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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems/ Master of Science in Engineering**

2. Datarelated to thesubject

2.1 Name of the subject			**Manufacturing automation systems**				
2.2 Holder of the subject			**Conf. PhD eng. Tiberiu Barabas**				
2.3 Holder of the academic laboratory/project			**Conf. PhD eng. Tiberiu Barabas**				
2.4 Year of study	**I**	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	**3**	of which: 3.2 course	**2**	3.3 academic laboratory/project	**1/-**
3.4 Total of hours from the curriculum	**42**	Of which: 3.5 course	**28**	3.6 academiclaboratory/project	**14/-**

Distribution of time	hours
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	17
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	24
Tutorials	2
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	(Conditions)
4.2 related to skills	

5. Conditions (where applicable)

5.1. for the development of the course	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic laboratory/project	- Mandatory presence at all laboratories; - The laboratory/project can be carried out face to face or online - Students come with the observed laboratory works - A maximum of 2 works can be recovered during the semester (30%);

	- The frequency at laboratory hours below 70% leads to the restoration of the discipline

6. Specific skills acquired	
Professional skills	**C3.** Implementation of control systems, software structure for real-time control applications, human-machine interfaces, artificial vision, automated manufacturing systems.
Transversal skills	**CT2.** Identify roles and responsibilities in a multi-specializedteam, decisions making and assigning tasks, applying relationshipstechniques and efficient work within the team

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

7.1 The general objective of the subject	• Fundamentals on the architecture of automated manufacturing systems in the CIM (Computer Integrated Manufacturing) concept, studying system components and information processing. Familiarity with the specific problems of modeling, simulation and management of automated manufacturing systems.
7.2 Specific objectives	• The course aims to present the theoretical elements related to the architecture, modeling and simulation of the operation of automatic manufacturing systems. • The laboratory familiarizes students with practical aspects of the management of automated manufacturing systems.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
Cap.1.Introduction to automatic manufacturing systems. Cim concept. Cap.2. Flexible Manufacturing Systems (FMS). Cap.3. Manufacturing automation structures used in CIM systems. Cap.4. Open architecture control equipments for CIM systems Cap.5.Modelling and simulation of the operation of automatic manufacturing systems. Petri networks. Cap.6.Simulation of the operation of robotic manufacturing cells using the ROBO-DK programming environment.	Free exposure, with the presentation of the course with video projector, on the board or online	4h 6h 6h 6h 4h 2h

Bibliography

1. T. Barabas, **Structuri deschise de automatizare a fabricaţiei din cadrul hipersistemelor CIM robotizate**, Editura Universităţii Oradea, 2004;
2. Th. Borangiu s.a. **Conducerea multiprocesor în timp real a structurilor flexibile de fabricatie** Ed.Tehnicã, 1989
3. S.Călin s.a. **Conducerea adaptivă si flexibilă a proceselor industriale**, Ed.Tehnicã, 1988
4. M. Ganea, T. Barabas**, Sisteme flexibile - Roboţi şi linii flexibile** – *Îndrumător de laborator*, Editura Universităţii Oradea, 2000
5. Kovacs, Fr. şi col, **Sisteme de fabricaţie flexibilă robotizate,** vol. I-II., Universitatea "Politehnică" Timişoara, 1994

8.2 Academic laboratory	Teaching methods	No. of hours/ Observations
1. Presentation of the laboratory and of the labor protection norms. 2. The pallet manipulator at the entry point of the Regal storage.	Students receive laboratory papers	2 h 2 h

3. The Regal storage and the Stacker manipulator. 4. The flow of parts and the control algorithm in CIM. 5. Management of the Regal storage. 6. Study of a ROBO-DK application to simulate the operation of a manufacturing cell. 7. Closing the situation at the laboratory.	at least one week in advance, study them, inspect them, and take a theoretical test at the beginning of the laboratory. Then, the students carry out the practical part of the work under the guidance of the teacher	2 h 2 h 2 h 2 h 2 h
Bibliography 1. 1. M. Ganea, T. Barabas**, Sisteme flexibile - Roboţi şi linii flexibile** – *Îndrumător de laborator*, Editura Universităţii Oradea, 2000de laborator. Universitatea din Oradea, ISBN 978-606-10-1432-3, Ediţie CD-ROM, 140 pag, 2014		

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 similar to similar subjects taught at the University "Politechnics" Timisoara.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10:thorough knowledge of all subjects is required	**Written exam** Students receive for solving each a form with 3 subjects of theory and an application.	70 %
10.5 Laboratory	Minimum required conditions for promotion (grade 5): in accordance with the minimum performance standard recognition of the stands used to carry out the laboratory works, without presenting details on them For 10: detailed knowledge of how to perform all laboratory	**Test + practical application** At each laboratory students receive a test and a grade. Each student also receives a grade for laboratory work during the semester and for the laboratory work file. This results in an average for the laboratory.	30%

	work		
10.6 Minimum performance standard: • Modeling, simulation and use/programming of automatic manufacturing systems.			

Completion date:
01.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management
1.4 Field of study	Systems Engineering
1.5 Study cycle	Master (2^{nd} cycle)
1.6 Study program/Qualification	Advanced Control Systems / Master of Science in Engineering

2. Data related to the subject

2.1 Name of the subject		Industrial networks					
2.2 Holder of the subject		Assoc. prof. GERGELY Eugen-Ioan					
2.3 Holder of the academic seminar/laboratory/project		Assoc. prof. GERGELY Eugen-Ioan					
2.4 Year of study	1	2.5 Semester	2	2.6 Type of the evaluation	Examination	2.7 Subject regime	Thoroughgoing Discipline

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

3.1 Number of hours per week	4	of which: 3.2 course	2	3.3 academic seminar/laboratory/project	-/2/-
3.4 Total of hours from the curriculum	56	Of which: 3.5 course	28	3.6 academic seminar/laboratory/project	-/28/-
Distribution of time					69 hours
Study using the manual, course support, bibliography and handwritten notes					26
Supplementary documentation using the library, on field-related electronic platforms and in field-related places					13
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					21
Tutorials					7
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	- The course room has to be provided with a video-projector - The course can be carried out face to face or online
5.2.for the development of the academic seminary/laboratory/project	- The laboratory facility has to be provided with the necessary equipments - Students presence to all laboratory/project hours is compulsory - Students must have summarized the current laboratory work - Maximum 4 laboratory works (30%) can be recovered during the semester - A participation below 70% at the laboratory works / project leads to the restoration of the subject - The laboratory hours can be carried out face to face or online

6. Specific skills acquired	
Professional skills	C1. Knowing the main types of economic processes and phenomena of communication, elements of microeconomic theory and practical aspects of financial and economic flows at business
Transversal skills	CT2. Identify the roles and responsibilities of each member of a pluri-disciplinary team and apply efficient work and relational techniques inside the team

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

7.1 The general objective of the subject	▪ The subject provides knowledge about the actual practices used for the design, installation, commisioning and troubleshooting of the industrial communication networks. The presented notions do not intend to make a ranking of the existing networks from the point of view of their performances. The main goal is to provide the necessary data for choosing the most adequate standards and technologies for a given application. The laboratory works are based on SIMATIC S7-300 PLCs and contain applications based on PROFIBUS DP.
7.2 Specific objectives	▪ To create skills for being able to analize, design, implement and maintain industrial communication networks.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introductory aspects	face to face or online interactive presentation	2 hours
2. Network topologies. The ISO/OSI model	face to face or online interactive presentation	4 hours
3. Communication media	face to face or online interactive presentation	6 hours
4. The standards RS-232 and RS-485	face to face or online interactive presentation	2 hours
5. The TCP/IP protocol. The Modbus protocol	face to face or online interactive presentation	2 hours
6. The Industrial Ethernet protocol	face to face or online interactive presentation	2 hours
7. The AS-i interface. The DeviceNet interface	face to face or online interactive presentation	2 hours
8. The Profibus PA/DP/FMS interface. The Foundation Fieldbus interface	face to face or online interactive	2 hours

	presentation	
9. The Modbus Plus protocol. The Data Highway Plus protocol. The Hart protocol	face to face or online interactive presentation	2 hours
10. Wireless technologies	face to face or online interactive presentation	4 hours
Bibliography 1. E. Gergely, Helga Silaghi, V. Spoială**,** L. Coroiu, Z. Nagy, Automate programabile. Operare, programare, aplicaţii, Editura Universităţii din Oradea, Oradea, ISBN 978-973-759-940-7, 2009. 2. L. M. Thompson, Industrial Data Communications, 4th Edition, ISA, 2007. 3. D. Reynders, S. Mackay, E. Wright, Practical Industrial Data Communications: Best Practice Techniques, Elsevier, 2005		
8.2 Laboratory	Teaching methods	No. of hours/ Observations
1. Labor protection. Presentation of laboratory works.	Laboratory work summary and practical demonstrations using specific equipments	2 hours
2. Presentation of the use of S7-300 for PROFIBUS communication.	Laboratory work summary and practical demonstrations using specific equipments	2 hours
3. Addressing methods.	Laboratory work summary and practical demonstrations using specific equipments	2 hours
4. Working with GSD files	Laboratory work summary and practical demonstrations using specific equipments	2 hours
5. Working with the organizational blocks OB82, OB86 and OB122	Laboratory work summary and practical demonstrations using specific equipments	2 hours
6. Configuring remote I/Os for PROFIBUS	Laboratory work summary and practical demonstrations using specific equipments	2 hours
7. Troubleshooting the communication	Laboratory work summary and practical demonstrations using specific equipments	2 hours
8. Using the FC125 function for programming diagnostic functions	Laboratory work summary and	2 hours

	practical demonstrations using specific equipments	
9. Using the Sync/Freeze commands	Laboratory work summary and practical demonstrations using specific equipments	2 hours
10. Deactivating I/O devices	Laboratory work summary and practical demonstrations using specific equipments	2 hours
11. Reading the diagnostic data from a slave station	Laboratory work summary and practical demonstrations using specific equipments	2 hours
12. Using a CPU as slave	Laboratory work summary and practical demonstrations using specific equipments	4 hours
13. Completion of the laboratories situation	Laboratory work summary and practical demonstrations using specific equipments	2 hours

