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 Electronics and Telecommunications**
1.4 Field of study	**Electronical Engeneering, Telecommunications And Information Technologies**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Audio - video technology and telecommunications**

2. Data related to the subject

2.1 Name of the subject			**Hardware structures for multimedia and telecommunications - project**				
2.2 Holder of the subject			**-**				
2.3 Holder of the academic seminar/laboratory/project			**Lect. dr. eng. Țepelea Laviniu**				
2.4 Year of study	I	2.5 Semester	2	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	1	of which: 3.2 course	-	3.3 project	1
3.4 Total of hours from the curriculum	14	Of which: 3.5 course	-	3.6 project	14
Distribution of time					36h
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					5
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					18
Tutorials					-
Examinations					3
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	Classroom equipped with computer, appropriate software and video projector, but also online on the e.uoradea.ro platform and the Microsoft Teams program, depending on the situation of the Covid pandemic

5.2.for the development of the academic seminary/laboratory/project	Laboratory room equipped with computers and dedicated software, but also online on the e.uoradea.ro platform and the Microsoft Teams program, depending on the situation of the Covid pandemic

6. Specific skills acquired

Professional skills	C4. Analysis and implementation of audio-video and telecommunications equipment strategies • Detail the performance criteria of the technological systems and processes for the realisation of audio-video and telecommunications equipment • Use of interdisciplinary knowledge to provide technological solutions for the industrial implementation of audio-video and telecommunications equipment • Creative use of advanced CAD design and technological implementation principles and methods to ensure safety, security and ease of operation of telecommunications systems. • Develop testing, use and compliance with quality, safety and security standards for audio-video and telecommunications equipment. • Carrying out professional and/or interdisciplinary research and development projects in compliance with quality, safety and security standards. C5. Design, optimise and implement communication system components using advanced methods and technologies • Demonstrate a thorough knowledge of modern computer systems, control techniques, concepts, principles and algorithms used in the design of audio-video and telecommunications equipment. • Use the ability to analyse and interpret new situations in the fields of processing, analysis, synthesis, compression and coding of audio-video signals through multidisciplinary knowledge of electronic engineering and telecommunications • Formulate and solve complex engineering problems such as image processing, analysis, synthesis, coding, compression and transmission of audio-video signals using modern methods and software support. Carrying out practical research activities • Meeting performance and security criteria for multimedia and telecommunications systems • Carrying out practical research activities
Transversal skills	CT2. Responsible execution of interdisciplinary team work tasks, taking on roles at different hierarchical levels

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

7.1 The general objective of the subject	▪ The discipline aims to create the skills to carry out a project with hardware and software components
7.2 Specific objectives	▪ knowledge of PC and dedicated hardware structures based on different processors; ▪ knowledge of digital interfaces; ▪ knowledge of how to integrate multimedia into hardware actions

8. Contents*

8.3 Project	Teaching methods	No. of hours/ Observations
1. General and technical information about the hardware structure of the Raspberry PI 4 dedicated board; Setting project themes	Presentation	2
2. Presentation of the project requirements	Presentation	2
3. Commissioning the Raspberry PI 4 board	Experimentation	2
4. Remote use of the Raspberry PI 4 hardware board	Experimentation	2
5. Presentation of a functional project	Experimentation	2
6. Implementation of a minimal project	Experimentation	2
7. Project testing and verification	Experimentation	2

Bibliography

1. O. Neamţu**,** *Arhitectura Calculatoarelor*, Ed. Universităţii din Oradea, 2008
2. Maik Schmidt, *Raspberry PI. A quick start guide*, Ed. The Pragmatic Bookshelf, USA, ISBN-13: 978-1-937785-04-8, 2012
3. Warren Gay, *Raspberry PI. Hardware reference*, Ed. Apress
4. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, Ed. O'Reilly Media, USA, 2013
5. Warren Gay, *Experimenting with Raspberry Pi*, Ed. Apress

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

- By mastering the theoretical-methodological concepts and addressing the practical aspects included in the subject Hardware structures for multimedia and telecommunications, students acquire a consistent body of knowledge in line with the required competences

• the content of the course is appreciated by companies that employ graduates of this course.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.7 Project	Mark 10 - Presentation of the project followed by correct answers to all questions ensuring professional competences required by the academic and professional environment. In addition the student must show conscientiousness, interest in individual study, active participation.	Oral or online Presentation of the project, followed by questions from the teacher and students	100%
10.8 Minimum performance standard: **Knowledge for graduate:** Presentation of a minimal project			

Completion date:
16.09.2022

Lect. dr. eng. Țepelea Laviniu
ltepelea@uoradea.ro
https://prof.uoradea.ro/ltepelea/

Date of endorsement
in the department:
19.09.2022

Departament director,
Prof. dr. eng. Nistor Daniel Trip
dtrip@uoradea.ro
https://prof.uoradea.ro/dtrip/

Date of endorsement
in the Faculty Board:

23.09.2022

Dean,
Prof. dr. eng. habil. Ioan Mircea Gordan
mgordan@uoradea.ro
https://prof.uoradea.ro/mgordan/

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 Electronics and Telecommunications
1.4 Field of study	Electronical engineering, telecommunications and information technologies
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject			Security of telecommunications networks and services				
2.2 Holder of the subject			Lect.Eng. Reiz Romulus, PhD				
2.3 Holder of the academic seminar/laboratory/project			Lect.Eng. Țepelea Laviniu, PhD				
2.4 Year of study	I	2.5 Semester	I	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	3	of which: 3.2 course	2	3.3 laboratory	1
3.4 Total of hours from the curriculum	42	Of which: 3.5 course	28	3.6 laboratory	14
Distribution of time					83 hours
Study using the manual, course support, bibliography and handwritten notes					26
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					24
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					20
Tutorials					7
Examinations					6
Other activities.					-

3.7 Total of hours for individual study	83
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)
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	Video projector, Smart board The course can take place on site or online
5.2.for the development of the academic seminary/laboratory/project	Computer Network, Software and Operating Systems for Network Security Analysis and Testing, Network Equipment Laboratory work can be carried out on site or online

6. Specific skills acquired	
Professional skills	**C1. Studying thoroughly the acquisition algorithms and techniques, the processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment.** - Using specific theories and instruments in order to explain the structure of audio-video and communications equipment. **C2. Applying specific field-related knowledge for solving complex technical problems concerning the design, analysis and implementation of systems for the processing of audio-video and data signals** - Acquisition of advanced techniques, methods, methodologies and technologies, used in systems for audio-video and data-processing systems. **C6. Applying artificial intelligence knowledge with the view of validating, implementing and analyzing certain components of multimedia and telecommunications equipment** - Describing the architecture, functioning, programming and projecting of telecommunications systems by using artificial intelligence. - Explaining and interpreting new situations from the field of telecommunications using the fundamental concepts of neuro-informatics and advanced processing of signals. - Applying the interdisciplinary knowledge acquired during bachelor-degree studies and the instruments specific to electronics and telecommunications engineering, in order to carry out applications in the field of multimedia and telecommunications equipment.
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	This discipline aims to familiarize master's students from Audio-Video Technologies and Telecommunications with the basics in the field of vulnerability assessment, risks and control of telecommunications networks and services and the implementation of appropriate security measures.
7.2 Specific objectives	The necessary knowledge will be acquired regarding the particularities of network protection and security, notions of audit and control of telecommunications networks and services. Theoretical and practical methods for analyzing the specific risks of some telecommunications systems will be learned. The students will gain the ability to use software and hardware components to implement and test the security of telecommunications networks and services. Basic principles related to the security of IT systems (computer networks, Windows operating systems, Linux) and web applications will be presented

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. General notions about telecommunication networks. Modeling of telecommunication networks and services	Lecture, presentation, debate	2 hours
2. General aspects regarding the protection and security of information systems. Principles and issues regarding the security of telecommunications networks and services	Lecture, presentation, debate	2 hours
3. Attacks on telecommunications networks and services. Passive attacks. Active attacks. Cryptographic attacks.	Lecture, presentation, debate	2 hours
4. Cryptographic functions used in the field of network security Cryptographic protocols. Protocols for authenticating network entities.	Lecture, presentation, debate	2 hours
5. Security at IP level. Security protocols: IPSec, SSL / TLS, SSH	Lecture, presentation, debate	2 hours
6. The KERBEROS protocol. RADIUS protocol. Extended Authentication Protocols (EAP)	Lecture, presentation, debate	2 hours
7. Security architectures for telecommunications networks. Firewall systems.	Lecture, presentation, debate	2 hours
8. Virtual Private Networks (VPNs). Tunneling protocols (PPTP, L2TP)	Lecture, presentation, debate	2 hours
9. IDS intrusion detection systems	Lecture, presentation, debate	2 hours

10. NAT / PAT systems. Honeypot and honeynet systems	Lecture, presentation, debate	2 hours
11. Security of Windows operating systems	Lecture, presentation, debate	2 hours
12. Security of Linux / Unix operating systems	Lecture, presentation, debate	2 hours
13. Security of wireless networks	Lecture, presentation, debate	2 hours
14. Electronic business security. Electronic commerce.	Lecture, presentation, debate	2 hours
Bibliography 1. W. Stallings, Cryptography and Network Security Principles and Practices, Fourth Edition, Prentice Hall, November 16, 2005, ISBN-13: 978-0-13-187316-2 2. E. Maiwald, Network Security - A Beginner's Guide Second Edition, McGraw-Hill/Osborne, 2003, ISBN 0-07-222957-8 3. J. Migga Kizza, A Guide to Computer Network Security, Springer, 2009, ISBN 978-1-84800-916-5		
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
1. Authentication and security elements in Windows systems	Practical application	2 hours
2. Authentication and security elements in Linux systems	Practical application	2 hours
3. Implementing and testing a firewall. NAT / PAT	Practical application	2 hours
4. Implementing a VPN.	Practical application	2 hours
5. Study of the use of antivirus programs	Practical application	2 hours
6. Means of virtualization. Creating a virtual machine to safely test the operation of unsafe programs.	Practical application	2 hours
7. Configure and test the security of a local network using a wireless broadband router	Practical application	2 hours
Bibliography		

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 the subject taught in other university centers. For a better adaptation to the requirements of the labor market of the content of the discipline, meetings were held with representative 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	Checking of theoretical knowledge. Correct and complete treatment of exam subjects related to designing, implementation and testing of a telecommunications network protection system, and detailed knowledge of the fundamental operating principles for the most used firewall and IDS systems. Minimum required conditions for passing the examination (grade 5): Minimum knowledge of attacks most often used on computer systems and methods of protection against them.	Written evaluation. The evaluation can be done face to face or online	70 %
10.5 Academic seminar	-	-	-
10.6 Laboratory	Carrying out all	Written assessment	30%

	laboratory applications provided in the discipline file. Active participation in all laboratory classes with a very good presentation of the works by the student. Minimum required conditions for passing the examination (grade 5): Carrying out the laboratory applications provided in the subject sheet	(during the semester): report. A percentage of 10% of the final grade from the laboratory is awarded for the successful completion of the individual study topic. The evaluation can be done face to face or online	
10.7 Project	-	-	-
10.8 Minimum performance standard: Minimum performance standard: Students must know the main types of cyber-attacks and methods of protecting telecommunications networks and services. Students must be able to implement a simple virtual network that offers the possibility of a secure data transfer between network nodes.			

