responsibilities in a multidisciplinary team and apply effective relationship techniques and teamwork;

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	• Completing and developing the knowledge of electromagnetism, emphasizing the technical aspects of the studied problems. Creative approach to advanced engineering problems in the field of electrical engineering.
7.2 Specific objectives	• Ability to apply the notions of mathematics to solving physics problems. Knowledge of experimental data processing and numerical simulation.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1 – Electromagnetic field. Maxwell's equations. Laws of material. Electrodynamic potentials. Lorentz calibration condition. Electromagnetic field energy. Poynting vector. Boundary conditions for electromagnetic field components.	Laptop, video projector, IQ Board, free speech	4
2 – Electromagnetic waves in ideal environments. Helmholtz equation. Where spherical. Where plane harmonics. The structure of the plane harmonic wave. Polarization of electromagnetic waves.	Laptop, video projector, IQ Board, free speech	3
3 – Electromagnetic wave in homogeneous, isotropic and absorbent media. Microscopic theory of dispersion and absorption. Skin effect.	Laptop, video projector, IQ Board, free speech	3
4 – Electromagnetic wave in anisotropic media.	Laptop, video projector, IQ Board, free speech	3
5 – Technical conditions for the correct formulation of an electromagnetic field problem: Technical boundary conditions. Sources. Coupled issues.	Laptop, video projector, IQ Board, free speech	3
6 – Electrostatic models: Scalar electric potential. Boundary conditions for scalar electric potential. Potential equipment. Capacity calculation. Model approximations.	Laptop, video projector, IQ Board, free speech	3
7 – Electrokinetic models: Scalar and vector electric potentials. Boundary conditions for scalar and vector electric potentials. Potential equipment. Field lines. Calculation of losses and resistances. Coupling with heating problems. Model approximations. 2D structures.	Laptop, video projector, IQ Board, free speech	3
8. Stationary magnetic field models: Scalar and vector magnetic potential. Boundary conditions for the vector magnetic potential. Calculation of magnetic field energy, inductances and forces. Model approximations.	Laptop, video projector, IQ Board, free speech	3
9. Quasi-magnetic field models: Vector magnetic potential. The complete equation of eddy currents. Calculation of eddy current losses. Coupling with heating problems. Model approximations. 2D structures.	Laptop, video projector, IQ Board, free speech	3

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1. Francisc Ioan Hathazi, Vasile Darie Șoproni, Mircea Nicolae Arion, Carmen Otilia Molnar, Supraconductori și sisteme supraconductoare. Fenomenul supraconductibilității și a diamagnetismului perfect, Editura Universității din Oradea, ISBN 978 – 606 – 10 – 1854 – 3, 2016, 2016;
2. Francisc Ioan Hathazi, Mircea Nicolae Arion, Vasile Darie Șoproni, Carmen Otilia Molnar, Elemente de teoria circuitelor electrice. Note de curs, Editura Universității din Oradea, ISBN 978 – 606 – 10 – 1855 – 0, 2016,
3. F.Hantila, T.Leuca, C.Ifrim, "Electrotehnică teoretica", vol. I, Editura Electra, 2002, ISBN 973-8067-69-3;
4. F.Hantila, "Câmpul magnetic în structuri cu magneți permanenți", Editura Electra, 2004, ISBN 973-7728-22-X;
5. F.Hantila, M.Vasiliu, "Campul electromagnetic variabil in timp", Editura Electra, 2005, ISBN 973-7728-48-3;
6. Simion, E. - Interferenta Electromagnetica. Ed. Casa Cartii de Stiinta, Cluj-Napoca, 1999;
7. Munteanu, C., Topa, V., Grindei, L., Advanced Numerical Computation Methods in EMC, Ed. Casa Cărţii de Ştiinţă, Cluj-Napoca, 2001.

8.2. Seminar	Teaching methods	No. of hours/ Observations

8.3. Laboratory	Teaching methods	No. of hours/ Observations
1. Laboratory presentation. Introducing and familiarizing	Free speech, use of computer network	2

students with numerical simulation programs for 2D and 3D electromagnetic field problems	from the laboratory equipment	
2. Introduction to the 2D FEMM Simulator 4.2	Free speech, use of computer network from the laboratory equipment	2
3. Numerical analysis of the electromagnetic field in electrostatic regime in 2D structures. Rectangular capacitor application	Free speech, use of computer network from the laboratory equipment	2
4. Numerical analysis of the electromagnetic field in electrostatic regime in 2D structures. Application of capacity calculation between two power lines	Free speech, use of computer network from the laboratory equipment	2
5. Numerical analysis of the electromagnetic field in stationary magnetic regime in 2D structures. Application of the calculation of an electromagnet	Free speech, use of computer network from the laboratory equipment	2
6. Numerical analysis of the electromagnetic field in stationary magnetic regime in 2D structures. Application of induction heating of semi-finished products	Free speech, use of computer network from the laboratory equipment	2
7. Numerical analysis of the electromagnetic field in stationary magnetic regime in 2D structures. Three-phase transformer application	Free speech, use of computer network from the laboratory equipment	2
8. Numerical analysis of the electromagnetic field in stationary magnetic regime in 2D structures. Magnetic bearing application	Free speech, use of computer network from the laboratory equipment	2
9. Introduction to ANSYS 3D Simulator	Free speech, use of computer network from the laboratory equipment	2
10. Numerical analysis of the electromagnetic field in electrostatic regime in 3D structures. Capacity calculation application	Free speech, use of computer network from the laboratory equipment	2
11. Numerical analysis of the electromagnetic field in electrostatic regime in 3D structures. Application of the calculation of an electromagnet	Free speech, use of computer network from the laboratory equipment	2
12. Numerical analysis of the electromagnetic field in electrostatic regime in 3D structures. Electromagnetic induction heating application	Free speech, use of computer network from the laboratory equipment	2
13. Numerical analysis of the electromagnetic field in electrostatic regime in 3D structures. Electromagnetic induction heating application	Free speech, use of computer network from the laboratory equipment	2
14. Checking the knowledge gained and concluding the situation in the laboratory. Recovery of laboratory works.	Free speech, use of computer network from the laboratory equipment	2