Bibliography

1. Gergely E., Reţele industriale, Lucrări de laborator.
2. http://support.automation.siemens.com .
3. xxx – SIMATIC NET, PROFIBUS Networks, User Manual, SIEMENS, 2004
4. xxx – Introduction To ProfiBus DP, Tehnical Reference, ACROMAG INCORPORATED, USA, 2004
5. xxx – PROFIBUS, Technology and Application, PROFIBUS Competence Centers, 2005

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

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

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluati methods The evaluati can be made fa to face c online
10.4 Course	Minimum required conditions for passing the exam	Written

	(mark 5): in accordance with the minimum performance standard - For mark 10: - thorough knowledge regarding the network topologies and the ISO/OSI model - thorough knowledge regarding the serial and parallel communication standards - thorough knowledge regarding the industrial standards and wireless communication - thorough knowledge regarding the safety and security in industrial networks - thorough knowledge regarding the design techniques for industrial networks	examina
10.6 Laboratory	Minimum required conditions for promotion (grade 5): in accordance with the minimum performance standard - For mark 10: - thorough knowledge regarding the S7-300 PLC - thorough knowledge regarding the communication through PROFIBUS - thorough knowledge regarding the master-slave communication	Knowle assessm test
10.8 Minimum performance standard: Course: - knowledge regarding the network topologies and the ISO/OSI model - knowledge regarding the serial and parallel communication standards - knowledge regarding the industrial standards and wireless communication - knowledge regarding the safety and security in industrial networks - knowledge regarding the design techniques for industrial networks Laboratory: - knowledge regarding the S7-300 PLC - knowledge regarding the communication through PROFIBUS - knowledge regarding the master-slave communication		

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems / Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject		**Advanced electrical drives**					
2.2 Holder of the subject		**Prof. PhD eng. Helga Silaghi**					
2.3 Holder of the academic laboratory		**Prof. PhD eng. Helga Silaghi**					
2.4 Year of study	**I**	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	**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 laboratory	**14**

Distribution of time	hours
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	10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	28
Tutorials	
Examinations	9
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	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic seminary/laboratory/project	- The laboratory can be carried out face to face or online - The frequency at laboratory hours below 70% leads to the restoration of the discipline

6. Specific skills acquired	
Professional skills	**C4.** Setting up and implementing control systems related to electrical drives, advanced electrical drives
Transversal skills	**TC2.** Identify roles and responsibilities in a multi-specialized team, decisions making and assigning tasks, applying relationships techniques and efficient work within the team

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

7.1 The general objective of the subject	• The discipline has as objective the familiarization of the students from the master's specialization Advanced Control Systems, with the field of advanced electric drives.
7.2 Specific objectives	• The course aims to present the theoretical elements of the technique of of advanced electric drives. • The laboratory provides the necessary knowledge to the students to be able to know and operate an advanced electric drive

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Advanced electric drives with DC servomotors	Free exposure, with the presentation of the course with video projector, on the board or online	4h
2. Advanced electric drives with asynchronous servomotors	Free exposure, with the presentation of the course with video projector, on the board or online	4h
3. Advanced electric drives with synchronous servomotors	Free exposure, with the presentation of the course with video projector, on the board or online	4h
4. Advanced electric drives with stepper motors	Free exposure, with the presentation of the course with video projector, on the board or online	6h

5. Variable frequency induction machine control systems	Free exposure, with the presentation of the course with video projector, on the board or online	6h
6. Advanced electric drives with linear motors	Free exposure, with the presentation of the course with video projector, on the board or online	4h

Bibliography

1. SILAGHI H., SPOIALĂ V., SILAGHI M. – *Acţionări electrice*, Editura Mediamira , Oradea, 2009
2. SILAGHI, H., SPOIALĂ, VIORICA, *Acţionări electrice-probleme fundamentale şi noţiuni de proiectare*, Ed. Universităţii din Oradea, 2002
3. SILAGHI H., SILAGHI M. – *Sisteme de acţionări electrice cu maşini asincrone*, Editura Treira , Oradea, 2000
4. IANCU V., SPOIALĂ D., SPOIALĂ VIORICA, *Maşini electrice şi sisteme de acţionări electrice*, vol.II, Ed. Universităţii din Oradea, 2006
5. RICHARD CROWDER, *Electric drives and electromechanical systems*, Elsevier, Great Britain, 2006
6. VIORICA SPOIALĂ, HELGA SILAGHI, *Acţionări electrice speciale,* Editura Universităţii din Oradea, 2010
7. HELGA SILAGHI, V. SPOIALA, D.SPOIALA, A. SILAGHI - *Acţionări electrice avansate*, Editura Universităţii din Oradea, Oradea, ISBN 978-606-10-2035-5, 157 pg., 2019

8.2 Academic laboratory	Teaching methods	No. of hours/ Observations
1. Presentation of the laboratory, of the labor protection norms and of the conventional signs specific to the field of electric drives. 2. Control of the main shaft to the machine tool GPR 45 NC. Speed selection 3. Control of advances to the GPR 45 NC machine tool 4. Control the revolver head on the GPR 45 NC machine tool 5. Microcontroller control of direct current servomotors 6. Microcontroller control of stepper motors 7. Closing the situation at the laboratory.	Students receive laboratory papers at least one week in advance, study them, and carry out the practical part of the work under the guidance of the teacher.	2 h 2 h 2 h 2 h 2 h 2 h 2 h

Bibliography

1.Silaghi Helga, Spoială Viorica, *Proiectarea acţionărilor electrice*, Îndrumător de proiectare, Editura Universităţii din Oradea, 2009
2.Helga Silaghi, V. Spoiala, D.Spoiala, A. Silaghi - *Acţionări electrice avansate*, Editura Universităţii din Oradea, Oradea, ISBN 978-606-10-2035-5, 157 pg., 2019
3. Viorica Spoială, Helga Silaghi, Dragoş Spoială – *Acţionări electrice*. Indrumator de laborator. Universitatea din Oradea, ISBN 978-606-10-1432-3, Ediţie CD-ROM, 140 pag, 2014
4. Helga Silaghi, Viorica Spoială, Claudiu Costea, *Acţionări electrice* – îndrumător de laborator, Editura Universităţii din Oradea, 126 pg, 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 can be found in the curriculum of Advanced Control Systems and from other university centers that have accredited these specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, Gh. Asachi University of Iasi, etc.) and knowledge of the types of electric drives and their operation and design is a stringent requirement of employers in the field (Comau, Faist Mekatronics, Celestica, GMAB, etc.).

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: thorough knowledge of all subjects is required	**Oral examination** Students receive for solving each a form with 3 subjects of theory and an application.	70 %
10.5 Laboratory	Minimum required conditions for promotion (grade 5): in accordance with the minimum performance standard recognition of the stands used to carry out the laboratory works, without presenting details on them For 10: detailed knowledge of how to perform all laboratory work	**Test + practical application** At each laboratory students receive a grade for laboratory work during the semester and for the laboratory work file. This results in an average for the laboratory.	30%
10.6 Minimum performance standard: Course: Selection and independent use of learned methods and algorithms for known standard situations as well as completion of calculations (analytical and numerical) with physical quantities. Laboratory: Development and implementation of algorithms and automation structures based on electrical drives, microcontrollers, signal processors, PLCs, embedded systems, etc. by using the principles of project management The timely solution, in individual activities and group activities, in conditions of qualified assistance, of the problems that require the application of principles and rules respecting the norms of professional deontology.			

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems / Master of Science in Engineering**

2. Data related to the subject

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

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

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

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

4. Pre-requisites (where applicable)

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

5. Conditions (where applicable)

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

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

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

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

8. 8. Contents

8.1.Course	Teaching methods	No. of hours/ Observations
The concept of ethics; general aspect of the ethics in scientific research. Regulations on ethics in Romanian universities.	Free exposure, with the presentation of the course with video projector, on the board or online	4h
Integrity in the educational system: integrity standards, promotion of academic integrity, violations of academic integrity, good practices.	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Ethical issues of research and publication: plagiarism, forms of plagiarism. Other forms of academic dishonesty.	Free exposure, with the presentation of the course with video projector, on the board or online	4h
Justice and equity in academic organizations and research teams. Legal provisions applicable to the ethics and integrity of scientific research.	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Elaboration of a scientific paper according to the principles of ethics and academic integrity	Free exposure, with the presentation of the course with video projector, on the board or online	2h

Bibliography

1. Ariely, D. (2012). *Adevărul (cinstit) despre necinste. Cum îi minţim pe toţi dar mai ales pe noi înşine*. Bucureşti: Editura Publica
2. Proiect PODCA 2013. Ghid practic privind cercetarea stiintifica
3. Pisoschi, A., Vacariu V, Ioana Popescu I. 2006. Etica în cercetare,
4. Singer, P. (2006), *Tratat de Etică*, Bucureşti: Editura Polirom
5. Şarpe, D., Popescu, D., Neagu, A., Ciucur, V., (2011**),** *Standarde de integritate în mediul universitar, UEFISCDI,* Bucureşti.
6.Şercan, Emilia, (2017), *Deontologie academică. Ghid practic,* Editura Universităţii Bucureşti
7. L.E.N- 1/2011
8. Legea 8/1996 privind drepturile de autor
9. Legea 206/2004 privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare

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

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

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

10. Evaluation

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

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems / Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject			**Computer vision and image processing**				
2.2 Holder of the subject			**Lect. PhD eng. Viorica Spoială**				
2.3 Holder of the academic laboratory			**Lect. PhD eng. Viorica Spoială**				
2.4 Year of study	**I**	2.5 Semester	**2**	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 laboratory	**2**
3.4 Total of hours from the curriculum	**56**	Of which: 3.5 course	**28**	3.6 academic laboratory	**28**

Distribution of time	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	14
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	20
Tutorials	
Examinations	9
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	Matlab software knowledge

5. Conditions (where applicable)

5.1. for the development of the course	- Attendance at least 50% of the courses
5.2.for the development of the academic seminary/laboratory/project	- Matlab software - The frequency at laboratory hours below 70% leads to the restoration of the discipline
6. Specific skills acquired	

Professional skills	**C3**. Control systems implementation, software structures for real-time control processes, human-machine interfaces, computer vision, manufacturing automated systems
Transversal skills	**TC2.** Identify roles and responsibilities in a multi-specialized team, decisions making and assigning tasks, applying relationships techniques and efficient work within the team

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

7.1 The general objective of the subject	• Is the comprehension of the working principle of a computer vision system and the principle of images acquisition and processing.
7.2 Specific objectives	• The course aims to present the digital representation of images, modalities of improving the quality of images, filtering, spectral analysis, morphological transforms, segmentation and compression of images. • The laboratory is oriented to image acquisition and processing using *Image Acquisition Toolbox* and *Image Processing Toolbox* in Matlab.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introduction in computer vision and image processing	Free exposure, with the presentation of the course with video projector, on the board	2h
2. Image representation	Free exposure, with the presentation of the course with video projector, on the board	3h
3. Image aspect improvement	Free exposure, with the presentation of the course with video projector, on the board	4h
4. Integral transforms of images	Free exposure, with the presentation of the course with video projector, on the board	4h

5. Image restoration	Free exposure, with the presentation of the course with video projector, on the board	2h
6. Mathematical morphology	Free exposure, with the presentation of the course with video projector, on the board	4h
7. Image segmentation and compression	Free exposure, with the presentation of the course with video projector, on the board	3h
8. Using the artificial intelligence in computer vision - Machine Learning - Deep Learning - Neural networks	Free exposure, with the presentation of the course with video projector, on the board	6h
Total		28h

Bibliography

1. Viorica Spoială, *Vedere artificială și prelucrarea imaginilor*, curs în format electronic, 2021
2. Rafael Gonzalez, Richard Woods, *Digital Image Processing Third Edition*, Pearson Prentice Hall, 2008
3. Cristian Grava, Vasile Buzuloiu, *Elemente de prelucrarea și analiza imaginilor*, Editura Universității din Oradea, 2007
4. Richard Szeliski, *Computer Vision: Algorithms and applications*, Springer, 2010
5. Brostow, Gabriel J., Julien Fauqueur, and Roberto Cipolla. "Semantic object classes in video: A high-definition ground truth database" *Pattern Recognition Letters* 30.2 (2009): 88-97.
6. Liang-Chieh Chen, Yukun Zhu, George Papandreou, Florian Schroff, Hartwig Adam, "Encoder-Decoder with Atrous Separable Convolution for Semantic Image Segmentation." © Springer Nature Switzerland AG , ECCV 2018, LNCS 11211, pp. 833–851, 2018.
https://doi.org/10.1007/978-3-030-01234-2_49
7. Yanming Guo, Yu Liu, Theodoros Georgiou, Michael S. Lew, "A review of semantic segmentation using deep neural networks", International Journal of Multimedia Information Retrieval, Springer Link, pp.87-93, 2018.

8.2 Academic laboratory	Teaching methods	No. of hours/ Observations
1. Presentation of the laboratory, of the labor protection norms. *Webcam* app installation and use for real-time image acquisition with Matlab	Students receive laboratory papers at least one week in advance, study them, and carry out the practical part of the work under the guidance of the teacher.	2 h
2. Matlab functions used for image acquisition, image conversion and manipulation		2 h
3. Image representation in Matlab		2 h
4. Image aspect improvement in Matlab		2 h
5. Punctual operators for changing image contrast. Image histogram in Matlab		2 h
6. Image filtering in Matlab		2 h
7. Fourier transform used for image analysis and processing in		4 h

Matlab **8.** Frequency response of linear filters used for images in Matlab **9.** Morphological transforms of images in Matlab **10.** Objects' detection from images in Matlab. **11.** Image segmentation using ImageSegmenter app in Matlab **12.** Semantic segmentation of images in Matlab, using Deep Learning method **13.** Recoveries and finish of the laboratory. **TOTAL**		2 h 2 h 2 h 2 h 2 h 2 h 28 h

Bibliography

1. Spoială Viorica, *Vedere artificială și prelucrarea imaginilor*, îndrumător de laborator în format electronic, 2022
2.https://ch.mathworks.com/products/image.html
3. https://www.mathworks.com/help/vision/ug/getting-started-with-semantic-segmentation-using-deep-learning.html
4. https://www.mathworks.com/help/vision/ug/label-pixels-for-semantic-segmentation.html
5. https://www.mathworks.com/help/vision/ug/get-started-with-the-image-labeler.html

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 other connected curriculum from other universities accredited, for example "Politehnica" University of Timisoara and knowledge of the working mode of computer vision and image processing systems is very important for the employment in any engineering field.

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 (grade 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	**Oral examination** Each student receives for solving a form with subjects of theory from all the courses.	60 %
10.5 Laboratory	Minimum required conditions for promotion (grade 5): in accordance with the minimum performance standard, the students have to know acquire images and apply simple processing functions on them, without details For 10: detailed knowledge of how to	**Practical application** Each laboratory consists of exercices in Matlab for which students receive a grade. All the grades are averaged and so results the grade for the laboratory.	40%

	perform all laboratory work		

10.6 Minimum performance standard:

Course:

Description of working principle of digital systems used for acquiring and processing images.
The ability of distinguish color images representation from binary or grayscale representation.
Filtering image methods description and their results.
Mathematical description of morphological transforms for images.
Knowing the principles that are the base for segmentation and compression of images.
Students participation at least a half of courses.

Laboratory:

Abilities to use Matlab functions for image acquisition and image proccesing (conversions, histogram generation, filtering, spectral analysis with Fourier transform, morphological transforms, segmentation, compression).
Students participation at all the laboratories.
The timely solution, in individual activities and group activities, in conditions of qualified assistance, of the problems that require the application of principles and rules respecting the norms of professional deontology.

Completion date:
04.09. 2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control Systems Engineering**
1.5 Study cycle	**Master(2st cycle)**
1.6 Study program/Qualification	**Advanced Control Systems**

2. Datarelated to thesubject

2.1 Name of the subject			**Inteligent Process Control Methods**				
2.2 Holder of the subject			**Assoc. Prof. PhD Sanda Dale**				
2.3 Holder of the academic laboratory/project			**Assoc. Prof. PhD Sanda Dale**				
2.4 Year of study	**V**	2.5 Semester	**8**	2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**DAP**

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

3.1 Number of hours per week	**4**	of which: 3.2 course	**2**	3.3 academic laboratory/project	**2/0**
3.4 Total of hours from the curriculum	**56**	Of which: 3.5 course	**28**	3.6 academic laboratory/project	**28/0**

Distribution of time	69
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	18
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	21
Tutorials	0
Examinations	4
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	Knowledge of mathematics, physics, theory of linear and nonlinear systems, Control engineering
4.2 related to skills	Conventional Control Systems Analysis and Design, Real-Time Programming, Modeling and Simulation in MATLAB-SIMULINK

5. Conditions (where applicable)

5.1. for the development of the course	- consulting the bibliography related to the topic discussed at the course - the course can be held face to face or online
5.2.for the development of the academic laboratory/project	- Carrying out documentation related to the theme of the laboratory - Going through the necessary steps for the realization of the lab application; - The lab can be conducted face-to-face or online
6. Specific skills acquired	

Professional skills	**C2**. Design of process control, distributed control systems, process control intelligent methods, hybrid control systems, advanced unconventional process control competences
Transversal skills	**TC3.** Identify training opportunities and efficient use of resources and learning techniques for their own development

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

7.1 The general objective of the subject	- providing knowledge on the design of control systems based on fuzzy logic and neural networks; - knowledge regarding the formation of skills related to the manipulation of uncertainties due to nonlinearities, modelling errors and disturbances, system correction and analysis of the system sensitivity to parameter variation and disturbances;
7.2 Specific objectives	- The course aims to present the theoretical and practical elements on control of dynamic fuzzy and neural systems. - The lab familiarizes students with practical aspects of analysis by control systems simulations using MATLAB&SIMULINK.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
CHAPTER 1. Elements of fuzzy set theory and reasoning with fuzzy notions: Language variables. Defining variables linguistic functions with the help of belonging functions. Reasoning with vague notions. Operators of fuzzy logic.	Free exposure, supported by smart table presentations, on the blackboard or online	4h
CHAPTER 2. Fuzzy Models Models based on Mandani rules Takagi-Sugeno models		4h
CHAPTER 3. Fuzzy Control Preliminaries Structure of fuzzy regulators Fuzzification and defusification of variables Inference mechanisms		4h
CHAPTER 4. Aspects of the design of fuzzy control systems Fuzzy regulators with two input variables (error and error derivative); Fuzzy controllers with variable structure; Adaptive fuzzy controllers; Takagi-Sugeno fuzzy controllers.		4h
CHAPTER 5. Basic concepts of neural calculation		4h
CHAPTER 6. Network Training Models and Strategies		4h
CHAPTER 7. Basics of expert systems		4h
Bibliography 1. Dale, S., Sisteme fuzzy și rețele neurale - suport de curs, Editura Universității din Oradea, CD, 2023. 2. Dale, S., Contribuții la studiul sistemelor de reglare cu regulatoare de tip interpolativ, Editura Politehnica, Timişoara, 2006. 3. Bara, A., Sisteme fuzzy- Aplicații la conducerea proceselor, Editura UTPress, Cluj-Napoca, 2001. 4. MATLAB-SIMULINK www.mathworks.com		
8.2 Academic laboratory	Teaching methods	No. of hours/ Observations
1. Presentation of the laboratory topic		2h