Completion date:

07.09.2022

Course holder
Lect.Eng.Reiz Romulus, PhD
email: rreiz@uoradea.ro
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Seminar/laboratory/project holder
Lect.Eng.Tepelea Laviniu, PhD
email: ltepelea@uoradea.ro
tel.0259408194

Date of endorsement in the department:
19.09.2022

Signature of the department director
Prof. Daniel TRIP, PhD
E-mail: dtrip@uoradea.ro

Date of endorsement in the Faculty Board:
23.09.2022

Signature of the Dean
Dean,
Prof.habil. Ioan Mircea GORDAN, PhD
E-mail: mgordan@uoradea.ro

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	**Electronics and Telecommunications**
1.4 Field of study	**Electronics Engineering, Telecommunications and Informational Technologies**
1.5 Study cycle	**Master studies (2nd cycle)**
1.6 Study program/Qualification	**Audio-Video Technologies and Telecommunications**

2. Data related to the subject

2.1 Name of the subject	**SPECIAL MATTERS OF ELECTRONICS**						
2.2 Holder of the subject	Prof.univ.dr.ing. Trip Nistor Daniel						
2.3 Holder of the academic seminar/laboratory/project	Prof.univ.dr.ing. Trip Nistor Daniel / - / Ş.l.dr.ing. Burca Adrian						
2.4 Year of study	1	2.5 Semester	1	2.6 Type of the evaluation	Ex	2.7 Subject regime	I

(I) Imposed (O) Optional (F) Facultative

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 seminar/laboratory/project	1/-/1
3.4 Total of hours from the curriculum	56	of which: 3.5 course	28	3.6 seminar/laboratory/project	14/-/14

Distribution of time	69
Study using the manual, course support, references and handwritten notes	30
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	16
Tutorials	-
Examinations	3
Other activities	-

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

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	-
5.2. for the development of the seminar/laboratory/project	-

6. Specific skills acquired

Professional skills

C1. Deepen the algorithms and techniques of acquisition, processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment

- Demonstrating the theoretical and practical concepts and principles of the acquisition, processing, analysis and synthesis of audio-video and communication specific signals.
- The use of specific theories and tools for explaining the structure of audio-video and communication equipment.
- Using models for audio - video equipment and communication systems.
- Comparative evaluation of the performance of systems for the processing and transmission of audio-video and data signals.
- Creative use of knowledge on acquisition, processing, analysis and synthesis of signals in the development of professional and research projects specific to the telecommunications field.

C2. Applying specialized knowledge to solve complex technical problems for designing, analyzing and implementing audio-video and data processing systems - Knowledge of techniques, methods, methodologies and advanced technologies used in audio-video and data processing systems. - Choosing suitable equipment for efficient implementation of video and data audio and data processing algorithms with specialized knowledge and concepts. - Developing applications based on new techniques, methods and methodologies for audio-video and telecommunication systems. - Evaluating the performance of equipment for the processing of audio-video and data signals and formulating recommendations for optimization and improvement. - Research, development and implementation of new, advanced techniques, methods and methodologies, specific to telecommunication systems.
C4. Analysis and implementation of audio-video and telecommunication equipment strategies - detailing the performance criteria for systems and technological processes for achieving audio-video and telecommunication equipment. - Using interdisciplinary knowledge for providing technological solutions for realization in the industrial environment of audio-video and telecommunication equipment. - Creative use of advanced CAD principles and methods and technological achievement to ensure the security, safety and ease of operation of telecommunication systems. - Develop tests, use and compliance with quality, safety and security standards in audio-video and telecommunication equipment. - Carrying out professional and / or interdisciplinary research and development projects in compliance with quality, security and safety standards. **C5. Design, optimization and implementation of components of communication systems using advanced methods and technologies** - Demonstration of the thorough knowledge of modern IT systems, control techniques, concepts, principles and algorithms used in designing audio-video equipment. - Using the capacity to analyze and interpret new situations in the fields of processing, analysis, synthesis, compression and coding of audio-video signals in terms of multidisciplinary knowledge in the field of electronic engineering and telecommunications. - Formulating and solving complex engineering problems such as image processing, analysis, synthesis, encoding, compression and transmission of audio-video signals using modern software methods and supports. Making research activities with practical finality. - Fulfilling the performance and security criteria of multimedia and telecommunication systems. - Creating research activities with practical finality.
Transversal skills
CT1. Fulfilling professional tasks with the exact identification of the objectives to be achieved, potential risk factors, available resources, economic and financial aspects, conditions for completing them, working stages, working time and related deadlines .

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

7.1 The general objective of the subject	▪ In the course, there are phenomena that occur in the transmission of high frequency signals or digital format on transmission lines respectively on printed wiring of audio-video electronic equipment, how these problems can be evaluated and diminished to ensure the integrity of Signal, i.e. ensuring the efficiency of the CC-CC electricity conversion and measures to reduce electromagnetic disturbances in terms of power supply with switching sources. ▪ Seminars are focused on the practical solving of the problems presented at the course, using CAD applications. ▪ Project activities aim at applying CAD design methods for electronic circuits to ensure signal integrity and / or optimization of switching sources.
7.2 Specific objectives	▪ Knowledge and acquiring specific problems for the transmission of high frequency signals or digital format by different transmission environments; ▪ Understanding CAD design stages of electronic equipment to ensure that signal integrity for the efficient supply of these circuits with switching sources. ▪ Deepening analysis methods and modeling phenomena that occur in the transmission of high frequency or digital signals through different transmission environments. ▪ Understanding the power optimization of electronic circuits using switching sources using CC-CC conversion with improved parameters. ▪ Acquisition of experience in design using CAD techniques for the production lines / routes, respectively the power supply sources to reduce electromagnetic interference.

8. Contents* (inclusive on-line)

8.1 **Course** (on site/ on-line)	Teaching methods	No. of hours/ Observations
Current status of electronic products based on analog / digital integrated devices / digital circuits that operate at high frequencies. Problems that occur when implementing these products: interference of signals, noise, electromagnetic interference, signal and power integrity, use of high frequency switching sources.	Lecture, conversation, video projection, presentation of practical examples, on-line presentation	2
Notions of electromagnetic compatibility in high-speed processing circuits and data transfer. Modeling of circuit parasitic elements and disturbances.		2
Representation of signals in time and frequency domain. The base band of the signals and its connection with the duration of the signal fronts. Band limitations produced by interconnections.		2
The printed circuit board for high frequency signals or digital signals - a complex electronic component. Problems that occur when implementing printed circuit board: impedance between routes, inductive effects, capacitive effects, resistive losses, mass plan, multilayer wiring and interconnection effect between layers, differential routes.		2
Transmission lines. Distribution of electrical parameters along transmission lines. Instant impedance of the transmission line. The characteristic impedance.		2
Reflections on transmission lines. The influence of reflections in transmission lines on		2

information signals. Measurement of reflections with TDR. Reflections due to geometric shapes on wiring trails, or multilayer wiring harness. Adaptation of impedance - practical solutions.		
Interference between signals. Inductive couplings and capacitive couplings.		2
Differential traces. Determination of differential impedance.		2
Continuous voltage sources with high switching frequency (MHz). Problems that occur in the practical implementation of sources in the switch.		2
Methods for reducing switching loss and reduction of electromagnetic disturbances using soft switching in switching sources.		2
Zero voltage switch and zero curent switch in DC-DC converters.		2
Quasi-resonant converters. Topologies. Command methods. Transfer functions.		2
DC-DC resonant conversion. Topologies. Command methods. Transfer functions.		2
Practical aspects for designing printed circuit boards for high switching voltage sources.		2
References		
1. Eric Bogatin, Signal and power integrity, Prentice Hall, 3rd edition, 2018. 2. www.ansys.com/products/electronics/ 3. https://courses.ansys.com/index.php/courses/transmission-line-theory/ 4. https://courses.ansys.com/index.php/courses/matching-networks-and-design-tools/ 5. Viorel Popescu, Electronică de putere, Editura de Vest, Timosoara, 1998.		
8.2. Seminar	Teaching methods	No. of hours/ Observations
Modelling of the electronics circuits used to the signal processing or to high speed data transmission. Problems related to the real parameters of circuit or device.	Interactive, lecture / discussions	2
Transmission lines. Problems related to the reflexions on the transmision lines due to the impedance mismatch.		2
Interference of signals. Problems that occur between high-speed data transmission lines - inductive and capacitive influences.		2
Differential traces / lines. Advantages and problems arising when using differential transmission lines.		
Methods for measuring the impedance of a transmission line. Practical example of using an Impedance / TDR / Network Analyzer / Antenna Analyzer.		2
Sources with improved energy parameters. Zero voltage switch and zero current switch. Practical problems.		2
Cvasi-resonant and resonant DC-DC conversion. Examples and case studies.		2
8.3. Laboratory	-	-
8.4. Project	Teaching methods	No. of hours/ Observations
Presentation of project topics to ensure signal and power integrity. Description of project content. Specification of the design stages.	lecture / discussion / practical implementation	2
Designing an electronic circuit based on a state-of-the-art microcontroller used for high-speed data transmission or a switching voltage source with high switching frequency and improved energy parameters.		4
Simulation of one of the two types of circuits (high-speed processing and transmission circuit or switching circuit and high operating frequency).		2
CAD design of a printed circuit board for an electronic circuit based on a microcontroller / state-of-the-art signal processor or for a continuous voltage source in high frequency switch (MHz).		4
Traces optimizing to ensure signal integrity and / or power.		2

* The content, respectively, the number of hours allocated to each course / seminar / laboratory / project during the 14 weeks of each semester of the academic year.