Bibliography

1. Francisc Ioan Hathazi, Vasile Darie Șoproni, Mircea Nicolae Arion, Carmen Otilia Molnar, Supraconductori și sisteme supraconductoare. Fenomenul supraconductibilității și a diamagnetismului perfect, Editura Universității din Oradea, ISBN 978 – 606 – 10 – 1854 – 3, 2016, 2016;
2. Francisc Ioan Hathazi, Mircea Nicolae Arion, Vasile Darie Șoproni, Carmen Otilia Molnar, Elemente de teoria circuitelor electrice. Note de curs, Editura Universității din Oradea, ISBN 978 – 606 – 10 – 1855 – 0, 2016,
3. F.Hantila, T.Leuca, C.Ifrim, "Electrotehnică teoretica", vol. I, Editura Electra, 2002, ISBN 973-8067-69-3;
4. F.Hantila, "Câmpul magnetic în structuri cu magneți permanenți", Editura Electra, 2004, ISBN 973-7728-22-X;
5. F.Hantila, M.Vasiliu, "Campul electromagnetic variabil in timp", Editura Electra, 2005, ISBN 973-7728-48-3;
6. Simion, E. - Interferenta Electromagnetica. Ed. Casa Cartii de Stiinta, Cluj-Napoca, 1999;
7. ***, Manual FEMM 4.2 și aplicații.
8. ***,Documentație Softul profesional ANSYS 3D;

8.4. Project	Teaching methods	No. of hours/ Observations
1. Recapitulation of knowledge of the Matlab programming language and presentation of the Mathcad programming language	Free exposure, with a presentation on how to solve problems on the board or online	2
2. Realization of the mathematical calculation and implementation in Matlab (Matcad) of the intensity of the magnetic field in an external point located at the distance x from the axis of an infinitely long rectilinear conductor traveled by the current i and located in the air.	Free exposure, with a presentation on how to solve problems on the board or online	2
3. Calculate the intensity of the magnetic field at a point on the axis of symmetry of a circular plane of radius a, traversed by	Free exposure, with a presentation on how to solve problems on the	2

the current I. Graph its variation as a function of the distance from the plane of the coil and calculate the maximum value of the intensity magnetic field. (Use Matlab or Matcad)	board or online	
4. Calculate the inductance of a single-phase line with the distance between the axes of the conductors equal to d and the radius a using Matlab or Matcad.	Free exposure, with a presentation on how to solve problems on the board or online	2
5. Mathematical calculation and implementation in Matlab (Matcad) of the inductance of an N-coil coil which is uniformly wound on a rectangular section tor (the material of which the tor is composed is linear and has magnetic permeability m.)	Free exposure, with a presentation on how to solve problems on the board or online	2
6. Calculation of the scattering inductances of two identical cylindrical coils placed on a closed magnetic core. (The two coils are flowing in the opposite direction). (Use Matlab or Matcad)	Free exposure, with a presentation on how to solve problems on the board or online	2
7. Teaching and supporting projects.	Free exposure, with a presentation on how to solve problems on the board or online	2

Bibliography

1. Francisc Ioan Hathazi, Mircea Nicolae Arion, Vasile Darie Șoproni, Carmen Otilia Molnar, Elemente de teoria circuitelor electrice. Note de curs, Editura Universității din Oradea, ISBN 978 – 606 – 10 – 1855 – 0, 2016,
2. F.Hantila, T.Leuca, C.Ifrim, "Electrotehnică teoretica", vol. I, Editura Electra, 2002, ISBN 973-8067-69-3;
3. T.Leuca, M. Novac, Chestiuni speciale de electrotehnica, Curs in format electronic.
4. ***, "*MATLAB User Guide*", The Mathworks
5. Cira, O., Lecţii de Mathcad 2001 Proffesional, Ed. Albastră, Cluj-Napoca, 2006
6. M. Ghinea, V. Fireţeanu, - " Matlab calculul numeric-grafică-aplicaţii.", Editura Teora, 1997.
7. Ivanov, Virginia, Aplicaţii în Mathcad şi Matlab, vol. I, Ed. Universitaria, Craiova, 2007.

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline is in accordance with what is taught in other profile faculties both from the University of Oradea and from other university centers in the country and abroad. For a better adaptation to the requirements of the labor market of the content of the discipline, meetings were held both with representatives of the business environment and with teachers from pre-university education.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Oral examination	The evaluation can be done face-to-face or online. Oral examination of students	50 %
10.5 Seminar	-	-	-
10.6 Laboratory	Final evaluation test	The evaluation can be done face-to-face or online. Oral examination of students	20 %
10.7 Project	Oral examination	Oral examination - Project presentation	30%

10.8 Minimum performance standard:

- Carrying out the works under the coordination of a teacher, in order to solve specific problems in the electrical field with the correct evaluation of the workload, resources available for the necessary time to complete the risks, under the conditions of application of occupational safety and health norms.