2. Mathematical modelling of an inverted pendulum. Obtaining state-space model. 3. Mathematical modelling of an inverted pendulum. Getting IO model and Transfer Function 4. Modelling the inverted pendulum using MATLAB-SIMULINK 5. Designing a fuzzy position controller for an inverted pendulum 6. Modelling and simulating a fuzzy control system for the position control of an inverted pendulum 7. Designing of a neural position controller for an inverted pendulum 8. Modelling and simulating a neural control system for the position control of an inverted pendulum 9. Analysis of the performance of systems for position control of an inverted pendulum, using MATLAB-SIMULINK 10. Conclusion of the laboratory situation	Students study the laboratory documentation in advance and carry out the practical part of the application under the guidance of the teacher	2h 2h 2h 4h 4h 4h 4h 2h 2h

Bibliography

1. Dale, S., Sisteme fuzzy și rețele neurale - suport de curs, Editura Universității din Oradea, CD, 2023.
2. Dale, S., Contribuții la studiul sistemelor de reglare cu regulatoare de tip interpolativ, Editura Politehnica, Timișoara, 2006.
3. Bara, A., Sisteme fuzzy- Aplicații la conducerea proceselor, Editura UTPress, Cluj-Napoca, 2001.
4. Dale, S., Sisteme fuzzy și rețele neurale – îndrumător de laborator, Editura Universității din Oradea, CD, 2023.
5. MATLAB-SIMULINK www.mathworks.com

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 curricula of the Automation and Applied Informatics specialization in all accredited university centers and is meant to provide knowledge and skills related to the design and implementation of fuzzy and neural algorithms for linear and nonlinear systems

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard, it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: thorough knowledge of all subjects is required	**Oral exam** consisting in solving fuzzy and neural modelling and control problems by various methods	70 %
10.5 Laboratory	Minimum condition for promotion (grade 5): it is necessary to know the fundamental notions, methods and techniques of design and implementation of adjustment algorithms based on elements of artificial intelligence; For grade 10, skills are	**Test + practical application** At each laboratory students receive a test and a grade. Each student also receives a grade for laboratory work during the semester and for the laboratory work file. This results in an average for the	30%

	required to apply design methods and techniques specific to fuzzy systems or neural networks and analysis of regulation performance as well as skills related to their implementation	laboratory.	
10.6 Minimum performance standard:			
Course: - Knowledge of the basic concepts and methods regarding design techniques that use elements of artificial intelligence (fuzzy systems, neural networks, etc.); - Skills in implementing control algorithms. - Control performance analysis skills **Laboratory**: - Skills to solve fuzzy and neural tuning problems related to design, implementation and analysis.			

Completion date:
04.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems/Master of Science in Engineering**

2. Data related to the subject

2.1 Name of the subject			**Hybrid Control Systems**				
2.2 Holder of the subject			**Associate Professor Phd. eng. Sanda DALE**				
2.3 Holder of the academic seminar/laboratory/project			**Associate Professor Phd. eng. Sanda DALE**				
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	**4**	of which: 3.2 course	**2**	3.3 academic seminar/laboratory/project	-/2/-
3.4 Total of hours from the curriculum	**56**	Of which: 3.5 course	**28**	3.6 academic seminar/laboratory/project	**28**
Distribution of time					94 h
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					20
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays					38
Tutorials					4
Examinations					4
Other activities.					

3.7 Total of hours for individual study	**94**
3.9 Total of hours per semester	**150**
3.10 Number of credits	**6**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	Knowledge of algebra, mathematical analysis, computer programming, modeling and simulation, system theory, control engineering, fuzzy systems and neural networks, advanced control systems
4.2 related to skills	Modeling and Simulation in MATLAB-SIMULINK Design of tuning algorithms Analysis of the performance of control systems

5. Conditions (where applicable)

5.1. for the development of the course	- minimum 50% course attendance - the course can be held face-to-face or online
5.2.for the development of the academic seminary/laboratory/project	- Carrying out documentation related to the theme of the laboratory - Going through the necessary steps for the realization of the laboratory application;

	- The lab can be conducted face-to-face or online

6. Specific skills acquired	
Professional skills	**C2.** Design of process control, distributed control systems, process control intelligent methods, hybrid control systems, advanced unconventional process control competences.
Transversal skills	**CT2.** Identification of roles and responsibilities in a plurispecialized team, making decisions and assigning tasks, applying techniques of effective relationships and team working. **CT3.** Identify training opportunities and efficient use of resources and learning techniques for their own development

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

7.1 The general objective of the subject	▪ Students to acquire general and thorough knowledge, aptitudes and skills related to the structure, typology, specific issues on analysis and design for hybrid control systems and developing new methods of approach for them
7.2 Specific objectives	▪ The course has the aim to present the concepts related to the approach methodology of hybrid control systems from various domains, of some specific strategy on analysis and design for HCS ▪ During the lab work, the students develop and apply specific analysis and design methodologies for hybrid control systems of adaptive-interpolative type

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
CAP 1. Introduction. 1.1. Hybrid control systems. Definitions and concepts. 1.2. Classifications for HCS. Types of HCS.	Free exposure, course presentation on video projector, on the board or online; debates on the exposed subjects	4h
CAP 2. Analog-discrete HCS 2.1. Generalities 2.2. Aspects related to analog-discrete systems control 2.3. Conclusions		4h
CAP 3. Intelligent hybrid systems 3.1. Generalities. Classifications. 3.2. Neuro-symbolic systems 3.3. Hybrid conventional-fuzzy systems 3.4. Hybrid interpolative-adaptive systems 3.5. Hybrid geno-neural control systems		20h

Bibliography

1. **S. Dale**, *Sisteme de control hibride*, notiţe de curs.
2. **S. Dale,** *Contribuţii la studiul sistemelor de conducere de tip interpolativ*, Ed. Politehnica, Timişoara, 2006.
3. **D. Drechsel,** *Regelbasierte Interpolation und Fuzzy Control,* Vieweg, 1996.
4. **I. Dumitrache, C. Buiu,** *Algoritmi genetici,* Ed. Mediamira, Cluj-Napoca, 2000.
5. **A.V. Savkin, R..J. Evans,** *Hybrid Dynamical Control*, Birkhäuser, 2002.
6. Editori: **O. Castillo, P. Melin,** *Hybrid Intelligent Systems in Control, Pattern Recognition and Medicine*, Springer Verlag, 2020.

8.2 Laboratory	Teaching methods	No. of hours/ Observations

1. Prezentarea tematicii de laborator. 2. Studiul caracteristicilor unui motor de curent continuu 3. Modelarea matematică a unui motor de curent continuu 4. Studiul strategiilor de control hibride inteligente 5. Întocmirea schemei bloc a unui sistem de reglare hibrid de tip adaptiv-interpolativ pentru controlul poziției unui motor de curent continuu 6. Proiectarea blocului regulator PI 7. Proiectarea blocului adaptiv-interpolativ 8. Simularea sistemului de reglare adaptiv-interpolativă a poziției unui motor de curent continuu în MATLAB+SIMULINK. 9. Obținerea de rezultate experimentale pentru validarea soluției. 10. Încheierea situației de laborator	Studenții studiază în avans documentația de laborator și realizează partea practică a aplicației sub îndrumarea cadrului didactic	2h 2h 4h 4h 2h 2h 4h 4h 2h 2h
Bibliografie 1. S. Dale, Sisteme de control hibride, îndrumător de laborator, variantă electronică. 2. S. Dale, Contribuții la studiul sistemelor de reglare cu regulatoare de tip interpolativ, Editura Politehnica, Timișoara, 2006.		

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 also in the curriculum of other academic centers with accreditation in this field (Universitatea „Politehnica" Timişoara, Universitatea Tehnică Cluj-Napoca, etc), and the approach of specific problems for the hybrid systems control engineering is a stringent requirement of the employers in the branch ((Plexus, Celestica, Comau, Continental etc).)

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard, without presenting details For 10: throughout knowledge of all subjects	**Oral exam** consists of solving problems of adaptive and adaptive-interpolative modeling and regulation through various methods The assessment can be done face-to-face or online.	70%
10.5 Laboratory	Minimum required conditions for passing the examination (grade 5): carrying out laboratory work with the data provided in each paper Grade 10: MATLAB-SIMULINK toolbox operating skills and proving skills in addressing analysis and design problems other than those presented	**Oral presentation** Based on the presentation of the project carried out during the semester (in front of their colleagues and the teacher), the student is evaluated and receives a grade. The evaluation can be done face to face or online.	30%
10.8 Minimum performance standard: Course:			

- Knowledge of basic concepts related to the approach methodology of hybrid control systems, their typology and implementation posibilities - Ability to identify, on particular cases, the proper hybrid control solutions Laboratory: - abilities regarding: analysis of a hybrid control solution from the utility and adaptability point of view in reduced complexity cases - the capacity to adopt specific implementation methods for a hybrid control system for simple processes

Completion date:
04.09. 2024

Date of endorsement in the department: 09.09.2024

Date of endorsement in the Faculty Board: 10.09.2024

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 Control Systems Engineering and Management**
1.4 Field of study	**Control systems engineering**
1.5 Study cycle	**Master (2nd cycle)**
1.6 Study program/Qualification	**Advanced Control Systems/ Master of Science in Engineering**

2. Datarelated to thesubject

2.1 Name of the subject			**Project development technology**				
2.2 Holder of the subject			**Lect. PhD eng. Coroiu Laura**				
2.3 Holder of the academic laboratory			**Lect. PhD eng. Coroiu Laura**				
2.4 Year of study	**II**	2.5 Semester	**1**	2.6 Type of the 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	**1**	3.3 academic laboratory	**2**
3.4 Total of hours from the curriculum	**42**	Of which: 3.5 course	**14**	3.6 academiclaboratory	**28**

Distribution of time	hours
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	30
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	36
Tutorials	2
Examinations	4
Other activities.	