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

The present course meets the requirements of the main employers in the area to prepare Master's students to cope with the many current electronics challenges, with direct reference to the modelling, designing and testing of complex electronic equipment designed to process and transfer information / data high speed. The processing and transfer of high-speed data as well as the supply of these circuits raises complex, multidisciplinary problems that require a longer deepening time.

10. Evaluation (inclusive on-line)

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Level and quality of student preparation in the course content.	Oral examination	60%
10.5 Seminar	Assessing understanding and solving practical problems.	Partial verification, tests, verification of the proposed solutions.	20% Remark. A percentage of 10% of the final note

			from the seminar is granted for individual study.
10.6 Laboratory	-	-	-
10.7 Project	The quality and accuracy of the information obtained by the students contained in the project, in compliance with precise implementation deadlines.	Checking the achievement project steps. Presentation and support of the project.	20%
10.8 Minimum performance standard for mark 5			
Course: Treating each exam subject. Knowledge of the main aspects of complex and multidisciplinary issues regarding the integrity of signal in electronic processing and high-speed data transfer circuits, namely knowledge of the techniques to increase the efficiency of the switching sources and the reduction in interference caused by the power modules. Seminar: Knowledge, modeling and analysis of phenomena occurring in electronic circuits used for the processing and / or transmission of high frequency or digital signals, namely source insurance in switching sources that operates high frequency. Project: Achieving a project, within a set time, complying with academic elaboration requirements, aimed at optimizing the transfer of high-speed data and / or efficient use of switching power supplies using CAD techniques.			

Date of completion

Date of approval in department

Date of approval in Council of the faculty

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 Electronics and Telecommunications
1.4 Field of study	Electronical engineering, telecommunications and information technologies
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications

2. Data related to the subject

2.1 Name of the subject				Synthesis of audio-video signals for Virtual Reality (SAVSVR)			
2.2 Holder of the subject				Prof.univ.dr. Sorin CURILA			
2.3 Holder of the academic seminar/laboratory/project				Prof.univ.dr. Sorin CURILA			
2.4 Year of study	I	2.5 Semester	1	2.6 Type of the evaluation	Examination	2.7 Subject regime	THD

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					83
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					53
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					5
Tutorials					-
Examinations					5
Other activities.					-

3.7 Total of hours for individual study	83
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	-
4.2 related to skills	-

5. Conditions (where applicable)

5.1. for the development of the course	projector
5.2.for the development of the academic seminary/laboratory/project	
6. Specific skills acquired	

Professional skills	**C1. Studying thoroughly the acquisition algorithms and techniques, the processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment.** **C2. Applying specific field-related knowledge for solving complex technical problems concerning the design, analysis and implementation of systems for the processing of audio-video and data signals** **C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems** **C4. Analysis and implementation of strategies for the execution of audio-video and telecommunications equipment** **C5. Designing, optimizing and implementing communication-systems components using advanced methods and technologies**
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 is scheduled to be taught to first year AVTT students. The course addresses virtual reality programming techniques such as: VRML (Virtual Reality Modeling Language) file structure, UTF-8 file syntax, Node Semantics, Environment setting, VRML interactivity, Field semantics, input and output event, reference in VRML, Reference fields and events, Reference nodes, Creating virtual worlds.
7.2 Specific objectives	1. Knowledge and understanding - knowledge and understanding of the notions of SAVSVR 2. Explanation and interpretation - explaining the mathematical apparatus used - interpretation of results - interpretation of specific formulas 3. Instrumental - applications - development of abstraction skills - formation of calculation skills 4. Attitudinal - developing a positive attitude - cultivating and promoting a scientific environment focused on values - forming a positive and responsible behavior.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. VRML (Virtual Reality Modeling Language) file structure,	The course is presented to students in the form of a lecture. The video projector and the laptop are used to present the slides that outline the mentioned course elements. Thus, the lecture leaves room for student intervention for a better understanding of the notions presented by the teacher. The activity	4
2. UTF-8 file syntax,		4
3. The Semantics of the Node,		2
4. Establishing the environment,		2
5. VRML interactivity,		2
6. The semantics of the field, the input event and the output event,		2
7.References in VRML,		2
8. Fields and reference events,		2
9.Reference nodes,		2
10. Creating virtual worlds,		2
11.Virtual world I,		2

12.Virtual world II	can also be carried out online.	2

Bibliography

1. M.Curila, ″ Programarea Realitatii Virtuale″, Ed. Univ. Oradea, 2004
2. S.Curila, D.Nuzillard, M.Curila, ″Modelare numerica si compresie in 3D″, Ed. Univ. Oradea, 2008
3. M.Curila, S.Curila, ″ Aplicatii pentru Bioinformatica si genomica computationala. Programarea Realitatii Virtuale ″, Proiect cofinantat din Fondul scoial prin POSDRU 2007-2013
4. Rachid Deriche, Gérard Giraudon *"A computational approach for corner and vertex detection"*
5. Heijmans, ″Morphological Image Operators″, 1994
6. Rong-Jian Chen, Bin-Chang Chieu, ″Multiresolutional Image Representation and Coding Using Morphological Pyramids″
7. S.S.Liu, M.E.Jernigan, ″Texture analysis and discrimination in additive noise″, Computer vision, graphics and image processing 1990, vol.49

S. Curila, M. Curila, „Tehnici de prelucrare a imaginilor utilizate la recunoasterea formelor”, Ed. Univ. Oradea, 2004

8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
1. VRML (Virtual Reality Modeling Language) file structure,	The laboratory is organized in the first part of a short teacher-student debate on algorithms. Then the students will implement the algorithms, will note the results in their personal notebooks and will present them to the teacher. The activity can also be carried out online.	2
2. UTF-8 file syntax,		2
3. The Semantics of the Node,		1
4. Establishing the environment,		1
5. VRML interactivity,		1
6. The semantics of the field, the input event and the output event,		1
7.References in VRML,		1
8. Fields and reference events,		1
9.Reference nodes,		1
10. Creating virtual worlds,		1
11.Virtual world I,		1
12.Virtual world II		1

Bibliography

8. M.Curila, ″ Programarea Realitatii Virtuale″, Ed. Univ. Oradea, 2004
9. S.Curila, D.Nuzillard, M.Curila, ″Modelare numerica si compresie in 3D″, Ed. Univ. Oradea, 2008
10. M.Curila, S.Curila, ″ Aplicatii pentru Bioinformatica si genomica computationala. Programarea Realitatii Virtuale ″, Proiect cofinantat din Fondul scoial prin POSDRU 2007-2013
11. Rachid Deriche, Gérard Giraudon *"A computational approach for corner and vertex detection"*
12. Heijmans, ″Morphological Image Operators″, 1994
13. Rong-Jian Chen, Bin-Chang Chieu, ″Multiresolutional Image Representation and Coding Using Morphological Pyramids″
14. S.S.Liu, M.E.Jernigan, ″Texture analysis and discrimination in additive noise″, Computer vision, graphics and image processing 1990, vol.49

S. Curila, M. Curila, „Tehnici de prelucrare a imaginilor utilizate la recunoasterea formelor”, Ed. Univ. Oradea, 2004

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

Introduction in the courses and laboratory works of some subjects of interest for the economic environment profile in the industrial area of the city.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	In order to obtain grade 5, the following conditions must be met: - obtaining at least a grade of 5 in the laboratory test;		

	- knowledge of the basic notions regarding Concepts of the theory of Virtual reality programming. In order to obtain grades 6, 7, 8 or 9, the students will present two subjects extracted from the package prepared with subjects that contain notions of course. Depending on the ability to understand and describe the respective notions, they receive the corresponding grade. In order to obtain a grade of 10, the following conditions must be met: - obtaining a grade of 10 in the laboratory test; - knowledge of all the topics presented in the course. The activity can also be carried out online.	written	80%
10.5 Academic seminar	Minimum required conditions for passing the examination (grade 5): in accordance with the minimum performance standard - For 10:		
10.6 Laboratory	The laboratory test will contain the theoretical presentation of an algorithm implemented during the semester and the presentation of the results. The activity can also be carried out online.	Oral presentation	20%
10.7 Project			
10.8 Minimum performance standard: Course: Knowledge of the basics on all the course topics. Academic seminar: Laboratory: Knowledge of the basics on all the laboratory topics. Project:			

Completion date:
01.09.2022

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19.09.2022

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Date of endorsement in the Faculty Board:
23.09.2022

Dean,
Prof.univ.dr. ing. Mircea GORDAN
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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 Electronics and Telecommunications**
1.4 Field of study	**Electronics engineering, telecommunications and information technologies**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Audio-Video Technologies and Telecommunications / Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject	**Advanced image processing techniques**						
2.2 Holder of the subject	Prof.dr.ing. Cristian Grava						
2.3 Holder of the academic seminar/laboratory/project	Prof.dr.ing. Cristian Grava						
2.4 Year of study	II	2.5 Semester	3	2.6 Type of evaluation	Vp	2.7 Subject regime	SYD

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 seminar/laboratory/project	28

Distribution of time (in hours)	22
Study using the manual, course support, bibliography and handwritten notes	6
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	6
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	Signals and systems, Theory of information transmission, Computer programming and programming languages
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the process of the course	
5.2. for the process of the seminary/laboratory/project	computer equipment, Matlab or Octave software Teams application. The laboratory can be carried out face-to-face or online.