Completion date:
28.08.2023

Date of endorsement in the department:
29.08.2023

Date of endorsement in the Faculty Board:
29.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced systems in electrical engineering / Master degree

2. Data related to the subject

2.1 Name of the subject				COMPUTERISED ELECTRICAL EQUIPMENTS			
2.2 Holder of the subject				Popa Monica			
2.3 Holder of the academic seminar/laboratory/project				Popa Monica			
2.4 Year of study	II	2.5 Semester	III	2.6 Type of the evaluation	Ex	2.7 Subject regime	I

(I) Imposed; (O) Optional;

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	3	of which: 3.2 course	1	3.3 academic laboratory	2
3.4 Total of hours from the curriculum	42	of which: 3.5 course	14	3.6 academic laboratory	28

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	20
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	20
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	22
Tutorials	4
Examinations	3
Other activities.	

3.7 Total of hours for individual study	**69**
3.9 Total of hours per semester	**125**
3.10 Number of credits	**5**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Electrical installations, Electrical devices
4.2 related to skills	Computer operation

5. Conditions (where applicable)

5.1. for the development of the course	on-site
5.2. for the development of the academic laboratory	on-site Computers and software packages, intelligent relays

6. Specific skills acquired	
Professional skills	**C2** Use of modern acquisition techniques, data processing and their use in complex equipment systems in electrical engineering **C3** Analysis and development of applications for optimizing industrial processes of electrical engineering using specific software
Transversal skills	

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	▪ Integration of intelligent equipments in electrical installations
7.2 Specific objectives	▪ Programing of intelligent equipments ▪ Choosing the intelligent equipments and their integration in complex installations

8. Contents *

8.1 Course	Teaching methods	No. of hours/ Observations
1. Basics of programmable equipments	notes on blackboard, Power Point presentation	2
2. Fundamentals of programming in ladder language. Ladder diagrams	notes on blackboard, Power Point presentation	2
3. FBD language(functional block diagram). Developing of complex applications.	notes on blackboard, Power Point presentation	2
4. Intelligent relays – basics and their programming	notes on blackboard, Power Point presentation	2
5. Applications of AP in electrical installations. Communication betwwens comutation equipments HMI (human machine interface)	notes on blackboard, Power Point presentation	2
6. Principles and local area networks technologies. LAN standards.	notes on blackboard, Power Point presentation	2
7. Wireless technologies in electrical installations..	notes on blackboard, Power Point presentation	2

Bibliografie 1. Monica Popa – Course notes, **http://webhost.uoradea.ro/mpopa/** 2. Shengwei Wang – Intelligent buildings and building automation, Spoon Press New York 2010 3. Equipments user guide 4. Web resources		
8.3 Laboratory	Teaching methods	No. of hours/ Observations
L1, L2 – Ladder language presentation and the intelligent equipments in the laboratory	assisting the students in solving applications on computer	4
L3 – AAR – two or three sources	assisting the students in solving applications on computer	2
L4 – Applications in lighting control	assisting the students in solving applications on computer	2
L5 – The temperature and ventilation control in a green house	assisting the students in solving applications on computer	2
L6 – Monitoring the access in a car parking	assisting the students in solving applications on computer	2
L7 – Control of a tank systems	assisting the students in solving applications on computer	2
L8 – Control of a pumping group	assisting the students in solving applications on computer	2
L9 – Control af three transportors belts	assisting the students in solving applications on computer	2
L10 – Cotrol of an irrigation system	assisting the students in solving applications on computer	2
L11- Control af a feeding system in a pharm	assisting the students in solving applications on computer	2
L12 – Control of a mixing system	assisting the students in solving applications on computer	2
L13 – Remote control of a pumping station	assisting the students in solving applications on computer	2
L14 – Evaluation of laboratory activity	final verification of applications	2

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the subject is in accordance with the one in other national or international universities. In order to provide a better accomodation to the labour market requirements, there have been organized meetings both with representatives of the socio-economic environment and with academic staff with similar professional interest fields.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Ability to solve a CAD	Oral examination	80%

	application	Application on computer	
10.5 Laboratory	Solving the tasks	Activity at laboratory classes	20%
10.6 Minimum performance standard:			
Passing the subject - grade ≥ 5.			

Completion date: Signature of subject holder Signature of academic laboratory holder

28.08.2023 Assoc. Prof. Monica Popa
E-mail: mpopa@uoradea.ro

Assoc. Prof. Monica Popa

Date of endorsement in the department: Signature of Department Head

29.08.2023 Lecturer. Mircea Nicolae Arion
E-mail: mnarion@gmail.com

Date of endorsement in the Faculty Board: Signature of Dean

29.09.2023 Prof. Francisc – Ioan Hathazi
E-mail: francisc.hathazi@gmail.com

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject	**ENERGY CONVERSION AND USE SYSTEMS**						
2.2 Holder of the subject	**S. l. dr. ing. TOMSE MARIN TITUS**						
2.3 Holder of the academic seminar/laboratory/project							
2.4 Year of study	II	2.5 Semester	3	2.6 Type of the evaluation	Ex.	2.7 Subject regime	THD

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-/
3.4 Total of hours from the curriculum	28	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-

Distribution of time	47 hours
Study using the manual, course support, bibliography and handwritten notes	24
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	8
Tutorials	2
Examinations	3
Other activities.	-

3.7 Total of hours for individual study	**47**
3.9 Total of hours per semester	**75**
3.10 Number of credits	**3**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Static Converters, Renewable sources
4.2 related to skills	Competences corresponding to the first year of preparation for the master in Advanced Systems in Electrical Engineering.

5. Conditions (where applicable)

5.1. for the development of the course	Interactive lectures using multi-media technology. The presence of students at courses is not mandatory, but is registered by the teacher in charge of the course, for the correct evaluation of students at the end of the course.
5.2.for the development of the academic seminary/laboratory/project	Attendance at the project is mandatory. It is necessary to study the bibliography.