3.7 Total of hours for individual study	**108**
3.9 Total of hours per semester	**150**
3.10 Number of credits	**6**

4. Pre-requisites(where applicable)

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

5. Conditions (where applicable)

5.1. for the development of the course	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic seminary/laboratory/project	- The project can be carried out face to face or online - The frequency at project hours below 70% leads to the restoration of the discipline

6. Specific skills acquired	
Professional skills	C5. Preparation and implementation of project management in automation and applied informatics and related fields, project management, application of knowledge engineering quality legislation automated systems
Transversal skills	CT2. Identify roles and responsibilities in a multi-specializedteam, decisions making and assigning tasks, applying relationshipstechniques and efficient work within the team CT3. Identify training opportunities and efficient use of resources and learning techniques for their own development

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

7.1 The general objective of the subject	• The discipline has as objective familiarizing the students from the master's specialization Advanced Control Systems, with the Project development technology and Management
7.2 Specific objectives	• The course aims to present the theoretical elements of the Project development technology. • The project provides the necessary knowledge to the students about Project manager techniques and tools.

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Introduction. Construction of the project proposal	Free exposure, with the presentation of the course with video projector, on the board or online	2h
2. Organizing projects on project phases. The internal organizational structure of the projects.	Free exposure, with the presentation of the course with video projector, on the board or online	2h
3. Project management tasks Project marketing Risk management	Free exposure, with the presentation of the course with video projector, on the board or online	2h
4. Controlul şi asigurarea calităţii Raportarea rezultatelor proiectelor	Free exposure, with the presentation of the course with video projector, on the board or online	2h

5. Project manager techniques and tools The SWOT analysis	Free exposure, with the presentation of the course with video projector, on the board or online	2h
6. Evaluation techniques Planning techniques Project monitoring	Free exposure, with the presentation of the course with video projector, on the board or online	2h
7. Redactarea raportului tehnic Raportarea Terminarea proiectelor	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Bibliography 1. **Laura Coroiu**, *Tehnica dezvoltarii proiectelor, curs în format electronic, 2019;* 2. Mariana Mocanu, Carmen Schuster, *Managementul proiectelor Ed a II-a,* Colecţia afaceri, Editura All Beck, Bucureşti, 2004; 3. Daniela Florescu, *Managementul proiectelor cu finanţare europeană*, Editura C.H.Beck, Bucureşti 2012; 4.O. Nicolescu, E. Burduş,… *Ghidul managerului eficient*, *Vol 1*, Editura Tehnică Bucureşti 1993; 5.J.L. Koorey, D.B. Medley, *Management Information Systems*, South-Western Publishing Co. Cincinnati,Ohio, 1986; 6.K.C.Laudon, J.Price Laudon, *Management Information Systems*, A Contemporary Perspective, Macmillan Publishing Company, 1988.		
8.2 Academic project	Teaching methods	No. of hours/ Observations
Project manager techniques and tools. Individual case studies	Students receive the project theme and design methodology and under the guidance of the teacher perform the project stages	28h
Bibliography 1. **Laura Coroiu,** *Tehnicile managerului de proiect, Indrumător de proiect în format electronic, 2019;* 2. Lonnie Pacelli, *Consilierul managerului de proiect*, Meteor Press 2007, ISBN 978-973-728-215-6; 3. Arieh Ullmann, Richard Romano, *Studii de caz în managementul românesc*, editura ACTAMI, Bucureşti, 1996.		

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 curriculum of Advanced Control Systems in Engineering from other university centers that have accredited similar specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, Gh. Asachi University of Iasi, etc.) and knowledge of Project management is a stringent requirement of employers in the field (Comau, FaistMekatronics, Celestica, GMAB, etc.).

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be	10.3 Percent from the final mark

		done face-to-face or online	
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	**Oral examination** Students receive for solving each a form with 3 subjects of theory and an application.	60 %
10.5Project	Minimum required conditions for promotion (grade 6): a brief overview of the design stages For 10: going through all the design stages, with the completion of the calculations	**Oral presentation** Following the presentation of the project completed during the semester, each student receives a grade.	40%
10.6 Minimum performance standard: Course: Solving and explaining problems of medium complexity, associated with the discipline of Project development technology. Project: Elaboration of a business plan that aims at the management of the enterprise using knoledge of Project development technology. The timely solution, in individual activities and group activities, in conditions of qualified assistance, of the problems that require the application of principles and rules respecting the norms of professional deontology. Responsible assumption of specific tasks in multi-specialized teams and efficient communication at institutional level. Elaboration and argumentative support of the application of a personal professional development plan.			

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

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

2. Data related to the subject

2.1 Name of the subject			**Automatic system quality engineering**				
2.2 Holder of the subject			**Prof. PhD eng. Gabriela Tonţ**				
2.3 Holder of the academic laboratory/project			**Prof. PhD eng. Gabriela Tonţ**				
2.4 Year of study	**II**	2.5 Semester	**3**	2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**DS**

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 laboratory	**2**
3.4 Total of hours from the curriculum	**56**	Of which: 3.5 course	**28**	3.6 academic laboratory	**28**

Distribution of time	69h
Study using the manual, course support, bibliography and handwritten notes	30
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	20
Tutorials	0
Examinations	9
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	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic laboratory/project	- Mandatory presence at all laboratories; - The laboratory/project can be carried out face to face or online - Students come with the observed laboratory works - A maximum of 2 works can be recovered during the semester (30%);

	- The frequency at laboratory hours below 70% leads to the restoration of the discipline

6. Specific skills acquired	
Professional skills	**C5.** Technical and technological design of processes belonging to electric, electronic and energy engineering systems, structures and industry, according to quality requirements. C6. Knowledge of key issues in the field of management and communication in engineering and in the area of interference between fields
Transversal skills	**TC1.**Responsibly apply the principles, norms and values of professional ethics in order to achieve the goals and identify the objectives, the available resources, the steps to be done and time spent for finishing the works, the deadlines, and the risks involved. **TC2.**Identify the roles and responsibilities of each member of a pluri-disciplinary team and apply efficient work and relational techniques inside the team.

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

7.1 The general objective of the subject	• Deepening students' knowledge on keeping under control, ensuring and improving quality; • The main models of quality management systems, focusing on the model offered by the ISO 9000 series of standards; • elements related to the audit and certification of quality management systems
7.2 Specific objectives	

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. The quality **1. 1**. The notion of quality. Definition and meanings 1. 2. Quality characteristics 1. 3. Quality components 1. 4. The quality loop. The spiral of quality 1.1. 1. 5. Statistical quality management	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
2. Quality assurance **2.1** The concept of total quality 2.2 Quality system 2.2.1 Main concepts 2.2.2 The need to implement a quality system 2.2.3 Situations in which the quality system is implemented 2.2.4 ISO standards series 9000: 1994 on quality systems 2.2.5 Selecting the quality system model 2.2.6 Quality system documents 2.2.7 Quality Manual - MQ 2.2.8 System function procedures - PFS 2.2.9 Working procedures / instructions-P / I-L 2.2.10 Quality plans - PC 2.2.11 Audit plans - PA Quality records - CI	Free exposure, with the presentation of the course with video projector, on the board or online	2 h

3. ISO standards series 9000: 2006 3.1 Quality and the year 2006 3.1.1 ISO 9000: 2006 standard 3.1.1.1 Vocabulary 3.1.1.2 Fundamental principles of quality management systems 3.1.2 The ISO 9001: 2006 standard 3.1.2.1 Characteristic features 3.1.2.2 The provisions of the standard 3.1.3 ISO 9004: 2006 standard	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
4. ISO standards series 9000: 2006 4.1 Quality and the year 2006 4.1.1 ISO 9000: 2006 standard 4.1.1.1 Vocabulary 4.1.1.2 Fundamental principles of quality management systems 4.1.2 The ISO 9001: 2006 standard 4.1.2.1 Characteristic features 4.1.2.2 The provisions of the standard 4.1.3 ISO 9004: 2006 standard	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
5. Quality costs 5.1 Non-quality costs 5.2 Structure of costs related to quality, to the manufacturer 5.3 Structure of costs related to quality, to the beneficiary	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
6. Methods, techniques and tools of analysis and evaluation used to improve quality 6.1 Quality index method 6.2 Histogram method 6.3 Pareto Diagram 6.4 Dementia method (penalty for defects) 6.5 Direct comparative method 6.6 Cause-effect diagram	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
7. Benchmarking and its stages 7.1 The notion of benchmarking 7.2 Definitions of benchmarking 7.3 Brief history of benchmarking 7.4 Types of benchmarking 7.5 The benchmarking process 7.5.1 When do we use benchmarking? 7.5.2. Stages of benchmarking	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
8. Evaluation of cognitive enterprise processes, system of quality indicators 8.1 The system of quality indicators 8.2 Development and implementation of the quality indicators system 8.2.1 Systematic data collection 8.2.2 Evaluation and presentation of quality indicators at the appropriate management level 8.2.3 Initiation of interventions in case of unfavorable changes 8.2.4 Implementation of interventions according to the values of the indicators	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
9. The motivational system of quality management activities 9.1 The process of motivation 9.2 Motivational theories 9.2.1 Maslow: The theory of the hierarchy of needs 9.2.2 Herzberg: The two-factor theory 9.3 Process theory of motivation The integrated model of	Free exposure, with the presentation of the course with video projector, on the board or online	2 h

motivation 9.4 Motivation tasks during the implementation and functioning of the quality management system		
10.Certification of quality management systems 10.1 Certification bodies 10.2 Staff certification 10.3 Terminology (according to EN 45000 series standards) 10.4 Areas of certification 10.5 Certification of products or services 10.6 Implications of affixing the CE marking 10.7 Products that require marking	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
11. Features and functions of quality management 11.1 Existence of the quality system 11.2 Integration in the management of the organization 11.3 Principles of quality management		
12. TQM Terminology Total quality Management through total quality	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
13. Excellence 13.1 The notion of excellence 13.2 The road to excellence 13.3 Models of excellence: EFQM, MBNQA etc. 13.4 Six Sigma 13.3 Quality Awards	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
14. Quality where? Integrated management systems 14.1 Other standardized management systems (environment, occupational health and safety, etc.) 14.2 Advantages of integrating management systems 14.3 Ways to achieve an integrated system	Free exposure, with the presentation of the course with video projector, on the board or online	2 h