6. Specific skills acquired

Professional skills	**C2. Applying specific field-related knowledge for solving complex technical problems concerning the design, analysis and implementation of systems for the processing of audio-video and data signals** - Acquisition of advanced techniques, methods, methodologies and technologies, used in systems for audio-video and data-processing systems. - Choosing the adequate equipment for the efficient implementation of algorithms used for processing audio-video and data signals with the help of acquired specialized knowledge and concepts - Developing applications based on new techniques, methods and methodologies developed for the audio-video, data and telecommunications systems. - Evaluating the performance of equipment necessary for processing audio-video and data signals and formulating recommendations with the view of their optimization and improvement. - Research on, development and implementation of new and advanced techniques, methods and methodologies, specific to telecommunication systems.

Professional skills	• **C6. Applying artificial intelligence knowledge with the view of validating, implementing and analyzing certain components of multimedia and telecommunications equipment** - Describing the architecture, functioning, programming and projecting of telecommunications systems by using artificial intelligence. - Explaining and interpreting new situations from the field of telecommunications using the fundamental concepts of neuro-informatics and advanced processing of signals. - Applying the interdisciplinary knowledge acquired during bachelor-degree studies and the instruments specific to electronics and telecommunications engineering, in order to carry out applications in the field of multimedia and telecommunications equipment. - The comparative evaluation of neuro-informatics alternatives for solving certain concrete problems and, based on some performance criteria, achieving the comparative evaluation of some applications, specific to dedicated systems. - Completing case-studies involving modeling and simulation using neuronal cellular networks, and advanced techniques for information processing and sending.
Transversal skills	**CT3.** Adapting to new technologies, identifying the needs for continuous formation and the efficient use of information sources and communication and assisted professional training resources (Internet portals, specialized software applications, data bases, on-line courses, printed documentation sources, etc.), both in Romanian and in a foreign 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 general objective of this discipline is to deepen the students' knowledge regarding the processing and analysis of images.
7.2 Specific objectives	• The specific objectives of this discipline are to deepen and develop knowledge and skills of students to implement algorithms for processing image sequences, especially for estimating and compensating motion.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
8.2 Academic seminar/laboratory/project	Teaching methods	28
1. Implementation of Horn & Schunk's method of estimating motion	Designing an imposed / chosen application. Theoretical and software development. Debates on the problems encountered and methods for solving them	4
2. Implementation of Lukas & Kanade's method of estimating motion		4
3. Implementation of the exhaustive of block-matching method		4
4. Implementation of block-matching methods for video sequence compression		8
5. Design and implementation of a motion compensation algorithm		4
6. Implementing a method of temporal interpolation of an image sequence		4
7. Recovery of laboratory works		2

Bibliography

1. C. Grava, V. Buzuloiu, „*Elemente de prelucrarea şi analiza imaginilor*", Editura Universităţii Oradea, 2007
2. C. Grava, C. Vertan, V. Buzuloiu, *Prelucrarea şi analiza imaginilor. Îndrumar de laborator*, Editura Universităţii din Oradea, 2003
3. M. Jiang - "Mathematical models in computer vision and image processing" - Course at the School of Mathematics, Peking University, China, 1999, 184 pages;
4. C. Grava - "Estimarea şi compensarea mişcării în secvenţe de imagini" - Seria de Matematică Aplicată şi Industrială, Piteşti, 2004, 278 pagini.
5. D. Sundararajan, „*Digital Image Processing. A Signal Processing and Algorithmic Approach*", Springer, 2017
6. V. Tyagi, „Understanding *Digital Image Processing*", CRC Press, 2018
7. C. Solomon, T. Breckon, „*Fundamentals of Digital Image Processing. A Practical Approach with Examples in Matlab*", John Wiley Ltd., 2011
8. E.R. Dougherty, „*Digital Image Processing Methods*", Marcel Decker Inc., 2020.

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 to the requirements of some potential main employers of the students of this specialization. Together with disciplines such as "Shape Recognition" or "Image Processing and Analysis" it responds to practical applications that can be applied in the production process of most electronic component manufacturers in the industrial park of Oradea.

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	the result of the final evaluation and the activity during the semester	evaluation - designing a practical application. The evaluation can be done face to face or online.	A percentage of 30% of the final grade from the project is awarded for the practical achievement and the activity during the semester
10.8 Minimum performance standard: theoretical treatment at elementary level of the project theme and implementation of an elementary algorithm for image processing and analysis.			

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15.09.2022

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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 Electronics and Telecommunications**
1.4 Field of study	**Electronics engineering, telecommunications and information technologies**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Audio-Video Technologies and Telecommunications / Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject	**Advanced image processing techniques**						
2.2 Holder of the subject	Prof.dr.ing. Cristian Grava						
2.3 Holder of the academic seminar/laboratory/project	Prof.dr.ing. Cristian Grava						
2.4 Year of study	II	2.5 Semester	3	2.6 Type of evaluation	Ex	2.7 Subject regime	SYD

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 laboratory	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 (in hours)					83
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					22
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					25
Tutorials					4
Examinations					4
Other activities.					

3.7 Total of hours for individual study	**83**
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	Signals and systems, Theory of information transmission, Computer programming and programming languages
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the process of the course	equipped with video projector or Teams application. The course can be held face-to-face or online.
5.2. for the process of the seminary/laboratory/project	computer equipment, Matlab or Octave software Teams application. The laboratory can be carried out face-to-face or online.

6. Specific skills acquired

Professional skills	**C1. Using the fundamental elements referring to electronic devices, circuits, systems, instrumentation and technology:** - Describing the functioning of electronic devices and circuits and of the fundamental methods for measuring electric dimensions. - Analyzing low-average complexity electronic circuits and systems, in order to design and measure them. - Troubleshooting and repairing certain electronic circuits, equipment and systems. - Using electronic instruments and specific methods for characterizing and evaluating the performance of certain electronic circuits and systems. - Designing and implementing electronic circuits of low/average complexity using CAD_CAM technologies, as well as the standards applied in the domain.

Professional skills	**C2. Applying basic methods for the acquisition and processing of signals:** - The temporal, spectral and statistic characterization of signals. - Explaining and interpreting methods for the acquisition and processing of signals. - Using simulation environments for the analysis and processing of signals. - Using specific methods and instruments for signal analysis. - Designing elementary functional blocks for the digital processing of signals with hardware and software implementation. **C6. Solving technological problems in the fields of applied electronics:** - Defining the principles and methods that lie at the basis of producing, adjusting, testing and troubleshooting devices and equipment in the fields of applied electronics. - Explaining and interpreting production processes and maintenance activities for the electronic equipment, identifying the points for testing and the electrical measurements to be determined. - Applying the principles of management for the organization, from the technological point of view, of production, exploitation and service activities in the fields of applied electronics. - Using criteria and methods for the evaluation of quality in different production and service activities in the fields of applied electronics. - Designing the technology for the fabrication and maintenance (by pointing out at necessary components and operations) of some limited and average-complexity products in the fields of applied electronics.

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

7.1 The general objective of the subject	▪ The general objective of this discipline is to deepen the students' knowledge regarding the processing and analysis of images.
7.2 Specific objectives	• The specific objectives of this discipline are to deepen and develop knowledge and skills of students to implement algorithms for processing image sequences, especially for estimating and compensating motion.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. **Real motion, apparent motion and estimated motion**	Lecture + interactive methods, discussions + questions and answers with students on the course	4
2. **Problems of motion estimation in image sequences**		2
3. **Differential methods for motion estimation**		4
4. **Block-matching methods for motion estimation**		6
5. **Applications of motion estimation in video compression**		4
6. Motion compensation in image sequences		4
7. **Adaptive temporal interpolation of image sequences**		4

Bibliography:

1. M. Jiang - ”Mathematical models in computer vision and image processing” - Course at the School of Mathematics, Peking University, China, 1999, 184 pages;
2. C. Grava - ”Estimarea şi compensarea mişcării în secvenţe de imagini” - Seria de Matematică Aplicată şi Industrială, Piteşti, 2004, 278 pagini.
3. C. Vertan, M. Ciuc - Tehnici fundamentale de prelucrarea si analiza imaginilor, Ed. MatrixROM, Bucuresti, 2007, 213 pagini.
4. W.K. Pratt, „*Introduction to Digital Image Processing*”,CRC Press, 2014
5. D. Sundararajan, „*Digital Image Processing. A Signal Processing and Algorithmic Approach*”, Springer, 2017
6. V. Tyagi, „Understanding *Digital Image Processing*”, CRC Press, 2018
7. C. Solomon, T. Breckon, „*Fundamentals of Digital Image Processing. A Practical Approach with Examples in Matlab*”, John Wiley Ltd., 2011
8. E.R. Dougherty, „*Digital Image Processing Methods*”, Marcel Decker Inc., 2020.

8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
1. Introductory notions of image processing. Introduction to MATLAB	Practical works for simulation and development of application programs, debates on the problems encountered and methods for solving them	14
2. Implementation of differential methods for estimating motion		2
3. Implementation of the exhaustive block-matching method		2
4. Implementation of block-matching methods for video sequence compression		2

5. Design and implementation of a motion compensation algorithm		2
6. Implementing a method of temporal interpolation of an image sequence		2
7. Recovery of laboratory works		2

Bibliography

1. C. Grava, V. Buzuloiu,„*Elemente de prelucrarea şi analiza imaginilor*”, Editura Universităţii Oradea, 2007
2. C. Grava, C. Vertan, V. Buzuloiu, *Prelucrarea şi analiza imaginilor. Îndrumar de laborator*, Editura Universităţii din Oradea, 2003
3. L.M. Ivanovici, „*Procesarea imaginilor*”,Editura Universităţii Transilvania Braşov, 2003

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 to the requirements of some potential main employers of the students of this specialization. Together with disciplines such as "Shape Recognition" or "Image Processing and Analysis" it responds to practical applications that can be applied in the production process of most electronic component manufacturers in the industrial park of Oradea.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	exam result and activity during the semester	The result of the exam and the written exam (and oral, if applicable). The assessment can be done face to face or online. Activity during the semester	70%
10.5 Academic seminar	-		
10.6 Laboratory	the result of the final evaluation and the activity during the semester	Evaluation - designing a practical application. The evaluation can be done face to face or online.	30% A percentage of 10% of the final grade from the laboratory is awarded for the successful completion of the individual study topic and for the activity during the semester.
10.7 Project			
10.8 Minimum performance standard: dealing with at least one subject of theory, that of applications and the correct answer to 2 eliminatory questions at the exam, respectively the design and implementation of an elementary algorithm for image processing and analysis, in the laboratory.			