6. Specific skills acquired	
Professional skills	C5. Design of equipment in the field of electrical engineering and systems for the conversion and use of unconventional sources.
Transversal skills	

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The course presents the fundamental aspects of the possibilities of conversion and use of electricity having as primary source renewable energies.
7.2 Specific objectives	- Presentation of the principles of conversion and use of electricity having as primary source renewable energies. - Knowledge, understanding and interpretation of aspects regarding the configurations of energy converters used in the field of renewable energies and their control methods. - Analysis of energy conversion circuits using specialized software; - Preparation of a project in the field of renewable energy use

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
Chapter 1. Introduction. Renewable energy sources. Renewable energy sources in the global energy balance. Conversion of renewable energies into electricity. The need to change the parameters of the electricity obtained for the supply of various consumers or for injection into the supply network.	Interactive lecture + video projector / Online	2
Chapter 2. Solar energy conversion. Characteristics of solar radiation. Indirect conversion of solar energy into electricity. Solar power plants.	Interactive lecture + video projector / Online	2
Direct conversion of solar energy into electricity. Photovoltaic cells. Components of photovoltaic systems. Examples	Interactive lecture + video projector / Online	2
Chapter 3. Power converters used for solar energy conversion. DC-AC converters for photovoltaic systems. Single phase inverters. Three-phase inverters.	Interactive lecture + video projector / Online	2
DC-DC converters for photovoltaic systems. Converters c.c. - c.c. without insulation Converters c.c. - c.c. with insulation. Maximum power transfer to solar installations	Interactive lecture + video projector / Online	2
Chap.4. Wind energy conversion. Evaluation of wind potential. Wind turbines	Interactive lecture + video projector / Online	2
Wind energy conversion systems. Variants of electronic power converters for wind systems.	Interactive lecture + video projector / Online	2
CA-CA converters for wind systems.	Interactive lecture + video projector / Online	2
Electronic control of wind systems. Power control. Power converter control. Network synchronization.	Interactive lecture + video projector / Online	2
Chapter 5. Hybrid power generation systems.	Interactive lecture + video projector / Online	2
Chapter 6. Circuits for charging, monitoring and protecting the batteries needed to store electricity.	Interactive lecture + video projector / Online	2
Chapter 7. Power filters to eliminate harmonics generated by energy conversion circuits. Passive filter. Active filters. Protection of equipment against disturbances.	Interactive lecture + video projector / Online	2
Chapter 8. Conversion of geothermal energy into electricity.	Interactive lecture + video projector / Online	2
Chapter 9. Conversion from other renewable energy sources to electricity. Power generation using hydrogen engines. Nuclear energy. Electronic power circuits required for such applications.	Interactive lecture + video projector / Online	2
Bibliography		

1. Marin Tomşe – Sisteme de conversie și utilizare a energiei electrice. https://prof.uoradea.ro/mtomse 2. Victor Dragan, Victor Buchiu - Energiile regenerabile si utilizarea acestora, Editura Ceres, București, 2012. 3 Nicu Bizon – Sisteme optimizate pentru conversia energiei curate, Editura Matrix Rom, București, 2018. 4. Vatra Fanica, ș.a. - Integrarea si functionarea centralelor eoliene si a instalatiilor fotovoltaice in sistemul electroenergetic, Editura S.I.E.R., București, 2012, 5. Site-uri Internet cu informație specifică surselor de energie regenerabile și a convertoarelor de putere.

8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline is in accordance with what is taught in other faculties of electrical profile both from the University of Oradea and from other university centers in the country and abroad. For a better adaptation to the labor market requirements of the content of the discipline, meetings were held with representatives of the industrial and business environment in Bihor.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	1. The level and quality of acquired knowledge reflected in the answers to the exam. 2. Activity during the semester + course reports	Written exam / Online assessment (Online questionnaire)	80% 20% 20% of the mark for the laboratory is awarded for the successful completion of the individual study topic
10.5 Academic seminar			-
10.6 Laboratory			
10.7 Project			
10.8 Minimum performance standard: Course - Requirements for grade 5 :: Knowledge of the topologies and operating principles of electronic power converters for the conversion of solar and wind energy into electricity. Ability to analyze an electronic power structure in parallel with the related waveforms; Knowledge of the position of electronic power converters in various controlled processes or systems.			

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject	**ENERGY CONVERSION AND USE SYSTEMS - PROJECT**						
2.2 Holder of the subject	**S. l. dr. ing. TOMSE MARIN TITUS**						
2.3 Holder of the academic seminar/laboratory/project							
2.4 Year of study	II	2.5 Semester	3	2.6 Type of the evaluation	Vp.	2.7 Subject regime	THD

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course		3.3 academic seminar/laboratory/project	-/-/2
3.4 Total of hours from the curriculum	28	Of which: 3.5 course		3.6 academic seminar/laboratory/project	-/-/28

Distribution of time	36 hours
Study using the manual, course support, bibliography and handwritten notes	
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	20
Tutorials	2
Examinations	4
Other activities.	-

3.7 Total of hours for individual study	**36**
3.9 Total of hours per semester	**50**
3.10 Number of credits	**2**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Static Converters, Renewable sources, Energy conversion and use systems
4.2 related to skills	Competences corresponding to the first year of preparation for the master in Advanced Systems in Electrical Engineering.

5. Conditions (where applicable)

5.1. for the development of the course	Interactive lectures using multi-media technology. The presence of students at courses is not mandatory, but is registered by the teacher in charge of the course, for the correct evaluation of students at the end of the course.
5.2.for the development of the academic seminary/laboratory/project	Attendance at the project is mandatory. It is necessary to study the bibliography.