Bibliography

[1]. Panaite, V., Munteanu, R., Control statistic şi fiabilitate, Bucureşti, Ed. Didactică şi Pedagogică, 1982;

[2]. Cătuneanu V.M., Mihalache A., Bazele fiabilităţii, Bucureşti, Ed. Tehnică, 1983

[3]. Gabriela Tonţ Fiabilitatea sistemelor, Ed. Universităţii din Oradea, 2002;

[4]. Panaite, V, Popescu M., Calitatea produselor şi fiabilitate, Bucureşti, Matrix Rom, 2003;

[5]. Mihoc Gh., Muja A., Diatcu E., Bazele matematicii ale teoriei fiabilităţii, Cluj-Napoca, Ed. Dacia,

1976. Panaite, V., Munteanu, R., Control statistic şi fiabilitate, Bucureşti, Ed. Didactică şi Pedagogică, 1982.

8.2 **Academic laboratory**	Teaching methods	No. of hours/ Observations
Laboratory work 1. Descriptive analysis of the quality characteristic 2. Variation intervals and stability of the technological manufacturing process 3. Making and interpreting a measurement histogram 4. Control by measurement. Completion of the control sheet	Students receive laboratory papers at least one week in advance, study them, inspect them, and take a theoretical test	2h 4 h 4 h 4 h

5. Attribute control. Completion of the control sheet 6. Dimensional control using statistical calculation 7. Capability analysis. Maintaining the accuracy of measuring and control equipment 8. Closing the situation at the laboratory	at the beginning of the laboratory. Then, the students carry out the practical part of the work under the guidance of the teacher	4 h 4 h 4 h 2 h

Bibliografie
[1]. Munteanu, R., Rusu, T., Introducere în ingineria calităţii, Editura Mediamira, Cluj-Napoca, 2002.
[2]. Tonţ, G., Calitatea în electrotehnică, ISBN 973- 613-544-6, Ed. Universităţii din Oradea, 2016;
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Stanciu, Ion*, Managementul calităţii totale*, Editura Cartea Universitară, Bucureşti, 2003
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[8]. 3. Hoyle, D., ISO 9000 Quality Systems Handbook, Fifth edition, Butterworth-Heinemann, 2005
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9. Corroboration of the discipline content with the expectations of the representatives of epistemological community, professional associations and representative employers in the field related to the program

- The content of the discipline can be found in the curriculum of Control systems engineering and other university centers that have accredited these specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, Gh. Asachi University of Iasi, etc.) and knowledge of the types of electric drives and their operation and design is a stringent requirement of employers in the field (Comau, Faist Mekatronics, Celestica, GMAB, etc.).

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: thorough knowledge of all subjects is required	**Written exam** Students receive for solving each a form with 3 subjects of theory and an application.	60 %
10.5 Laboratory	- cunoştinţe pentru nota 5: utilizarea indicatorilor statistici de variaţie şi de	**Test + aplicaţie practică** La fiecare laborator studenţii primesc un test	40%

	grupare; cunoştinţe pentru nota 6 realizarea fişei de control prin măsurare; cunoştinţe pentru nota 7: realizarea histogramelor, graficelor Gantt cunoştinţe pentru nota 8: analiza SWOT; cunoştinţe pentru nota 9 utilizarea corelaţiilor in metodele de analiza a calităţii cunoştinţe pentru nota 10 Interpretarea indicatorilor statistici ai procesului.	şi o notă. De asemenea, fiecare student primeşte o notă pentru activitatea la laborator în timpul semestrului şi pentru dosarul cu lucrările de laborator. Astfel rezultă o medie pentru laborator.	

10.6 Minimum performance standard:
Course: After completing the discipline students will be able to:
- After completing the discipline students will be able to:
- to configure a management system for an organization;
- to compose and analyze the factors that influence the quality of a product / service;
- Participation in at least half of the courses.

SMC for a considered organizationLaboratory: the operating block scheme – system failure is drawn up, the implementation of the logical reliability scheme;
Ability to calculate and use statistical indicators for the calculation of statistical indicators for the statistical management of processes
- Participation in all laboratory work

The timely solution, in individual activities and group activities, in conditions of qualified assistance, of the problems that require the application of principles and rules respecting the norms of professional deontology.
Responsible assumption of specific tasks in multi-specialized teams and efficient communication at institutional level.
Elaboration and argumentative support of the application of a personal professional development plan.

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

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

2. Data related to the subject

2.1 Name of the subject				**Innovative technological projects**			
2.2 Holder of the subject				**Prof. PhD eng. Teodor Leuca**			
2.3 Holder of the academic laboratory/**project**				**Prof. PhD eng. Teodor Leuca**			
2.4 Year of study	**II**	2.5 Semester	**3**	2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**SI**

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 project	**1**
3.4 Total of hours from the curriculum	**42**	Of which: 3.5 course	**28**	3.6 academic project	**14**

Distribution of time	83h
Study using the manual, course support, bibliography and handwritten notes	30
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	14
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	30
Tutorials	0
Examinations	9
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	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic laboratory/project	- Mandatory presence at all project hours; - The project can be carried out face to face or online - Students come with the observed laboratory works - A maximum of 2 works can be recovered during the semester (30%); - The frequency at project hours below 70% leads to the restoration of the

	discipline

6. Specific skills acquired	
Professional skills	**C2.** Design of process control, distributed control systems, process control intelligent methods, hybrid control systems, advanced unconventional process control competences **C3.** Implementation of control systems, software structure for real-time control applications, human-machine interfaces, artificial vision, automated manufacturing systems
Transversal skills	**TC1.**Responsibly apply the principles, norms and values of professional ethics in order to achieve the goals and identify the objectives, the available resources, the steps to be done and time spent for finishing the works, the deadlines, and the risks involved. **TC2.**Identify the roles and responsibilities of each member of a pluri-disciplinary team and apply efficient work and relational techniques inside the team.

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

7.1 The general objective of the subject	♣ Implementing theories, ideas on the theoretical and design bases of innovation an technology management. ♣ Training the necessary competencies for the objective assessment and retention b master students of the issue of innovation and technology management.
7.2 Specific objectives	

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Key aspects of innovation management	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
2. Innovation - as a management process	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
3. Elaboration of the necessary framework for the innovation strategy	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
4. The position of the national and competitive environment	Free exposure, with the presentation of the course with video projector, on the board or online	2 h

5. Pathways: exploitation of technological trajectories	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
6. Processes: integration for strategic learning	Free exposure, with the presentation of the course with video projector, on the board or online	3 h
7. The cognitive process based on market realities	Free exposure, with the presentation of the course with video projector, on the board or online	3 h
8. Innovation and research and development in a European and global context	Free exposure, with the presentation of the course with video projector, on the board or online	3 h
9. Project management: basics, definitions and concepts	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
10. Research project management: practices and specificities	Free exposure, with the presentation of the course with video projector, on the board or online	3 h
11. Center for research and technological engineering in conversion of electromagnetic energy	Free exposure, with the presentation of the course with video projector, on the board or online	2 h
12. Euro / regional scientific integration center Oradea / Debrecen	Free exposure, with the presentation of the course with video projector, on the board or online	2 h

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2.Ciobotaru, Daniela / Milo , Teodor / Ciobotaru, Dan (2010): *Triunghiul de aur al realizării unui proiect tehnic: tehnic versus calitate, costuri de realizare, termene de execuţie*, în: Buletinul AGIR, nr. 2-3, aprilie-septembrie, pp. 176-180.

3.Holzbaur, Ulrich D. (2009): *Project Management in Research*, în: Lategan, Laetus O. K. / Holzbaur, Ulrich D. (eds.), Managing applied research: theories, cases and perspectives, Aalener Schriften zur Betriebswirtschaft, pp. 40-52.

4.Pollack, Julien (2006): *The changing paradigms of project management*, în: International Journal of Project Management, doi: 10.1016/j.ijproman.2006.08.002.
5.Thomas, Graeme / Fernández, Walter (2008): *Success in IT projects: A matter of definition?*, în: International Journal of Project Management, 26, pp. 733-742.
*Anexa A, Echipamente inovative de încălzire prin inducție, Teze de doctorat coordonate de profesor dr. ing. Teodor LEUCA, Biblioteca Universității din Oradea
**Anexa B, Echipamente inovative de încălzire în câmp de înaltă frecvență, Teze de doctorat coordonate de profesor dr. ing. Teodor LEUCA, Biblioteca Universității din Oradea.

8.2 **Academic project**	Teaching methods	No. of hours/ Observations
1. Innovative technologies in lighting 2. Innovative electricity production systems - photovoltaic panels 3. Innovative electricity production systems - wind turbines 4. Control by measurement. Completion of the control sheet 4. Smart buildings 5. Communication protocols in electrical installations 6. Electrothermal induction, radio frequency and microwave systems 7. Smart relays 8. The new generation of low voltage circuit breakers 9. Computer and robotics systems microwave	Master students receive the design theme and design methodology and under the guidance of the teacher perform the project stages	10h
Conclusions		2h
Project support		2h

Bibliography

1. [Băloiu, Liviu, Mihail şi Frăsineanu, Ioan – Gestiunea inovaţiei, Ed. Economică, Bucureşti, 2001
2. Christensen, Clayton M – The innovators dilemma, Harper Business Essentials, New York, 2000,
3. Phillips, Fred Y. – Market oriented Technology Management – Innovating for Profit in Entrepreneurial Times, Springer-Velag, Heidelberg, 2001
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5. Utterback, James M – Mastering the dynamics of innovation, Harvard Business School Press, Boston, 1996
6. Von Stamm, Bettina – Managing Innovation, Desing & Creativity, John Wiley & Sons Ltd,Chichester, West Sussexd, 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 can be found in the curriculum of Advanced Control Systems from other university centers that have accredited these specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, Gh. Asachi University of Iasi, etc.) and knowledge of the types of electric drives and their operation and design is a stringent requirement of employers in the field (Comau, Faist Mekatronics, Celestica, GMAB, etc.).

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required	**Oral examination**	60 %

	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	Students sustain an oral exam	
10.5 Project	- for grade 6, going through the design stages, without deepening the calculations - for grade 10, completion of all design stages, with completion of calculations and power supply and control diagrams	**Oral support** Following the presentation of the project made during the semester, each master student receives a grade, separate from the exam. .	40%
10.6 Minimum performance standard: - Critical evaluation of the strategic performance of the teams. - Manifesting autonomy in choosing a learning route and demonstrating understanding of learning processes. - Communicating project results, methods and key principles to an audience of specialists and non-specialists, using appropriate techniques. - Careful observation, reflection and decision-making in order to change social norms and interpersonal relationships. - Problem solving by integrating complex, sometimes incomplete, sources of information in new and unfamiliar contexts. - Demonstration of experience in operational interactions for change management in a complex context. - Manifestation of an active behavior towards a series of social, scientific and ethical aspects that appear in work or study.			

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

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

2. Data related to the subject

2.1 Name of the subject			**Advanced control of unconventional processes**				
2.2 Holder of the subject			**Prof. PhD eng.Mihail Abrudean**				
2.3 Holder of the academic laboratory			**Prof. PhD eng. Mihail Abrudean**				
2.4 Year of study	**I**	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	**2**	of which: 3.2 course	**1**	3.3 academic laboratory/project	**1**
3.4 Total of hours from the curriculum	**28**	Of which: 3.5 course	**14**	3.6 academic laboratory/project	**14**

Distribution of time	hours
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	10
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	28
Tutorials	
Examinations	9
Other activities.	

3.7 Total of hours for individual study	**83**
3.9 Total of hours per semester	**108**
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	- Attendance at least 50% of the courses - The course can be held face to face or online
5.2.for the development of the academic seminary/laboratory/project	- The laboratory can be carried out face to face or online - The frequency at laboratory hours below 70% leads to the restoration of the discipline

6. Specific skills acquired

Professional skills	**C2** Design of control structures, distributed control systems, intelligent process control methods, hybrid control systems, competencies regarding advanced control of unconventional processes
Transversal skills	**TC2.** Identify roles and responsibilities in a multi-specialized team, decisions making and assigning tasks, applying relationships techniques and efficient work within the team.

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

7.1 The general objective of the subject	• The discipline has as objective the familiarization of the students from the master's specialization Advanced Control Systems, with the advanced control of unconventional processes and their automatic control methods.
7.2 Specific objectives	The course aims to present the theoretical elements of the technique of: • Automatic control of processes in a nuclear reactor, • Unconventional processes for laser processing, plasma, electron beam, • Automatic control structures for low temperature distillation columns a (70K). The laboratory provides the necessary knowledge to the students to be able to know and operate with unconventional processes (nuclear reactors, lasers, separation plants, electron beam cannons, etc.)

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Advanced process control in the nuclear power plant - Control structures of nuclear reactors;	Free exposure, with the presentation of the course with video projector, on the board or online	4h
2. Control of heavy water separation processes - Control structures for biterm type separation columns (water-hydrogen sulphide, distillation).	Free exposure, with the presentation of the course with video projector, on the board or online	2h
3. Control of separation processes at low temperatures (70K) - Modeling of separation processes; - Block diagram of the rectification column; - Control systems of distillation columns at low temperatures (NO distillation at -154^{0}C, CO distillation at -192^{0}C).	Free exposure, with the presentation of the course with video projector, on the board or online	2h
4. Advanced methods of nuclear fuel production - Fluidized bed reactor control structures for producing uranium hexafluoride.	Free exposure, with the presentation of the course with video projector, on the board or online	2h

5. Control of laser processing processes: - Pulse laser control with a repetition rate of 1-100Hz, type TEA with CO_2, N_2, He, 500 W,25Mw/impulse;	Free exposure, with the presentation of the course with video projector, on the board or online	2h
6. Control of plasma processing processes, electron beam - Jet or plasma arc generators; − Electron beam cannon control and adjustment system (vacuum adjustment, magnetic focusing, magnetic deflection, beam trajectory control, welding control, machining area visualization).	Free exposure, with the presentation of the course with video projector, on the board or online	2h
Bibliography 1. Mureşan V, Abrudean M, *Conducerea proceselor industriale*, Editura Galaxia Gutenberg, Cluj-Napoca 2017, 181 pagini, ISBN 978-973-141-699-1. 2. D. Axente, M. Abrudean, A. Bâldea, *Separarea Izotopilor Stabili prin Schimb Izotopic*, Ed. Casa Cărţii de Ştiinţă, 1994. 3. J. Lowe, *Process automation Handbook - A Guide to Theory and Practice*, Springer-Verlag, London Limited, 2007. 4. M. Abrudean, *Teoria Sistemelor şi Automatizări*, Ed. Mediamira, 1998 5. M. Dulău, *Automatizarea Proceselor Neconvenţionale*, Ed. Univ. Petru Maior, Tîrgu Mureş, 2005. 6. M. Leca, *Automatizarea Centralelor Nuclearo-Electrice*, Ed. Tehnică, 1984. 7. T. Coloşi, M. Abrudean, M.-L. Ungureşan, V. Mureşan, *Numerical Simulation Method for Distributed Parameters Processes using the Matrix with Partial Derivatives of the State Vector*, Ed. Springer, 2013, pg. 343.		
8.2 Academic laboratory/project	Teaching methods	No. of hours/ Observations
1. Control structures of the nuclear fuel plant. 2. Advanced temperature control structures (-192^{0}C), pressure, boiler level, CO flows from the ^{13}C separation plant by CO distillation. 3. Advanced structures for controlling the ^{15}N productive plant by isotopic exchange. 4. Laser control structures TEA with CO2, N2, He 1- 100 Hz, 25 M W/impulse.	Presentation of experimental and productive plants, operating regimes and regulation structures. Presentation of analysis laboratories by mass spectrometry and chromatography.	2 h 4 h 4 h 4 h
Bibliography 1. M. Abrudean, *Teoria Sistemelor şi Automatizări*, Ed. Mediamira, 1998. 2. M. Dulău, *Automatizarea Proceselor Neconvenţionale*, Ed. Univ. Petru Maior, Tîrgu Mures, 2005. 3. Vlad Mureşan, *Conducerea proceselor industriale Îndrumător de laborator*, Editura U.T. PRESS, Cluj-Napoca 2011, ISBN 978-973-662-663-0, 134 pag.		

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 curriculum of Advanced Control Systems and from other university centers that have accredited these specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, "Politehnica" University Bucharest, Technical University Gh. Asachi, University Iasi, etc.)

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods The evaluation can be done face-to-face or online	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: thorough knowledge of all subjects is required	**Oral (online) examination** Students receive for solving each a form with 3 subjects of theory and an application.	70 %
10.5 Laboratory/project	Minimum required conditions for promotion (grade 5): in accordance with the minimum performance standard recognition of the stands used to carry out the laboratory works, without presenting details on them For 10: detailed knowledge of how to perform all laboratory work	**Test + practical application** At each laboratory students receive a grade for laboratory work during the semester and for the laboratory work file. This results in an average for the laboratory.	30%
10.6 Minimum performance standard: Course: Knowledge of advanced control structures for nuclear reactors, distillation plants, high power lasers, electron beam cannons, plasma welding Laboratory/project: Mathematical models, advanced control structures (cascade, IMC, etc.) for the unconventional processes studied.			

Completion date:
02.09.2024

Date of endorsement in the department:
09.09.2024

Date of endorsement in the Faculty Board:
10.09.2023

SUBJECT DESCRIPTION

1. Data related to the study program

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

2. Data related to the subject

2.1 Name of the subject		***Data Protection and Monitoring***					
2.2 Holder of the subject		**Prof.dr.habil.eng. Daniela Elena Popescu**					
2.3 Holder of the academic seminar/laboratory/project		**Prof.dr.habil.eng. Daniela Elena Popescu**					
2.4 Year of study **I**		2.5 Semester **1**		2.6 Type of the evaluation	**Ex**	2.7 Subject regime	**DS**

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

Distribution of time	hours
Study using the manual, course support, bibliography and handwritten notes	28
Supplementary documentation using the library, on field-related electronic platforms and in field-related places	8
Preparing academic seminaries/laboratories/ themes/ reports/ portfolios and essays	**14**
Tutorials	2
Examinations	4
Other activities.	

3.7 Total of hours for individual study	**56**
3.9 Total of hours per semester	**112**
3.10 Number of credits	**4**

4. Pre-requisites (where applicable)

4.1 related to the curriculum	(Conditions) Operating Systems
4.2 related to skills	Computer Systems Architecture

5. Conditions (where applicable)

5.1. for the development of the course	- The course can be held face to face or online " - attendance at least 50% of the courses
5.2.for the development of the academic seminary/laboratory/project	- The seminar / laboratory / project can be held face to face or online - Mandatory presence at all laboratories; - Students must have completed the theoretical part of the paper; - A maximum of 4 works can be recovered during the semester (30%); - The frequency at laboratory hours below 70% leads to the restoration of the discipline
6. Specific skills acquired	

Professional skills	CP3. Problem solving using Computer Science and engineering tools CP5. Design, life cycle management, integration and integrity of hardware, software and communications systems in order to increase the security of systems
Transversal skills	CT1. Applying, in the context of compliance with the law, intellectual property rights (including technology transfer), product certification methodology, principles, norms and values of the code of professional ethics within its own rigorous, efficient and responsible work strategy • Defining the basic managerial concepts necessary to implement a high security operating environment at the level of organizations • Scientific substantiation of management decisions regarding the preservation and increase of process security as well as the implementation and monitoring of their effects within the organization CT2. Identify roles and responsibilities in a multi-specialized team decision-making and assigning tasks, with the application of relationship techniques and efficient work within the team • Assuming the specific roles and responsibilities of leading teams engaged in development activities for high security infrastructures / systems • Increasing the interest for the correct realization of a scientific research and for the pursuit of a career in research.

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

7.1 The general objective of the subject	▪ Familiarizing students with the defining elements for implementing and increasing the level of information security at the organizational level as well as identifying healthy strategies for institutional development in this regard
7.2 Specific objectives	• The course aims to familiarize students with information security issues, with understanding and identifying what vulnerabilities are, with how the issue of protection of both the unconnected system and those connected in an internal network / Internet. Therefore, it proposes to present the basic characteristics of information security issues and to develop the capacities to develop security policies at organizational level in order to protect data. • Project: Follow-up of the risks and vulnerabilities to which the structures of an institution are exposed, considered as a case study with identification of the protection measures that are required

8. Contents*

8.1 Course	Teaching methods	No. of hours/ Observations
1. Information processing security, protection of values, Characteristics of computer intrusion, Attacks, Significance of computer security, Security purposes, Privacy, Integrity, Availability, Vulnerabilities - hardware, software, Data vulnerabilities, Computer offenders, Methods Defense, Controls, The Future in the Field 2. Protection of non-networked computers, User authentication, Password systems, Advantages of password systems, Disadvantage, Rules to increase the security provided by the password system, Encryption protection, Authentication based on encrypted keys, Authentication based on what the user is, Biometric authentication systems, Use of fingerprints in authentication 1. Access control: • Identification • Authentication	Free course presentation with video projector / overhead projector and blackboard in an interactive way: punctuate from time to time questions for students in order to increase the degree of interactivity • Indication of topics for documentation and individual study	28 ore

Three factors • Single login • Single conviction • Access control with subjects and objects • Access control mode (DAC, non-DAC, MAC and RBAC) • Bell-LaPadula, Biba, Clark -Wilson, and Chinese Wall architecture • Identity management • Cloud computing 2. Advanced communication and network elements: Open Systems Interconnection (OSI) and Transmission Control Protocol / Internet Protocol (TCP / IP) models • Bus, star and token ring network configurations • Common protocols in TCP / IP suite • Ports used with common protocols • Different network architectures such as Internet, intranet, and extranet • Demilitarized zones (DMZ) • Wireless security protocols such as Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA) and WPA2 • Wireless technologies such as Bluetooth, RFID, 802.11, WiMax, GSM, 3G and NFC 3. Communication and network elements: • Telecommunication methods used to access the Internet • Securing the Voice over Internet Protocol (VoIP) with Secure Real-Time • Transport Protocol (SRTP) • Filtering packets, firewalls and firewalls application • Protects diversity with firewalls • Differentiates between network and host based firewalls • Risks and vulnerabilities related to remote access solutions • Different tunneling protocols using remote access • Authentication methods using remote access • Control network access 4. Differences between hackers and crackers • Differences between whitehats, blackhats, and grayhats • Denial-of-service and distributed denial-ofservice attacks • Zero-day exploits • Threats Advanced Persistence • Social Engineering Tactics • The Importance of Tools to Reduce Social Engineering Attacks 5. Code and Malware: Different types of viruses • Differences between viruses, worms, Trojans and logic bombs • Sets of roots, hatches, back doors and spyware • Differences between signature-based detection and heuristic-based detection • for antivirus software • The importance of keeping antivirus signature definitions up to date • Using spam filters and content filtering devices • The principle of least privilege and how it can help prevent infections • Educating users about practices 6. Malicious code and activity: • Different types of viruses • Differences between viruses, worms, Trojans and logic bombs • Root sets, hatches, backdoors and spyware • Differences between signature-based detection and detection-based of antivirus heuristics • The importance of keeping antivirus signature definitions up to date • Using spam filters and content filtering devices • The least privilege principle and how it can help prevent infections • Educating users about safe computer practices • Common vulnerabilities and exposures 7. Risk, responses and recovery: • Definition of risk, threats, vulnerabilities and impact • Four main methods of risk management: mitigation (mitigation), avoidance, transfer and acceptance • Definition of residual risk • Steps used in risk assessment • Differences between analyzes quantitative and		

qualitative • Steps in response to the incident: preparation, detection, analysis, retention, eradication, • recovery and post-incident activities 8. Monitoring and analysis: • Security alert and false positive • Network-based and host-based intrusion detection systems • Intrusion prevention systems • Method of detection and prevention of attacks • File integration verifiers • Honeypots, plas honeycomb and lined cells • Event And Incident Managers, such as SIMs, System Event Managers (SEMs) and SIEMs • Types of vulnerability assessment tests • Tools		

Bibliography

- Course notes (slides) made available to students in electronic format on the Office 365 platform
- Deborah Russel and. mul 1 CISCOmaterialului course comprin in Mprotection that se impuncareamilor specific search IA general notions legaG.T. Gangemi Sr, Computer security basics, Editura O'Reilly & Assoc, ISBN: 0-
- 937175-71-4, 1993
- Stallings W, Cryptography and Network Security Principles and Practice, Thhird Edition, Prentice Hall, 2003,
- K.Hwang, F.A.Briggs, Computer Architecture and Parallel processing, Mc Graw - Hill Book company 1987
- Artech House, Fundamentals of Network Security, Artech House
- D.E.Popescu, Information Security Management, University of Oradea Publishing House, 2012
- ITIL

8.2 Project	Teaching methods	No. of hours/ Observations
1. Presentation of project activities, the laboratory, labor protection norms and conventional signs specific to the field of computer systems - general, general information on Protection and data monitoring. Presentation of the required design specifications 2. Analysis of existing vulnerabilities for the case study considered 3. Analysis of the existing risks for the case study considered 4. Classification of the information with the establishment of the security policies for the considered case 5. Identifying the solutions for increasing the security with establishing the concrete security policies for the considered case 6. Tracing the audit techniques for maintaining the security at the level of the analyzed objective 7. Teaching the project with knowledge verification	Students receive laboratory papers at least one week in advance, study them, inspect them, and take a theoretical test at the beginning of the laboratory. Then, the students carry out the practical part of the work under the guidance of the teacher.	• 4 hours are allocated for each of the 7 detailed points of the laboratory activity. • The results of the project activities are presented in plenary at group level

Bibliography

1. D.E.Popescu, Information Security Management, University of Oradea Publishing House, 2012
2. Moodle module with project works
3. Webography recommended during project hours

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 found in the curriculum of Computer and Information Technology specializations and other university centers that have accredited these specializations (Technical University of Cluj-Napoca, University of Craiova, "Politehnica" University of Timisoara, Gh. Asachi University of Iasi, etc.), and knowledge of the architecture and organization of computer systems as well as their operation and design is a stringent requirement of employers in the field (Rds & Rcs, Plexus, Neologic, Celestica, Keysys, etc.).

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percent from the final mark
10.4 Course	Minimum required conditions for passing the exam (mark 5) in accordance with the minimum performance standard: - it is necessary to know the fundamental notions required in the subjects, without presenting details on them For 10: - for grade 10, a thorough knowledge of all is required	The evaluation can be done face to face or online depending on the situation imposed	70%
10.6 Laboratory	- for mark 5 it is necessary to solve the corresponding number of requirements, depending on the test scale. - for mark 10, all requirements on the test sheet must be correctly resolved.	Tests during the semester The evaluation of students is done through two tests, taken during the semester. The arithmetic mean of the marks of these tests represents the mark with which they enter the exam. Students can also get extra points, depending on their participation in the laboratory and solving exercises with a higher degree of difficulty. These points can be used to calculate the test score.	30%

10.8 Minimum performance standard:

Assimilation of detailed knowledge about vulnerabilities, risks and security solutions in managing and conveying information in a company

The timely solution, 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.

Responsible assumption of specific tasks in multi-specialized teams and efficient communication at institutional level.

- Development of team spirit, spirit of mutual help, awareness of the importance of training during the semester for good and sustainable results, awareness of the importance of research, own research related to learning (library, internet), cultivating a work discipline, done correctly and time

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