Signature of the course holder

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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 Electronics and Telecommunications**
1.4 Field of study	**Electronical engineering, telecommunications and information technologies**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Audio-Video Technologies and Telecommunications / Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject			**CAD techniques for audio video equipment**				
2.2 Holder of the subject			Șchiop Adrian				
2.3 Holder of the academic seminar/laboratory/project			Șchiop Adrian				
2.4 Year of study	2	2.5 Semester	1	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	4	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	0/2/0
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	hours
Study using the manual, course support, bibliography and handwritten notes	40
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	10
Tutorials	2
Examinations	2
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)
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	

5.2.for the development of the academic seminary/laboratory/project	

6. Specific skills acquired	
Professional skills	**C1. Studying thoroughly the acquisition algorithms and techniques, the processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment.** - - Using specific models for the audio-video equipment and the communication systems. **C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems** - The adequate identification and use of advanced techniques, methods, methodologies and technologies necessary for the analysis, design and implementation of audio-video systems **C4. Analysis and implementation of strategies for the execution of audio-video and telecommunications equipment** - The creative application of some advanced principles and methods for CAD and technological execution, so as to ensure the security, safety and facility in operating telecommunications systems. **C5. Designing, optimizing and implementing communication-systems components using advanced methods and technologies** - Demonstrating the deep understanding of modern computer systems, of control techniques, of concepts, principles and algorithms used in designing audio-video and telecommunications equipment.
Transversal skills	**CT2.** The responsible execution of some work tasks within an interdisciplinary team, by assuming roles on different hierarchy levels **CT3.** Adapting to new technologies, identifying the needs for continuous formation and the efficient use of information sources and communication and assisted professional training resources (Internet portals, specialized software applications, data bases, on-line courses, printed documentation sources, etc.), both in Romanian and in a foreign 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 course aims to familiarize students with CAD techniques for the design of electronic modules
7.2 Specific objectives	▪ The ability to design electronic wiring in Cadence PCB Editor.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. CAD methods of generating electronic schemas 1.1 Fundamentals 1.1.1. Create a new project 1.1.2. Work units 1.1.3. Grids and units 1.2.Making a low-complexity electronic scheme 1.2.1 Add virtual components 1.2.2 Add electrical connections	conversation, exposure, explanation, observation, algorithmization	4
2. Achieving CAD of complex electronic projects 2.1 Introduction 2.2 Hierarchical electronic schemes 2.3 Concatenate electronic schemes	conversation, exposure, explanation, observation, algorithmization	4
3. Creating Virtual Components 3.1 Homogeneous Virtual Components	conversation, exposure,	4

3.2 Heterogeneous Virtual Components 3.3 Attachment of SPICE Model	explanation, observation, algorithmization	
4. Making and editing layout footprints 4.1 Composition of a footprint 4.2. Padstacks 4.3 Outlines 4.4 Adding text 4.5 Creating footprintss using library expert	conversation, exposure, explanation, observation, algorithmization	4
5. SCM Transfer Techniques - PCB 5.1 Allocation of the footprints for transfer to PCB block 5.2. Electrical verification of the projected electrical scheme 5.3 Generation of postprocessing files and transfer to PCB block	conversation, exposure, explanation, observation, algorithmization	4
6. Design of printed circuits 6.1. Making the outline 6.2. Placing components 6.2.1 Manual placement 6.2.2 Interactive placement 6.2.3 Automatic placement 6.3. Routing the printed circuit board 6.3.1 Checking the layers. Definition of crossing holes. Checking and allocating the properties of connection trees. Check spacing assignment 6.3.2 Manual routing 6.3.3 Interactive Routing 6.3.4 Automatic Routing 6.4 Postprocessing	conversation, exposure, explanation, observation, algorithmization	8
Bibliography 1. K Mitzner Complete PCB Design Using OrCAD Capture and PCB Editor, Ed. Academic Press, 2019 2. http://www.cetti.ro/v2/tehnicicad.php 3. http://www.cetti.ro/v2/labtie.php		
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
CAD methods of generating electronic schemas	exposure, explanation,	4
Making and editing capture parts	exposure, explanation,	4
Making and editing layout footprints	exposure, explanation,	4
SCM-PCB transfer	exposure, explanation,	4
Placing components, creating outline	exposure, explanation,	4
PCB routing	exposure, explanation,	4
Recovery of laboratories	exposure, explanation,	2
Bibliography 1. K Mitzner Complete PCB Design Using OrCAD Capture and PCB Editor, Ed. Academic Press, 2019 2. http://www.cetti.ro/v2/tehnicicad.php 3. http://www.cetti.ro/v2/labtie.php		

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

- Introducing in courses and laboratory works some topics of interest to the economic environment in the industrial area of the city.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Exposure of two topics of theory - Clarity, consistency, concision of presentation and explanation of topics Minimum required conditions for passing the exam (mark 5): Basics knowledge without entry into details - For 10: In-depth knowledge of PCB routing		70%
10.5 Academic seminar	Minimum required conditions for passing the examination (grade 5): in accordance with the minimum performance standard - For 10:		
10.6 Laboratory	Tests at the beginning of each laboratory hour from the theoretical part and the work for that week. Minimum required conditions for promotion (grade 5): Basics knowledge without entry into details For 10: In-depth knowledge of PCB routing		30%
10.7 Project			
10.8 Minimum performance standard: Correct response to at least one theory topic, exposing the theory subjects in appropriate technical language and obtaining a minimum score of 5 in laboratory activities.			

Completion date:
15.09.2022

Date of endorsement in the department:
19.09.2022

Date of endorsement in the Faculty Board:
23.09.2022

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	Electronics and Telecommunications
1.4 Field of study	Electronical Engeneering, Telecommunications and Information Technologies
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject	**Digital transmission systems over optical fiber - 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	4	2.6 Type of the evaluation	Pr.	2.7 Subject regime	THD

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 academic seminar/laboratory/project	-/14
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					3
Examinations					3
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	Optical Communication, Digital transmission systems using optical fibers
4.2 related to skills	Competences corresponding to the first year of preparation for the master in Audio-Video Technologies and Telecommunications.

5. Conditions (where applicable)

5.1. for the development 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. Designing, optimizing and implementing communication-systems components using advanced methods and technologies** - Formulating and solving certain complex engineering problems such as image processing, the analysis, synthesis, encoding, compression and transmission of audio-video signals, using modern methods and software supports. Carrying out research activities with practical finality. **C6. Applying artificial intelligence knowledge with the view of validating, implementing and analyzing certain components of multimedia and telecommunications equipment** - Completing case-studies involving modeling and simulation using neuronal cellular networks, and advanced techniques for information processing and sending.
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 digital transmission of information through optical fibers. The design of the elements necessary for a fiber optic connection is chosen and a dimensioning of these elements is made.
7.2 Specific objectives	- Presentation of the principles of light propagation through optical fibers, their technical characteristics, primary sources of optical radiation, receivers for optical radiation, auxiliary components for fiber optic transmission systems. - Knowledge, understanding and use of aspects of digital information transmission and processing: data encoding and decoding, multiplexing, demultiplexing, modulation, demodulation.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
1. Establishing design stages and themes.	Interactive lecture + video projector / Online	2
2. Specifications of an optical network.	Interactive lecture + video projector / Online	2
3. Planning a fiber optic system.	Interactive lecture + video projector / Online	2
4. System sizing: Power balance.	Interactive lecture + video projector / Online	2
5. Loss of power due to couplings.	Interactive lecture + video projector / Online	2
6. Determination of the frequency band. Pulse widening due to chromatic dispersion.	Interactive lecture + video projector / Online	2
7. Teaching and supporting the project.	Interactive lecture + video projector / Online	2

Bibliography

1. Marin Tomşe – Sisteme de transmisiuni digitale pe fibre optice. Curs manuscris, https://prof.uoradea.ro/mtomse
2. Doicaru Vladimir şi Pârvulescu Mihai - *Transmisii prin fibre optice*, Bucureşti, Editura Militară, 1994
3. Duma, Ioan - *Curs practic de comunicaţii optice*, U.P.Bucureşti, 2004.
4. Manea A. - *Sisteme optice de comunicaţii*, Ed. Electus, Pitesti, 2000.

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. Activity during the semester. 2 Level and quality of acquired knowledge reflected in the project presentation.	Periodic verification of the project implementation stage Project support at the end of the semester / If necessary online	30% project activity 50% project content 20% of the grade for the project is awarded for the successful completion of the individual study topic
10.8 Minimum performance standard: Project - Requirements note 5: - Knowledge of the basic elements of the main components of a digital fiber optic transmission system and the ability to choose based on their criteria.			

Completion date
05.09.2022

Signature of the course holder
S.l. dr. ing. Tomse Marin
mtomse@yahoo.com

Signature of the project holder
S.l. dr. ing. Popa Sorin
sorin2popa@yahoo.co.uk

Date of endorsement in the department:
19.09.2022

Signature of the department director
Prof.dr.ing. Daniel Trip
dtrip.uo@gmail.com

Date of endorsement in the Faculty Board:
23.09.2022

Signature of the Dean
Prof.dr.ing. Mircea Gordan
mirgordan@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	Electronics and Telecommunications
1.4 Field of study	Electronical Engeneering, Telecommunications and Information Technologies
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject	**Digital transmission systems using optical fibers**						
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					72 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					24
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					12
Tutorials					3
Examinations					5
Other activities.					-

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	Optical Communication
4.2 related to skills	Competences corresponding to the first year of preparation for the master in Audio-Video Technologies and Telecommunications.