6. Specific skills acquired	
Professional skills	C5. Design of equipment in the field of electrical engineering and systems for the conversion and use of unconventional sources.
Transversal skills	

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The course presents the fundamental aspects of the possibilities of conversion and use of electricity having as primary source renewable energies.
7.2 Specific objectives	- Presentation of the principles of conversion and use of electricity having as primary source renewable energies. - Knowledge, understanding and interpretation of aspects regarding the configurations of energy converters used in the field of renewable energies and their control methods. - Analysis of energy conversion circuits using specialized software; - Preparation of a project in the field of renewable energy use

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
Presentation of the proposed project themes. Details regarding the realization of the project. Choosing the design theme.	Lecture interactive / Online	2
Presentation of some theoretical and practical notions necessary for the realization of the projects.	Lecture interactive / Online	2
Discussions on project initiation, search and use of bibliography.	Interactive lecture, individual work / Online	2
Realization of projects (during this period the student goes through the necessary stages to realize the project under the guidance of the teacher).	Interactive lecture, individual work / Online	6
Presentation of projects. Discussions. Final remarks on the projects. Scoring them.	Interactive / Online Lecture	2
Topic1. Design of a power supply system using photovoltaic panels. Theme 2. Power supply of a modern weather station using wind energy. Theme 3. The car of the future: clean life = clean energy. Electric car based on solar panels Theme 4. Power supply of a mountain hut using the hydrographic potential of the area. Theme 5. Design of a static converter for connecting photovoltaic panels to the power supply. Topic 6. Study of a photovoltaic plant using MATLAB / Simulink		

1. Marin Tomșe – Sisteme de conversie și utilizare a energiei electrice. https://prof.uoradea.ro/mtomse
2. Victor Drăgan, Victor Buchiu - Energiile regenerabile si utilizarea acestora, Editura Ceres, București, 2012.
3 Nicu Bizon – Sisteme optimizate pentru conversia energiei curate, Editura Matrix Rom, București, 2018.
4. Vatra Fănică, ș.a. - Integrarea si funcționarea centralelor eoliene si a instalațiilor fotovoltaice in sistemul electroenergetic, Editura S.I.E.R., București, 2012.
5. Surse regenerabile de energie - http://ener-supply.eu/downloads/ENER_handbook_ro.pdf,
6. Site-uri Internet cu informație specifică surselor de energie regenerabile și a convertoarelor de putere.

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline is in accordance with what is taught in other faculties of electrical profile both from the University of Oradea and from other university centers in the country and abroad. For a better adaptation to the labor market requirements of the content of the discipline, meetings were held with representatives of the industrial and business environment in Bihor.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course			
10.5 Academic seminar			-
10.6 Laboratory			
10.7 Project	1. The activity carried out and the verification along the way of the realization of the project 2. The result of the final evaluation of the project	Tests in progress / Online Presentation and support of the project / Online	30% 50% 20% of the mark for the laboratory is awarded for the successful completion of the individual study topic
10.8 Minimum performance standard: Project - Requirements for grade 5 :: Correct choice of power converter configuration required to achieve the chosen project theme. - Knowledge of the main relationships for their sizing. A coherent project structure.			

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Advanced systems in electrical engineering / Master degree

2. Data related to the subject

2.1 Name of the subject	Optimization in electrical engineering						
2.2 Holder of the subject	Assoc. prof. Pasca Sorin						
2.3 Holder of the academic seminar/laboratory/project							
2.4 Year of study	2	2.5 Semester	3	2.6 Type of the evaluation	Ex - Exam	2.7 Subject regime	Specialized Discipline

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-/-/-
3.4 Total of hours from the curriculum	28	of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-/-/-

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	28
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	16
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	-
Tutorials	-
Examinations	3
Other activities.	-

3.7 Total of hours for individual study	47
3.9 Total of hours per semester	75
3.10 Number of credits	3

4. Pre-requisites (where applicable)

4.1 related to the curriculum	(Conditions) -
4.2 related to skills	-

5. Conditions (where applicable)

5.1. for the development of the course	Teaching activities will take place face to face. The existing multimedia facilities in the classroom are used, i.e. laptop and video projector or smart board. The presentation of the course is accompanied by additional explanations on the classical board.
5.2.for the development of the academic seminary/laboratory/project	

6. Specific skills acquired

Professional skills	C3. Analysis and development of applications for optimizing industrial processes of electrical engineering using specific software
Transversal skills	

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	▪ Knowledge of optimization methods / techniques applicable in electrical engineering and how they can be applied in order to increase the efficiency or improve the operating parameters of electrical devices, equipment or electrical installations
7.2 Specific objectives	▪ Analysis of energy indicators and operating parameters of some installations and equipment for electric power use ▪ Learning the basic principles and notions regarding the optimization techniques applicable in the field of electrical engineering ▪ Identification, correct setting and initiation in solving optimization problems in electrical engineering ▪ Ability to develop optimal design algorithms ▪ Development of skills regarding the use of specific software

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introduction to optimization issues. Short history. Classification of optimization problems. Optimization and optimal design / synthesis	Presentation with video-projector and additional explanations on the blackboard	2
2. Optimization problems in engineering - examples. Formulation of optimization problems. Obtaining the mathematical model		2
3. Identification of optimization problems, respectively optimal design, in electrical engineering. Energetic parameters of electrothermal installations with resistors. General balance of powers and efficiency of the resistance furnace. Optimality conditions.		2
4. Identification of optimization problems, respectively optimal design, in electrical engineering. Energetic parameters of electromagnetic induction heating systems. The efficiency of induction furnaces. Optimality conditions		2
5. One-dimensional minimization. Zero-order algorithms based on search methods		2
6. One-dimensional minimization. First order algorithms based on polynomial approximation methods		2
7. Multidimensional minimization. Zero order deterministic methods. The descending simplex method. Powell method		4
8. Multidimensional minimization. First order deterministic methods. Conjugate gradient method. Quasi-Newtonian method		4
9. Multidimensional minimizations. Stochastic optimization methods. Genetic algorithms		4
10. Applications – examples. Application 1 - Aspects regarding the optimal design of power transformers. Optimization of the magnetic core section		2
11. Applications - examples Application 2 - Aspects of the optimal design of a graphite crucible induction furnace		2

Bibliography (selection)

1. C.I. Mocanu – Electromagnetic Field Theory (in Romanian), Didactic and Pedagogical Publishing House, Bucharest, 1981
2. D. Comsa – Electrothermal Industrial Installations, Technical Publishing House, Bucharest, 1986
3. I. Sora, N. Golovanov – Electrothermal and electrotechnologies (in Romanian), Vol. I,II, Technical Publishing House, Bucharest, 1998,1999
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6. G. Ciuprina, D. Ioan, I. Munteanu, M. Rebican, R. Popa – Numerical optimization of electromagnetic devices (in Romanian), Printech Publishing, Bucharest, 2002
7. S. S. Rao – Engineering Optimization. Theory and Practice, John Wiley & Sons, Inc., 2009
8. M. Rudnicki, A. Savini (eds.) – Optimization and Inverse Problems in Electromagnetism, Kluwer Academic Publishers, 2003
9. P. Neittaanmäki, M. Rudnicki, A. Savini – Inverse Problems and Optimal Design in Electricity and Magnetism, Claredon Press, Oxford, 1996
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11. Mohamed Bakr – Nonlinear Optimization in Electrical Engineering with Applications in MATLAB, The Institution of Engineering and Technology IET, London, 2013
12. I. Necoara – Numerical optimization methods (in Romanian), Politehnica Publishing Press, Bucharest, 2013
13. E. Vladu, T. Leuca – Using genetic algorithms in the synthesis of electromagnetic devices (in Romanian), Rev. EEA Electrotehnica, No. 1, 2004
14. T. Leuca, E. Vladu, M. Popa – Using genetic algorithms in optimal design of electromagnetic devices, Revue Roumaine des Sciences Techniques – Electrotechnique et Energetique, 49, 3, pp. 319-327, Bucharest, 2004
15. I. Necoara, A. Patrascu, D. Clipici – Numerical optimization methods. Problems (in Romanian), Politehnica Publishing Press, Bucharest, 2013
16. G. Ciuprina – Study of the electromagnetic field in nonlinear media. Contributions on optimization of nonlinear electromagnetic devices, PhD thesis (in Romanian), University Politehnica of Bucharest, 1998
17. M. Popa – Contributions regarding the numerical modeling of the heating in transversal magnetic flux, PhD thesis (in Romanian), University of Oradea, 2001
18. S. Pasca – Contributions regarding the numerical modeling of the electrothermal processes in crucible induction furnaces, PhD thesis (in Romanian), University of Oradea, 2004
19. M. Tomse, S. Pasca – Optimization of Magnetic Pulse Forming Installations Based on PSPICE Model of Equivalent Electrical Circuit, Nonconventional Technologies Review, ISSN 1454-3087, vol. XIV, no. 4/2010, pp. 59-66, 2010
20. E. Vladu, M. Tomse, S. Pasca – Using Genetic Algorithms for Optimization of Magnetic Pulse Forming Installations Based on PSPICE Model, Journal of Electrical and Electronics Engineering, No. 1/2009, Part I Electrical Engineering, ISSN 1844-6035, p. 104-108, 2009
21. V. Fireteanu, M. Popa, S. Pasca – Optimal Parameters of One-side Traveling Field Inductors for Stirring and Pumping Applications, International Scientific Colloquium "Modeling for Electromagnetic Processing" MEP 2008, Hannover, Germany, Proceedings, ISBN 978-3-00-026003-2, p. 223-228, 2008
22. S. Pasca – Optimization în electrical engineering - lecture notes (in Romanian), (electronic)

8.2 Project	Teaching methods	No. of hours/ Observations

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the subject is in accordance with the one in other national or international universities. In order to provide a better accomodation to the labour market requirements, there have been organized meetings both with representatives of the socio-economic environment and with academic staff with similar professional interest fields.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	- Exam Grade E	Written or oral exam, at the students' choice. The exam consists in solving two topics from the course topic.	100 %
10.6 Project			
10.8 Minimum performance standard: - Passing the exam (obtaining the credits) assumes E $\geq$ 5			

Completion date: 28.08.2023

Signature of the course holder

Assoc. prof. Sorin Paşca

E-mail: spasca@uoradea.ro

Date of endorsement in the department: 29.08.2023

Signature of the head of department

Lecturer dr. ing. Mircea-Nicolae Arion

E-mail: mnarion@gmail.com

Date of endorsement in the Faculty Board: 29.09.2023

Signature of the dean

Prof. habil. Francisc-Ioan Hathazi

E-mail: francisc.hathazi@gmail.com

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master
1.6 Study program/Qualification	Advanced systems in electrical engineering

2. Data related to the subject

2.1 Name of the subject				OPTIMIZATION IN ELECTRICAL ENGINEERING - PROJECT			
2.2 Holder of the subject				Popa Monica			
2.3 Holder of the academic seminar/laboratory/project				Popa Monica			
2.4 Year of study	II	2.5 Semester	III	2.6 Type of the evaluation	PR	2.7 Subject regime	I

(I) Imposed; (O) Optional;

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	2	of which: 3.2 course		3.3 academic project	2
3.4 Total of hours from the curriculum	28	of which: 3.5 course		3.6 academic project	28

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	4
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	6
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	8
Tutorials	2
Examinations	2
Other activities.	