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	**C1. Studying thoroughly the acquisition algorithms and techniques, the processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment.** - The comparative evaluation of performance in systems for processing and transmitting audio-video and data signals. **C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems** - - The comparative evaluation of alternatives for the optimization of telecommunications systems performance. - Investigation, development and implementation of complex projects based on original solutions involving telecommunication equipment and systems. **C4. Analysis and implementation of strategies for the execution of audio-video and telecommunications equipment** - Using interdisciplinary knowledge for providing technological solutions to the execution, in the industrial environment, of audio-video and telecommunications equipment. - Carrying out interdisciplinary professional and/or research-development projects while complying with quality, safety and security standards.
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 digital transmission of information through optical fibers. The design of the elements necessary for a fiber optic connection is chosen and a dimensioning of these elements is made.
7.2 Specific objectives	- Presentation of the principles of light propagation through optical fibers, their technical characteristics, primary sources of optical radiation, receivers for optical radiation, auxiliary components for fiber optic transmission systems. - Knowledge, understanding and use of aspects of digital information transmission and processing: data encoding and decoding, multiplexing, demultiplexing, modulation, demodulation.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introductory notions. Technical characteristics of optical fibers.	Interactive lecture + video projector / Online	2
2. Radiation propagation through optical fibers (reflection, refraction, total reflection, numerical aperture).	Interactive lecture + video projector / Online	2
3. Fiber optic profiles. Step index profile.	Interactive lecture + video projector / Online	2
4. Fiber optic profiles. Graded and multistage profile.	Interactive lecture + video projector / Online	2
5. Primary sources of optical radiation. Light emitting diodes (operating principles, construction types, control circuits).	Interactive lecture + video projector / Online	2
6. Laser diodes (operating principles, construction types, comparison with light emitting diodes).	Interactive lecture + video projector / Online	2
7. Receivers for optical radiation. Photodiodes (characteristic sizes, constructive types, advantages-disadvantages)	Interactive lecture + video projector / Online	2
8. Phototransistors.	Interactive lecture + video projector / Online	2
9. Auxiliary optical components. Passive optical components (coupling attenuators, isolators, switches, switches).	Interactive lecture + video projector / Online	2
10. Active optical components (control options, switches, switches)	Interactive lecture +	2

	video projector / Online	
11. Digital transmission systems. Overview, Coding and decoding of data in digital systems.	Interactive lecture + video projector / Online	2
12. Multiplexing and demultiplexing of data in digital systems.	Interactive lecture + video projector / Online	2
13. Analog data transmission systems.	Interactive lecture + video projector / Online	2
14. Audio-video transmission systems.	Interactive lecture + video projector / Online	2
Bibliography 1. Marin Tomşe – Sisteme de transmisiuni digitale pe fibre optice. Curs manuscris, https://prof.uoradea.ro/mtomse 2. Doicaru Vladimir şi Pârvulescu Mihai - *Transmisii prin fibre optice*, Bucureşti, Editura Militară, 1994 3. Duma, Ioan - *Curs practic de comunicaţii optice*, U.P.Bucureşti, 2004. 4. Manea A. - *Sisteme optice de comunicaţii*, Ed. Electus, Pitesti, 2000.		
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 awar-ded 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 characteristics of the main components of a digital fiber optic transmission system and the ability to design a medium complexity fiber optic transmission system			

Completion date
05.09.2022

Signature of the course holder
S.l. dr. ing. Tomșe Marin
mtomse@yahoo.com

Date of endorsement in the department:
19.09.2022

Signature of the department director
Prof.dr.ing. Daniel Trip
dtrip.uo@gmail.com

Date of endorsement in the Faculty Board:
23.09.2022

Signature of the Dean
Prof.dr.ing. Mircea Gordan
mirgordan@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 Electronics and Telecommunications**
1.4 Field of study	**Electronics engineering, Telecommunications and Information Technologies**
1.5 Study cycle	**Master(2nd cycle)**
1.6 Study program/Qualification	**AUDIO-VIDEO TECHNOLOGIES AND TELECOMMUNICATIONS/ Master Degree**

2. Data related to the subject

2.1 Name of the subject			**ENTREPRENEURSHIP IN ELECTRONIC ENGINEERING AND TELECOMMUNICATIONS**				
2.2 Holder of the subject							
2.3 Holder of the academic seminar/laboratory/project			Professor eng.PhD CORNELIA EMILIA GORDAN				
2.4 Year of study	II	2.5 Semester	4	2.6 Type of evaluation	VP	2.7 Subject regime	I

(I) Imposed; (O) Optional; (F) Facultative

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

3.1 Number of hours per week	2	of which: 3.2 course	-	3.3 academic project	2
3.4 Total hours from the curriculum	28	of which: 3.5 course	-	3.6 academic project	28
Distribution of time					22 hours
Study using the manual, course support, references and handwritten notes					6
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					7
Tutorials					-
Examinations					3
Other activities.					-

3.7 Total hours for individual study	**22**
3.9 Total 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 course development	Videoprojector, laptop, smart board
5.2. for academic laboratory development	The existence of the apparatus and equipment necessary for the development in optimal conditions of the works provided in the discipline file. Providing students with the laboratory guide in printed or electronic format.

6. Specific skills acquired	
Professional skills	
Transver-sal skills	**CT2** Responsible execution of interdisciplinary team work tasks, assuming roles at different hierarchical levels **CT1** Fulfilling the professional tasks with the exact identification of the objectives to be achieved, of some potential risk factors, of the available resources, of the economic-financial aspects, of the conditions for their completion, of the working stages, of the working time and of the related accomplishment terms

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

7.1 General	This project is taught to second year students Audio-video and telecommunications technologies, master.

objective of the subject	The project aims to familiarize students with the main problems of entrepreneurial thinking and action seen in terms of factors that ensure entrepreneurial success
7.2 Specific obiectives	Acquiring knowledge specific to the entrepreneurial approach in the field of Electronic Engineering and Telecommunications (IETC) Training skills and abilities to analyze the entrepreneurial environment in the field of Electronic Engineering and Telecommunications, in order to make the most of business opportunities. Development of skills aimed at understanding the role of the entrepreneur and developing a business plan in the field of Electronic Engineering and Telecommunications (IETC)

8. Contents*

8.1 Course (on site/ on-line)	Teaching methods	No. of hours/ Observations
8.2 Seminar	Teaching methods	No. of hours/ Observations
8.2 Academic laboratory (on site/ on-line)	Teaching methods	No. of hours/ Observations
8.4 Project	Teaching methods	No. of hours/ Observations
1. Reasons, skills and sources for business ideas	Interactive lecture; exposure, Practical application.Discussions	2 hours
2. The decision to invest and the identification of opportunities	Interactive lecture; exposure, Practical application.Discussions	2 hours
3. Understanding the business environment	Interactive lecture; exposure, Practical application.Discussions	2 hours
4. Business authorization	Interactive lecture; exposure, Practical application.Discussions	2 hours
5. Customers and their behavior	Interactive lecture; exposure, Practical application.Discussions	2 hours
6. Competitors and product sales	Interactive lecture; exposure, Practical application.Discussions	2 hours
7. Low budget marketing. Resources, skills, capabilities	Interactive lecture; exposure, Practical application.Discussions	2 hours
8. Estimating the resources needed for a business	Interactive lecture; exposure, Practical application.Discussions	2 hours
9. Sources of financing and data sources for a business plan	Interactive lecture; exposure, Practical application.Discussions	2 hours
10. Components of a business plan	Interactive lecture; exposure, Practical application.Discussions	2 hours
11. Elaboration of a business plan on the example of the business idea of organizing events - the process model	Interactive lecture; exposure, Practical application.Discussions	2 hours
12. Environmental analysis and identification of the business idea in the field of IETC	Interactive lecture; exposure, Practical application.Discussions	2 hours
13. Customers, competitors and resources needed for a business in the field of IETC	Interactive lecture; exposure, Practical application.Discussions	2 hours
14. Drafting a business plan in the field of IETC	Interactive lecture; exposure, Practical application.Discussions	2 hours

References

1. Ghenea Marius, *Antreprenoriat. Drumul de la idei către oportunități și succes în afaceri*, Editura Univers Juridic, București, 2011;
2. Grigore Ana-Maria, *Antreprenoriat și management pentru afaceri mici și mijlocii,* Editura C.H. Beck, București,2019;
3. Onetiu Cristian, *Start în antreprenoriat. Călătoria antreprenorului de la a ști la a avea înspre a deveni*, Editura Act și Politon, 2019;
4.Cornelia Gordan, Suport de curs *Competențe antreprenoriale pentru non-economiști – Antreprenoriat în Inginerie Electronică și Telecomunicații,* format e-learning, disponibil pe platforma Universității din Oradea la adresa https://e.uoradea.ro/course/view

9. Corroboration of the discipline content with the expectations of the representatives of epistemology-cal community, professional associations and representative employers in the field related to the specialisation

The content of this discipline was compiled by reference to the curricula of other universities in the country and abroad, taking into account the requirements of the economic environment and the representatives of potential employers of IETC graduates.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation	10.3 Percent from

		methods	the final mark
10.4 Cours	-	-	-
10.5 Seminar	-	-	-
10.6 Academic Laboratory		-	-
10.7 Project	Knowledge and understanding of concepts, methods, techniques and tools specific to entrepreneurship; Explanation and interpretation of IETC-specific entrepreneurial phenomena and processes; Making connections between theoretical and practical knowledge; Achieving the importance of case studies and free presentations, as well as applied research in the formation of practical entrepreneurial thinking; Ability to develop and present a business plan.	Written test. Practical test. Discussions. Online or on-site argumentation	100%
10.8 **Minimum performance standard:** Writing a business plan with a minimum basic structure, which contains the strictly necessary elements specific to the field of study of electronic engineering, telecommunications and information technology. A final grade of at least 5 (five) is required to complete this discipline			

Completion date: 01.09.2022

Date of endorsement in the department: 19.09.2022

Date of endorsement in the Faculty Board: 23.09.2022

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 Electronics and Telecommunications
1.4 Field of study	Electronical engineering, telecommunications and information technologies
1.5 Study cycle	Master (2nd cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications/Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject			**Information and communications modern technologies**				
2.2 Holder of the subject			Associate Prof.PhD.Castrase Simona Cristina				
2.3 Holder of the academic laboratory			Associate Prof.PhD.Castrase Simona Cristina				
2.4 Year of study	II	2.5 Semester	4	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	3	of which: 3.2 course	1	3.3 academic laboratory	1/1
3.4 Total of hours from the curriculum	42	Of which: 3.5 course	14	3.6 academic /laboratory	28
Distribution of time					88
Study using the manual, course support, bibliography and handwritten notes					36
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					20
Tutorials					8
Examinations					4
Other activities.					

3.7 Total of hours for individual study	88
3.9 Total of hours per semester	130
3.10 Number of credits	**5**

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	Videoproiector -on site, Moodle platform- online
5.2.for the development of the academic laboratory	Moodle platform- online Laboratory equipped with computers and specific equipment

6. Specific skills acquired

Professional skills	C2. Applying specific field-related knowledge for solving complex technical problems concerning the design, analysis and implementation of systems for the processing of audio-video and data signals C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems C5. Designing, optimizing and implementing communication-systems components using advanced methods and technologies
Transversal skills	CT1. Fulfilling professional tasks with the exact identification of objectives to be achieved, of certain potential risk-factors, of available resources, of financial-economic aspects, of conditions for the completion of the stages thereof, of work stages, of the time allocated to activities and the related implementation deadlines CT3. Adapting to new technologies, identifying the needs for continuous formation and the efficient use of information sources and communication and assisted professional training resources (Internet portals, specialized software applications, data bases, on-line courses, printed documentation sources, etc.), both in Romanian and in a foreign 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	Theoretical knowledge on modern information techniques and technologies and advanced communication tools
7.2 Specific objectives	Learning the concepts, modern information technologies and advanced ICT communication tools. Educational aspects regarding the elaboration of ICT-based materials and their use in the field of engineering sciences

8. Contents*

8.1 Course	Teaching methods	No. hours
1. Introductory notions. Modern information techniques and technologies. Educational activities based on ICT. International standards	Direct teaching	2
2. Educational aspects regarding the elaboration of ICT-based learning materials and their use in		2

the field of engineering sciences. Identifying students' needs. Specific educational objectives BL. Case studies.	aided by visual methods of presentation on site, and on the Moodle platform	
3. Development of courses in the field of engineering sciences in BL system. Identifying students' needs. Specific educational objectives. Didactic communication. Elements of interpersonal communication.		2
4. The use of ICT in the educational process. Distributing and accessing materials online. Blended & e-learning. The role of ICT in the modern educational process. ICT educational infrastructure. E-Learning platforms		2
5. Facilities and components of the DidaTec blended-learning support platform. Facilities and components support platforms for e-Learning developed on other technologies.		2
6. Design and development of courses and educational materials for engineering sciences using modern techniques and technologies. The structure of a material in electronic format		2
7. Advanced information retrieval using ICT tools. Advanced content editing tools. Graphic transposition of text, equations, graphs, images. Conversion and online publication of course teaching materials. Course / Web Authoring Technologies		2
8. Use of audio / video materials in the course. Frontal didactic communication and interaction with the audience. Creating presentation support (PPT) and effective support.		2
9. Design and development of materials for applications in the field of engineering sciences. Development of teaching materials in electronic format using video capture tools.		2
10. Electronic management of applicable online activities. Virtual laboratories. Group work.		2
11. Methodologies, types of electronic assessment tests for disciplines in the field of engineering sciences		2
12.Tools for conducting electronic assessment / self-assessment tests of students. Carrying out and managing tests - Moodle case study. Types of questions - Moodle case study. Applications.		2
13. Advanced ICT communication technologies and tools in the educational process. Organizing educational activities and communicating with students using educational platforms: calendar, work group, email, chat, forum, blog, wiki, RSS.		2
14. Use of audio and video conferencing systems in educational activities. Carrying out educational activity in virtual classrooms. Integration of course materials and required applications.		2
Bibliography 1. S. Castrase, *Tehnologii moderne ale informației și comunicațiilor*, Curs, ISBN 978-606-10-2114-7, Ed. Univ. Oradea, 2020 2. L Grindei, L.Ciascai, R.Vlaicu -*Tehnici si Tehnologii moderne în educație* Ed. U.T.PRESS ,Cluj-Napoca, 2012 3. R.Terebes, A. Vlaicu.B.Orza, Ș.Meza, L. Grindei- *Utilizarea TIC în procesul educațional. Distribuirea și accesarea materialelor online. Blended& E-Learning*, Editura U.T.PRESS ,Cluj-Napoca, 2012 4.. A.Vlaicu.B.Orza,Ș.Meza, L.Grindei-*Proiectarea și dezvoltarea cursurilor și materialelor educaționale pt.științele inginerești utilizând tehnici și tehnologii moderne,*Cluj-Napoca, 2011		
8.2 Academic laboratory	Teaching methods	No. hours
1. Distribute and access materials online. Blended & e-learning e-Learning Platforms.	laboratory applications, simulation program on site and on the Moodle platform	2
2.Advanced content editing tools.		2
3. Creating presentation support (PPT) and effective support.		2
4. Development of teaching materials in electronic format using audio and video capture tools.		2
5. Electronic management of applicable online activities. Virtual labs.		2
6. Carrying out electronic evaluation / self-evaluation tests		2
7. Evaluation test		2
	Direct teaching aided by visual presentation methods, Modeling, simulation	
8.4.Project		
1. Presentation of homework and requirements.		2
2. Conversion, online publication of teaching materials for course. Course / Web Authoring Technolog.		2
3.Development of teaching materials in electronic format using video capture tools.		2
4. Design and development of an educational material using modern techniques and technologies.		2
5. Electronic management of applicable online activities. Virtual labs.		2
6. Implementing a complex test in Moodle.		2
7. Presentation of projects		2
Bibliography 1. S. Castrase, *Tehnologii moderne ale informației și comunicațiilor*, Curs, ISBN 978-606-10-2114-7, Ed. Univ. Oradea, 2020 2. L Grindei, L.Ciascai, R.Vlaicu -*Tehnici si Tehnologii moderne în educație* Ed. U.T.PRESS ,Cluj-Napoca, 2012 3. R.Terebes, A. Vlaicu.B.Orza, Ș.Meza, L. Grindei- *Utilizarea TIC în procesul educațional. Distribuirea și accesarea materialelor online. Blended& E-Learning*, Editura U.T.PRESS ,Cluj-Napoca, 2012 4.. A.Vlaicu.B.Orza,Ș.Meza, L.Grindei-*Proiectarea și dezvoltarea cursurilor și materialelor educaționale pt.științele inginerești utilizând tehnici și tehnologii moderne,*Cluj-Napoca, 2011		

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 can be found in the specialization curriculum of and from other university centers that have accredited this specialization.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation	10.3 Percent from

		methods	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 required	Written exam	60%
10.6 Laboratory	Minimum required conditions for promotion (grade 5): it is necessary to know the fundamental notions required in the subjects, without presenting details on them in accordance with the minimum performance standard For 10:Realization of online application topics, minimal theoretical knowledge about each laboratory work. Final evaluation test. The grade obtained gives the right to enter the exam. -15% of the grade from the laboratory is the evaluation of individual topics.	Evaluation of works + test	20%
10.7 Project	Elaboration of the project theme	practice application	20%
10.8 Minimum performance standard: The solution on time, in individual activities and activities carried out in groups, in conditions of qualified assistance, of the problems that require the application of principles and rules respecting the norms of professional deontology.			

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 Department	Department of Electronics and Telecommunications
1.4 Field of study	Electronical engineering, telecommunications and information technologies
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject			**Microsystems for electronics and telecommunication**				
2.2 Holder of the subject			Moldovan Liviu				
2.3 Holder of the academic seminar/laboratory/project			Moldovan Liviu				
2.4 Year of study	II	2.5 Semester	3	2.6 Type of the evaluation	CA (Vp)	2.7 Subject regime	THD

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	0/0/1
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					88 hours
Study using the manual, course support, bibliography and handwritten notes					54
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					
Examinations					4
Other activities.					