3.7 Total of hours for individual study	**22**
3.9 Total of hours per semester	**50**
3.10 Number of credits	**2**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Computer aided design
4.2 related to skills	Computer operation

5. Conditions (where applicable)

5.1. for the development of the course	on-site
5.2. for the development of the academic laboratory	on-site Computers and software packages Matlab, Flux

6. Specific skills acquired	
Professional skills	C3. Analysis and development of applications for optimizing industrial processes of electrical engineering using specific software C6. Developing leadership skills of specific projects in electrical engineering

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	▪ Knowledge of optimization methods applied in electrical engineering and their use in improving the efficiency of electrical devices
7.2 Specific objectives	▪ Identification and proper formulation of an optimization problem in electrical engineering ▪ Ability to develop algorithms for optimal design ▪ Learning of using specific software packages. ▪ Implementation of an optimal design application

8. Contents *

8.2 Project	Teaching methods	No. of hours/ Observations
Transposing the electrical engineering problems in optimal synthesis problems	Power Point presentation	2
Introductive notions - Matlab Optimization Toolbox	Power Point presentation	2
Solving optimization problems. Using the functions – *fminbnd, fminunc, fminsearch, linprog, fmincon*	computer application	4
Application - optimal problem for the synthesis of a coil	computer application	2
Application - optimal problem for the synthesis of a transverse flux inductor	computer application	4
Presentation of the project subject – optimization of efficiency for an induction heating application	discussions	2
Implementation of the optimization problem	assisting the students in developing the application	10
Results interpretation	discussions	2

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12. Monica Popa – Contribuții privind modelarea numerică a încălzirii în flux magnetic transversal, teză de doctorat, Universitatea din Oradea, 2001
13. Sorin Pașca – Contribuții privind modelarea numerică a proceselor electrotermice din cuptorul de inducţie cu creuzet, teză de doctorat, Universitatea din Oradea, 2004
14. Matlab Optimization Toolbox – User guide, documentation

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the subject is in accordance with the one in other national or international universities. In order to provide a better accomodation to the labour market requirements, there have been organized meetings both with representatives of the socio-economic environment and with academic staff with similar professional interest fields.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods face to face or on-line	10.3 Percent from the final mark
10.5 Project	Solving the tasks	Activity at project classes	100%
10.6 Minimum performance standard:			
Passing the subject - grade ≥ 5.			

Completion date: 28.08.2023

Signature of subject holder

Assoc. Prof. Monica Popa
E-mail: mpopa@uoradea.ro

Signature of academic laboratory holder

Assoc. Prof. Monica Popa

Date of endorsement in the department: 29.08.2023

Signature of Department Head

Lecturer. Mircea Nicolae Arion
E-mail: mnarion@gmail.com

Date of endorsement in the Faculty Board: 29.09.2023

Signature of Dean

Prof. Francisc – Ioan Hathazi
E-mail: francisc.hathazi@gmail.com

SUBJECT DESCRIPTION

1. Data related to the study program

1.1 Higher education institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**Faculty of Electrical Engineering and Information Technology**
1.3 Department	Department of Electrical Engineering
1.4 Field of study	Electrical engineering
1.5 Study cycle	Master (2st cycle)
1.6 Study program/Qualification	Advanced Systems in Electrical Engineering / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject		Techniques and Equipment for Energy Quality					
2.2 Holder of the subject		Assoc. prof. Șoproni Vasile Darie					
2.3 Holder of the academic seminar/laboratory/project		-/ Assoc.prof. Șoproni Vasile Darie/-					
2.4 Year of study	2	2.5 Semester	3	2.6 Type of the evaluation	Exam	2.7 Subject regime	THD Discipline

THD – Thoroughgoing Disciplines

3. Total estimated time (hours of didactic activities per semester)

3.1 Number of hours per week	4	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-/2/-
3.4 Total of hours from the curriculum	56	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-/28/-
Distribution of time					69 hours
Study using the manual, course support, bibliography and handwritten notes					21
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					21
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					14
Tutorials					7
Examinations					6
Other activities.					-

3.7 Total of hours for individual study	**69**
3.9 Total of hours per semester	**125**
3.10 Number of credits	5

4. Pre-requisites (where applicable)

4.1 related to the curriculum	(Conditions) - Knowledge of Electrical Circuit Theory I and II, Electrical Equipment, Electrical Installations, Industrial Automation, Production, Transport and Distribution of Electricity, Use of Electricity, Industrial Energy and Non-Polluting Energy Sources, Modern Electrothermal Systems, Synthesis of Electrical Equipment and Systems
4.2 related to skills	- Adequate selection of the design methodology and the characteristics of the components of the electrical systems

5. Conditions (where applicable)

5.1. for the development of the course	Laptop, video projector, magnetic board, smart board, free speech, online The course can be hold face to face or on-line platform https://e.uoradea.ro/
5.2.for the development of the academic seminary/laboratory/project	Online / computer network with Workstation for each student, access to softwares that is useful in the course, access to the Internet, online / - The laboratory can be hold face to face or on-line platform https://e.uoradea.ro/

6. Specific skills acquired	
Professional skills	C1. Providing skills in the study of the electromagnetic field, at a higher level, with direct application in superior engineering design, particularly in matters concerning the assurance of the quality of energy C4. Use of measurement techniques of electrical and non-electrical quantities and data acquisition systems in electrical systems C5. Equipment design in electrical engineering, design of conversion systems and use of unconventional sources
Transversal skills	CT2. Identification of the roles and responsibilities in a multidisciplinary team and use of relationship and effective working techniques in the team