3.7 Total of hours for individual study	**88**
3.9 Total of hours per semester	**130**
3.10 Number of credits	5

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	projector
5.2.for the development of	-

the academic seminary/laboratory/project	

6. Specific skills acquired	
Professional skills	**C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems** - The adequate identification and use of advanced techniques, methods, methodologies and technologies necessary for the analysis, design and implementation of audio-video systems - Interpreting numerical data obtained as a result of modeling and simulating systems containing audio-video and telecommunication equipment. - Using some generally valid analysis and synthesis methods that can be used for a large variety of particular situations, different than the ones that were studied. - The comparative evaluation of alternatives for the optimization of telecommunications systems performance. - Investigation, development and implementation of complex projects based on original solutions involving telecommunication equipment and systems. **C4. Analysis and implementation of strategies for the execution of audio-video and telecommunications equipment** - Providing details for the performance criteria of technological systems and processes used in the execution of audio-video and telecommunications equipment. - Using interdisciplinary knowledge for providing technological solutions to the execution, in the industrial environment, of audio-video and telecommunications equipment. - The creative application of some advanced principles and methods for CAD and technological execution, so as to ensure the security, safety and facility in operating telecommunications systems. - Elaborating tests, using and complying with quality, safety and security standards in the field of audio-video and telecommunications equipment. - Carrying out interdisciplinary professional and/or research-development projects while complying with quality, safety and security standards. **C5. Designing, optimizing and implementing communication-systems components using advanced methods and technologies** - Demonstrating the deep understanding of modern computer systems, of control techniques, of concepts, principles and algorithms used in designing audio-video and telecommunications equipment. - Using the capacity to analyze and interpret new situations in the field of processing, analyzing, synthesizing, compressing and encoding audio-video signals in the light of multidisciplinary knowledge in the field of electronics and telecommunications engineering. - Formulating and solving certain complex engineering problems such as image processing, the analysis, synthesis, encoding, compression and transmission of audio-video signals, using modern methods and software supports. - Carrying out research activities with practical finality. - Fulfilling performance and security criteria of multimedia and telecommunications systems.
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	▪
7.2 Specific objectives	▪

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introduction to microsystems for electronics.	Transmission of knowledge using oral communication,	2
2. The MEMs (MicroElectroMechanical systems) and NEMs (nanoelectromechanical systems)		2
3. The current state of microsystems for electronics		2

4. Materials for microsystems	presentation, conversation, problematization (using video and power point materials), written communication (bibliographies).	2
5. Technologies for the manufacture of microsystems		2
6. Superconducting microstructures		2
7. Micro Thermal Sensors		2
8. Electrostatic Field Sensors		2
9. Applications of advanced MEMs and microsystems		2
10. Microsystems for telecommunications		2
11. Tapping microresonators		2
12. High frequency microresonators		2
13. Microswitches		2
14. Magnetic mechanical microsystems (MMMs)		2
Bibliography 1.		
8.2 Project	Teaching methods	No. of hours/ Observations
1. The stages of designing a MEMS device	exposure	2
2. The stages of designing a MEMS device	exposure	2
3. The stages of a concrete project theme for each student or group of 2-5 students	exposure/ discussions	2
4. Making a proposal of successions of technological processes	discusions/ problematizations	2
5. Determining alternative methods for carrying out the project	discusions/ problematizations	2
6. Establishing the chosen method according to advantages and disadvantages	discusions/ problematizations	2
7. Project defending		2

Bibliography

1. E.W. Becker; W. Ehrfeld; P. Hagmann; A. Maner; D. Münchmeyer, Fabrication of microstructures with high aspect ratios and great structural heights by synchrotron radiation lithography, galvanoforming, and plastic moulding (LIGA process), Microelectronic Engineering, Vol 4, pg 35-56, 1986
2. Bertsch, H. Lorenz, P. Renaud, Combining microstereolithography and thick resist UV lithography for 3D microfabrication, Proc. 11th International Workshop on Micro Electro Mechanical system, Heildeberg, Germania, ianuarie 24-29, pg 18-23, 1998
3. M.C. Wu, L.Y. Lin, S.S. Lee, K.S.J. Pister, Microfabricated free space integrated micro-optics, Sensors and Actuators, vol A50, pg. 127-134, 1995
4. V. Agache, Integration et caracterisation physique de nanostructures pour les technologies de l'information et de la communication, teză de doctorat, Universitatea din Lille, Franţa, 2003
5. S. Logothetidis, Nanostructured Materials and Their Applications (NanoScience and Technology), Springer, 2012
6. W.K. Schomburg, Introduction to Microsystem Design, Springer, 2013
7. Z. Zsou, Z. Wang, L. Lin, Microsystems and Nanotechnology, Springer, 2012
8. S.D. Senturia, Microsystem Design, Springer, 2005
9. T.R. Hsu, MEMS & Microsystems: Design, Manufacture, and Nanoscale Engineering, John Wiley & Sons, 2008

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 acquired skills will be necessary for the employees who will carry out their activity in the companies with specific activities.

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): Description of the structure of a microsystem for	Writing (1 hour), followed by discussion if necessary. If face-to-face exam is impossible, an oral examination using Microsoft Teams will be	

	electronics and telecommunications, description of technological processes for the realization of microsystems. - For 10: Establishing in chronological order the technological processes for a given microsystem and illustrating the evolution of the tranche towards the desired structure.	done.	
10.5 Academic seminar	-		
10.6 Laboratory	-		
10.7 Project	Feasibility of the realized project	Project analysis	80%
	Understanding the problems to be avoided	Discussions on the project	20%
10.8 Minimum performance standard: Course: - Knowing the definitions of all the technological processes presented, comparing them when necessary. Academic seminar: Laboratory: Project: - Knowing the criteria for choosing a certain technological process.			

Completion date: 16.09.2022

Date of endorsement in the department: 19.09.2022

Date of endorsement in the Faculty Board: 23.09.2022

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 Electronics and Telecommunications
1.4 Field of study	Electronical engineering, telecommunications and information technologies
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Audio-Video Technologies and Telecommunications **/** Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject			**Video Equipments**				
2.2 Holder of the subject			**Lect.dr.eng. Gavriluţ Ioan**				
2.3 Holder of the academic seminar/laboratory/project			**Lect.dr.eng. Gavriluţ Ioan**				
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	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					83
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					19
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					24
Tutorials					10
Examinations					10
Other activities.					0
3.7 Total of hours for individual study	**83**				
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)
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	The classroom. The course can be held face to face or online.

5.2.for the development of the academic seminary/laboratory/project	Laboratory room with the devices related to the proposed works. The seminar / laboratory / project can be held face to face or online

6. Specific skills acquired

Professional skills	**C1. Studying thoroughly the acquisition algorithms and techniques, the processing, analysis and numerical synthesis of signals in designing audio-video and communication equipment.** - Using specific theories and instruments in order to explain the structure of audio-video and communications equipment. - The comparative evaluation of performance in systems for processing and transmitting audio-video and data signals. **C3. Using hardware and software instruments for the simulation, analysis, design and implementation of audio-video systems** - Interpreting numerical data obtained as a result of modeling and simulating systems containing audio-video and telecommunication equipment. - The comparative evaluation of alternatives for the optimization of telecommunications systems performance. **C4. Analysis and implementation of strategies for the execution of audio-video and telecommunications equipment** - Using interdisciplinary knowledge for providing technological solutions to the execution, in the industrial environment, of audio-video and telecommunications equipment.
Transversal skills	**CT2.** The responsible execution of some work tasks within an interdisciplinary team, by assuming roles on different hierarchy levels **CT3.** Adapting to new technologies, identifying the needs for continuous formation and the efficient use of information sources and communication and assisted professional training resources (Internet portals, specialized software applications, data bases, on-line courses, printed documentation sources, etc.), both in Romanian and in a foreign 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 purpose of the course is familiarizing with the structure and the principle of functioning of the current video equipments. Besides these, the course aims to know the trends in the development of the latest generation of video equipments.
7.2 Specific objectives	familiarization with the structure and operation of a modern color TV receiver, digital video camera, DVD player, monitor

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Video signals	Exposition of theoretical elements and examples of practical applications. Discussions and questions The activity can also be carried out online	2
2. Digital video signal processing		2
3. Video signal recording / playback techniques		2
4. Compatibility of video equipment		2
5. Digital cameras		2
6. Digital video cameras		2
7. Frequency synthesis televisions		2
8. Digital tape recorders / cassette players		2
9. Multifunction cassette recorders		2
10. CD players and recorders		2
11. Monitors		2
12. High definition televisions		2
13. LCD TV		2

14. LED TV		2
Bibliography		
1. I. Gavriluţ, *Echipamente video - curs*, Editat local, Oradea, 2008.		
2. M. Oteşteanu, F. Alexa, C. Ianasi, *Sisteme de înregistrare audio & video*, Ed. de Vest, Timişoara, 1997.		
3. E. Damachi, C. Şerbu, R. Zaciu, *Televiziune*, Editura Didactică si Pedagogică, Bucureşti, 1983.		
4. L. Stanciu, *Echipamente audio Hi-Fi*, Editura Matrix Rom, Bucureşti, 1998.		
5. M. Băşoiu, M. Gavriliu, G. Pflanzer, *Funcţionarea si depanarea televizorului în culori*, Ed. Tehnică, Bucureşti, 1985.		
6. A. Gacsádi, Bazele televiziunii, Editura Universităţii din Oradea, 2002.		
7. A. Gacsádi, I. Gavriluţ, *Bazele televiziunii - Îndrumător de laborator*, Editura Univ. din Oradea, 2008.		
8.2 Academic seminar/laboratory/project	Teaching methods	No. of hours/ Observations
L. 1. Complex color video signal	Using the laboratory guide, presenting the paper, performing the measurements, completing the tables of results The activity can also be carried out online	2
L. 2. Recording / playback and processing of video signals		2
L. 3. Convert videos		2
L. 4. Interconnection of video equipment		2
L. 5. Digital video cameras		2
L. 6. DVD player		2
L. 7. TFT TVs		2
Bibliography		
1. I. Gavriluţ, *Echipamente video - curs*, Editat local, Oradea, 2008.		
2. M. Oteşteanu, F. Alexa, C. Ianasi, *Sisteme de înregistrare audio & video*, Ed. de Vest, Timişoara, 1997.		
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6. A. Gacsádi, *Bazele televiziunii*, Editura Universităţii din Oradea, 2002.		
7. A. Gacsádi, I. Gavriluţ, *Bazele televiziunii - Îndrumător de laborator*, Editura Univ. din Oradea, 2008.		

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 done in other university centers in the country. In developing the discipline, the requirements of engineers in the field of audio-video technologies on the labor market were taken into account.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	The level and quality of student training in the course.	PPT presentation	70%
10.5 Academic seminar			
10.6 Laboratory	Assimilation of theoretical and practical knowledge following individual study and laboratory work.	practical test	30%
10.7 Project			
10.8 Minimum performance standard: Course: Knowledge of the general principles of construction and operation of the usual video equipment. Laboratory: Knowledge of the basic notions regarding the block diagram operation of an LCD and LED color TV receiver.			

Completion date:
15.09.2022

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Date of endorsement in the department:
19.09.2022

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Date of endorsement in the Faculty Board:
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