7. The objectives of the discipline (resulting from the grid of the specific competences acquired)

7.1 The general objective of the subject	The course is addressed to students from the Advanced Systems in Electrical Engineering specialization and aims to present studies on establishing best practices for the conversion of unconventional energies into electrical or thermal energy.
7.2 Specific objectives	Starting from the preconditions imposed by each case, the student will be able to analyse the variations of the monitored parameters, useful for the design of installations for the production of electricity from electro-ecological sources.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1-2. National electricity generation, transmission and distribution network. History, current situation, future trends	Laptop, video projector, free speech. Online	4
3. Structure of electricity distribution networks	Laptop, video projector, free speech. Online	2
4. Performance indicators that characterize continuity in power supply	Laptop, video projector, free speech. Online	2
5. Electricity quality. Overview	Laptop, video projector, free speech. Online	2
6. Technical quality of electricity power	Laptop, video projector, free speech. Online	2
7. Commercial quality of the distribution service	Laptop, video projector, free speech. Online	2
8. Monitoring the quality of the electrical power distribution service	Laptop, video projector, free speech. Online	2

9. Comparative analysis of the electrical power distribution service	Laptop, video projector, free speech. Online	2
10-11. Global energy consumption. Consumption reduction trends; the use of clean energy that provides security, prosperity and environmental protection	Laptop, video projector, free speech. Online	4
12-13. Energy efficiency in industry. Intelligent technologies using integrated projects, innovative methods of replacing coal with natural gas or solar electricity	Laptop, video projector, free speech. Online	4
14. Energy efficient projects using co-generation technologies and energy loss recovery	Laptop, video projector, free speech. Online	2

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[14] Michael Potts, *The Road to the New Era*, Solutions Journal, Rocky Mountain Institute, vol.6, no. 1, 2013, http://www.rmi.org/summer_2013_esj_road_to_new_energy_era_main

8.2 Academic seminar	**Teaching methods**	**No. of hours/ Observations**

8.3 Laboratory	**Teaching methods**	**No. of hours/ Observations**
1.Occupational Safety and Health Administration – technical instruction	On line. Use the equipment provided by the laboratory	2
2. Electric power quality	On line. Use the equipment provided by the laboratory	2
3. Familiarization with the Lucas-Nulle Labsoft UniTrain program dedicated to the analysis of laboratory equipment in the field of electrical engineering that uses renewable energies	On line. Use the equipment provided by the laboratory	2

4. Determining the quality parameters of electricity. Methods for analysing the quality of electrical power	On line. Use the equipment provided by the laboratory	2
5. Measurement techniques. High-performance information acquisition systems. Monitoring the quality of electrical power	On line. Use the equipment provided by the laboratory	2
6-7. Monitoring the operating parameters of a wind farm	On line. Use the equipment provided by the laboratory	4
8-9. Analysis in different operating conditions of the parameters of photovoltaic panels	On line. Use the equipment provided by the laboratory	4
10-11. The study of a wind generator. Qualitative analysis of measured values	On line. Use the equipment provided by the laboratory	4
12-13. Serial, parallel and mixed connection of photovoltaic panels. Methods for optimizing their efficiency	On line. Use the equipment provided by the laboratory	4
14. Calculation of the reduction of harmful gas emissions (reduction of the greenhouse effect) by replacing the conventional system with the studied electro-ecological system.	On line. Use the equipment provided by the laboratory	2

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8. http://www.anre.ro/ Standard de performanta pentru serviciul de distributie a energiei electrice
9. Kiss Geza Levente –Monitorizarea parametrilor de funcționare a unei centrale eoliene de laborator, Disertație, 2013, Coordonator Șoproni Darie
10. Malița Mircea - Simularea funţionării instalaţiilor fotovoltaice cu programul RETScreen considerând orientarea panourilor, Disertație, 2014, coordonator Șoproni Darie
11. Marian Sebastian - Modelarea unui sistem fotovoltaic de microputere, Disertație, 2014, coordonator Șoproni Darie
12. Oraș Vasile - Proiectarea și racordarea unei centrale electrice fotovoltaice la sistemul energetic național, Disertație, 2017, coordonator Șoproni Darie
13. Silaghi Dănuț – Cogenerarea energiei electrice și termice din biogaz, Disertație, 2013, coordonator Șoproni Darie
14. Vlad – Proiectarea și realizarea unui generator eolian, Disertație, 2014, coordonator Șoproni Darie
15. Kotheles Arthur – Metode de reducere a consumului de energie, Disertație, 2014, coordonator Șoproni Darie

9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the subject is in accordance with the one in other national or international universities. In order to provide a better accommodation to the labour market requirements, there have been organized meetings both with representatives of the socio-economic environment and with academic staff with similar professional interest fields.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Exam	Oral examination. On line	75 %
10.5 Academic seminar			
10.6 Laboratory	Realization of all labs applications	Knowledge assessment test. On line	25 %

10.8 Minimum performance standard:

- Carrying out the works under the coordination of a teacher, in order to solve specific problems in the electrotechnical field with the correct evaluation of the workload, the resources available for the necessary time to complete the risks, under the application of occupational safety and health norms.

- Grade components: Exam (Ex), Laboratory (L).
- Evaluation calculation formula: $N = 0.75Ex + 0.25L$;
- Condition for obtaining credits: $N \geq 5$, $L = \geq 5$

Completion date:

Date of endorsement in the department:

Date of endorsement in the Faculty Board: