# 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<br>- 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<br>- Students presence to all laboratory/project hours is compulsory<br>- Students must have summarized the current laboratory work<br>- Maximum 4 laboratory works (30%) can be recovered during the semester<br>- A participation below 70% at the laboratory works / project leads to the restoration of the subject<br>- 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<br>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.<br>2. L. M. Thompson, Industrial Data Communications, 4th Edition, ISA, 2007.<br>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<br>- For mark 10:<br>- thorough knowledge regarding the network topologies and the ISO/OSI model<br>- thorough knowledge regarding the serial and parallel communication standards<br>- thorough knowledge regarding the industrial standards and wireless communication<br>- thorough knowledge regarding the safety and security in industrial networks<br>- 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<br>- For mark 10:<br>- thorough knowledge regarding the S7-300 PLC<br>- thorough knowledge regarding the communication through PROFIBUS<br>- thorough knowledge regarding the master-slave communication | Knowle<br>assessm<br>test |
| 10.8 Minimum performance standard:<br>Course:<br>- knowledge regarding the network topologies and the ISO/OSI model<br>- knowledge regarding the serial and parallel communication standards<br>- knowledge regarding the industrial standards and wireless communication<br>- knowledge regarding the safety and security in industrial networks<br>- knowledge regarding the design techniques for industrial networks<br>Laboratory:<br>- knowledge regarding the S7-300 PLC<br>- knowledge regarding the communication through PROFIBUS<br>- knowledge regarding the master-slave communication | | |

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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<br>- 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<br>- 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:<br>• Automatic control of processes in a nuclear reactor,<br>• Unconventional processes for laser processing, plasma, electron beam,<br>• Automatic control structures for low temperature distillation columns a (70K).<br>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<br>- 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<br>- 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)<br>- Modeling of separation processes;<br>- Block diagram of the rectification column;<br>- 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<br>- 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:<br>- 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<br>- Jet or plasma arc generators;<br>- 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. | Presentation of experimental and productive plants, operating regimes and regulation structures. | 2 h |
| 2. Advanced temperature control structures (-192$^0$C), pressure, boiler level, CO flows from the $^{13}$C separation plant by CO distillation. | | 4 h |
| 3. Advanced structures for controlling the $^{15}$N productive plant by isotopic exchange. | Presentation of analysis laboratories by mass spectrometry and chromatography. | 4 h |
| 4. Laser control structures TEA with CO2, N2, He 1- 100 Hz, 25 M W/impulse. | | 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<br>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<br>For 10: thorough knowledge of all subjects is required | **Oral (online) examination**<br>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<br>For 10: detailed knowledge of how to perform all laboratory work | **Test + practical application**<br>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:<br>Course: Knowledge of advanced control structures for nuclear reactors, distillation plants, high power lasers, electron beam cannons, plasma welding<br>Laboratory/project: Mathematical models, advanced control structures (cascade, IMC, etc.) for the unconventional processes studied. | | | |

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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<br>- The course can be held face to face or online |
| 5.2.for the development of the academic | - The laboratory can be carried out face to face or online<br>- The frequency at laboratory hours below 70% leads to the restoration of |

| | |
|---|---|
| seminary/laboratory/project | 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.<br>• 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 |


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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.<br>2. Control of the main shaft to the machine tool GPR 45 NC. Speed selection<br>3. Control of advances to the GPR 45 NC machine tool<br>4. Control the revolver head on the GPR 45 NC machine tool<br>5. Microcontroller control of direct current servomotors<br>6. Microcontroller control of stepper motors<br>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<br>2 h<br>2 h<br>2 h<br>2 h<br>2 h<br>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<br>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<br>For 10: thorough knowledge of all subjects is required | **Oral examination**<br>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<br>For 10: detailed knowledge of how to perform all laboratory work | **Test + practical application**<br>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:<br>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.<br>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<br>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:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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<br>- 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. Șarpe, D., Popescu, D., Neagu, A., Ciucur, V., (2011**),** *Standarde de integritate în mediul universitar, UEFISCDI*, București.
6.Șercan, Emilia, (2017), *Deontologie academică. Ghid practic*, Editura Universității București
7. L.E.N- 1/2011
8. Legea 8/1996 privind drepturile de autor
9. Legea 206/2004 privind buna conduită în cercetarea ştiinţifică, dezvoltarea tehnologică şi inovare

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

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

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

**10. Evaluation**

| Type of activity | 10.1 Evaluation criteria | 10.2 Evaluation methods The evaluation can be done face-to-face or online | 10.3 Percent from the final mark |
|---|---|---|---|
| 10.4 Course | Minimum required conditions for passing the exam (mark 5): in accordance with the minimum performance standard it is necessary to know the fundamental notions required in the subjects, without presenting details on them<br>For 10: thorough knowledge of all subjects is required | **Oral examination**<br>Students receive for solving each a form with 2 subjects of theory and an application. | 100 % |
| 10.6 Minimum performance standard:<br>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:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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 | **As. Prof. PhD Sanda Dale** | | | | | | |
| 2.3 Holder of the academic laboratory/project | **As. 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 | **0/2** |
| 3.4 Total of hours from the curriculum | **56** | Of which: 3.5 course | **28** | 3.6 academiclaboratory/project | **0/28** |
| 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 | - Mathematics<br>- Dynamic Systems Control |
| 4.2 related to skills | Systems Modelling and Simuling , MATLAB environment |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1. for the development of the course | - Attendance at least 50% of the courses<br>- The course can be held face to face or online |
| 5.2.for the development of the academic laboratory/project | - The project can be carried out 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 | • The main task of the course consists in applications of artificial intelligence tools to the control of dynamic systems |
| 7.2 Specific objectives | • The course aims to present the theoretical and practical elements on control of dynamic systems.<br>• The project 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 |
|---|---|---|
| **1. Introduction into Fuzzy Systems Control**<br>1.1. Fuzzy Sets Theory<br>1.2. Fuzzy Reasoning<br>1.3 Fuzzy Models<br>1.4 Fuzzy Control | Free exposure, with the presentation of the course with video projector, on the board or online | 14h |
| **2. Introduction into neural networks**<br>2.1. Artificial neural networks<br>2.2.Basic Model of a neuron<br>2.3 Learning in Artificial Neural Networks<br>2.4 Single and Multilayer Neural Networks | Free exposure, with the presentation of the course with video projector, on the board or online | 8 h |
| **3. Introduction into Genetic Algorithms**<br>3.1 Fundamentals of Genetic Algorithms<br>3.2 Solving constraint and unconstrained optimization problems | Free exposure, with the presentation of the course with video projector, on the board or online | 6h |
| Bibliography<br>1. Gurney, et al., An Introducyion to neural networks<br>2. Dorf.,C.R , Bishop, H.R. –Modern Control Systems, Prentice-Hall, 1997<br>3. Bara, A., Sisteme fuzzy- Aplicatii la conducerea proceselor | | |
| 8.2 Academic laboratory | Teaching methods | No. of hours/ Observations |
| 1 | | 2h |

| | | |
|---|---|---|
| | | |
| Bibliography<br>1. | | |
| 8.3 Academic project | Teaching methods | No. of hours/ Observations |
| | | |
| | | |

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

- The content of the discipline can be found in the curriculum of Automatics and Applied Informatics 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<br>For 10:thorough knowledge of all subjects is required | **Written exam**<br>Students receive for solving each a form with 3 subjects of theory and an application. | 60 % |
| 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<br>For 10: detailed knowledge of how to perform all laboratory work | **Test + practical application**<br>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. | 20% |
| 10.6 Project | Minimum required conditions for promotion (grade 6):going through the design stages, without deepening the | **Oral presentation**<br>Following the presentation of the project completed during the semester, each | 20% |

| | | | |
|---|---|---|---|
| | calculations<br>For 10: going through all the design stages, with the completion of the calculations and the electrical supply and control diagrams | student receives a grade. | |
| 10.6 Minimum performance standard:<br>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.<br>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 | | | |

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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 | | **As. Prof. PhD eng. Tiberiu Barabas** | | | | | |
| 2.3 Holder of the academic laboratory/project | | **As. Prof. 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<br>- 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;<br>- The laboratory/project can be carried out face to face or online<br>- Students come with the observed laboratory works<br>- A maximum of 2 works can be recovered during the semester (30%);<br>- 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.<br>• 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.<br>Cap.2. Flexible Manufacturing Systems (FMS).<br>Cap.3. Manufacturing automation structures used in CIM systems.<br>Cap.4. Open architecture control equipments for CIM systems<br>Cap.5.Modelling and simulation of the operation of automatic manufacturing systems. Petri networks. | Free exposure, with the presentation of the course with video projector, on the board or online | 4h<br>6h<br>6h<br>6h<br>6h |
| Bibliography<br>1. T. Barabas, **Structuri deschise de automatizare a fabricaţiei din cadrul hipersistemelor CIM robotizate**, Editura Universităţii Oradea, 2004;<br>2. Th. Borangiu s.a. **Conducerea multiprocesor în timp real a structurilor flexibile de fabricatie** Ed.Tehnicã, 1989<br>3. S.Călin s.a. **Conducerea adaptivă si flexibilă a proceselor industriale**, Ed.Tehnicã, 1988<br>4. M. Ganea, T. Barabas**, Sisteme flexibile - Roboţi şi linii flexibile** – *Îndrumător de laborator*, Editura Universităţii Oradea, 2000<br>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.<br>2. The pallet manipulator at the entry point of the Regal storage.<br>3. The Regal storage and the Stacker manipulator.<br>4. The flow of parts and the control algorithm in CIM.<br>5. Management of the Regal storage. | Students receive laboratory papers at least one week in advance, study them, inspect | 2 h<br>2 h<br>2 h<br>2 h<br>2 h |

| | | |
|---|---|---|
| 6. Analysis of the image of the part as a CAQ procedure.<br>7. Closing the situation at the laboratory. | 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<br>2 h |

Bibliography

2. 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, professio 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<br>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<br>For 10:thorough knowledge of all subjects is required | **Written exam**<br>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<br>For 10: detailed knowledge of how to perform all laboratory work | **Test + practical application**<br>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% |
| 10.6 Minimum performance standard:<br>• Modeling, simulation and use/programming of automatic manufacturing systems. | | | |

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **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 | | **Assoc.Prof.eng. Eugen Gergely** | | | | | |
| 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)<br>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 "<br>- 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<br>- Mandatory presence at all laboratories;<br>- Students must have completed the theoretical part of the paper;<br>- A maximum of 4 works can be recovered during the semester (30%);<br>- 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<br><br>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<br>• Defining the basic managerial concepts necessary to implement a high security operating environment at the level of organizations<br>• 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<br><br>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<br>• Assuming the specific roles and responsibilities of leading teams engaged in development activities for high security infrastructures / systems<br>• 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.<br>• 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<br>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<br>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<br>• 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<br>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<br>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<br>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<br>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<br>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<br>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<br>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<br>2. Analysis of existing vulnerabilities for the case study considered<br>3. Analysis of the existing risks for the case study considered<br>4. Classification of the information with the establishment of the security policies for the considered case<br>5. Identifying the solutions for increasing the security with establishing the concrete security policies for the considered case<br>6. Tracing the audit techniques for maintaining the security at the level of the analyzed objective<br>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.<br>• 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:<br>- it is necessary to know the fundamental notions required in the subjects, without presenting details on them<br><br>For 10:<br>- 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.<br><br>- for mark 10, all requirements on the test sheet must be correctly resolved. | Tests during the semester<br>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

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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<br>- 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;<br>- The laboratory/project can be carried out face to face or online<br>- Students come with the observed laboratory works<br>- A maximum of 2 works can be recovered during the semester (30%);<br>- 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.<br><br>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.<br><br>**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;<br>• The main models of quality management systems, focusing on the model offered by the ISO 9000 series of standards;<br>• 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**<br>**1. 1**. The notion of quality. Definition and meanings<br>1. 2. Quality characteristics<br>1. 3. Quality components<br>1. 4. The quality loop. The spiral of quality<br>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**<br>**2.1** The concept of total quality<br>2.2 Quality system<br>2.2.1 Main concepts<br>2.2.2 The need to implement a quality system<br>2.2.3 Situations in which the quality system is implemented<br>2.2.4 ISO standards series 9000: 1994 on quality systems<br>2.2.5 Selecting the quality system model<br>2.2.6 Quality system documents<br>2.2.7 Quality Manual - MQ<br>2.2.8 System function procedures - PFS<br>2.2.9 Working procedures / instructions-P / I-L<br>2.2.10 Quality plans - PC<br>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<br>3.1 Quality and the year 2006<br>3.1.1 ISO 9000: 2006 standard<br>3.1.1.1 Vocabulary<br>3.1.1.2 Fundamental principles of quality management systems<br>3.1.2 The ISO 9001: 2006 standard | Free exposure, with the presentation of the course with video projector, on the board or online | 2 h |

| | | |
|---|---|---|
| 3.1.2.1 Characteristic features<br>3.1.2.2 The provisions of the standard<br>3.1.3 ISO 9004: 2006 standard | | |
| **4. ISO standards series 9000: 2006**<br>4.1 Quality and the year 2006<br>4.1.1 ISO 9000: 2006 standard<br>4.1.1.1 Vocabulary<br>4.1.1.2 Fundamental principles of quality management systems<br>4.1.2 The ISO 9001: 2006 standard<br>4.1.2.1 Characteristic features<br>4.1.2.2 The provisions of the standard<br>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**<br>5.1 Non-quality costs<br>5.2 Structure of costs related to quality, to the manufacturer<br>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**<br>6.1 Quality index method<br>6.2 Histogram method<br>6.3 Pareto Diagram<br>6.4 Dementia method (penalty for defects)<br>6.5 Direct comparative method<br>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**<br>7.1 The notion of benchmarking<br>7.2 Definitions of benchmarking<br>7.3 Brief history of benchmarking<br>7.4 Types of benchmarking<br>7.5 The benchmarking process<br>7.5.1 When do we use benchmarking?<br>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**<br>8.1 The system of quality indicators<br>8.2 Development and implementation of the quality indicators system<br>8.2.1 Systematic data collection<br>8.2.2 Evaluation and presentation of quality indicators at the appropriate management level<br>8.2.3 Initiation of interventions in case of unfavorable changes<br>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**<br>9.1 The process of motivation<br>9.2 Motivational theories<br>9.2.1 Maslow: The theory of the hierarchy of needs<br>9.2.2 Herzberg: The two-factor theory<br>9.3 Process theory of motivation The integrated model of motivation<br>9.4 Motivation tasks during the implementation and functioning of the quality management system | Free exposure, with the presentation of the course with video projector, on the board or online | 2 h |

| | | |
|---|---|---|
| **10.Certification of quality management systems**<br>10.1 Certification bodies<br>10.2 Staff certification<br>10.3 Terminology (according to EN 45000 series standards)<br>10.4 Areas of certification<br>10.5 Certification of products or services<br>10.6 Implications of affixing the CE marking<br>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**<br>11.1 Existence of the quality system<br>11.2 Integration in the management of the organization<br>11.3 Principles of quality management | | |
| **12. TQM**<br>Terminology<br>Total quality<br>Management through total quality | Free exposure, with the presentation of the course with video projector, on the board or online | 2 h |
| 13. Excellence<br>13.1 The notion of excellence<br>13.2 The road to excellence<br>13.3 Models of excellence: EFQM, MBNQA etc.<br>13.4 Six Sigma<br>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**<br>14.1 Other standardized management systems (environment, occupational health and safety, etc.)<br>14.2 Advantages of integrating management systems<br>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<br>1. Descriptive analysis of the quality characteristic<br>2. Variation intervals and stability of the technological manufacturing process<br>3. Making and interpreting a measurement histogram<br>4. Control by measurement. Completion of the control sheet<br>5. Attribute control. Completion of the control sheet<br>6. Dimensional control using statistical calculation<br>7. Capability analysis. Maintaining the accuracy of measuring and control equipment<br>8. Closing the situation at the laboratory | 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 | 2h<br>4 h<br>4 h<br>4 h<br>4 h<br>4 h<br>4 h<br>2 h |

| | | |
|---|---|---|
| | teacher | |


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;
[3]. Olaru, M., Mangementul calităţii, Editura Economica, Bucuresti, 1999.
[4]. Băleanu ,Cristian *Managementul îmbunătăţirii continue*, Editura Expert, Bucureşti, 1996
[5]. Mitonneau, Henri – *O nouă orientare în managementul calităţii: şapte instrumente noi*, Editura Tehnică,
Bucureşti, 1998
[6]. Oprean, C., *Managementul calităţii*, Editura Univrsităţii „L. Blaga", Sibiu, 2002
Stanciu, Ion, *Managementul calităţii totale*, Editura Cartea Universitară, Bucureşti, 2003
[7]. Popescu, S., s.a., Bazele Managementului Calitatii - Editura Casa Cartii de Stiinta, Cluj Napoca, 1999, ISBN 973-9404-61-8
[8]. 3. Hoyle, D., ISO 9000 Quality Systems Handbook, Fifth edition, Butterworth-Heinemann, 2005
[9]. ***, Standardele: SR EN ISO 9000:2006, SR EN ISO 9001:2001, SR EN 9004:2001, SR EN 19011:2003, SR ISO/TS 16949:2004, SR EN ISO 22000:2005, ASRO
[10]. http://www.bcub.ro/continut/unibib/calitatea_indicator.php


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

- 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<br>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<br>For 10: thorough knowledge of all subjects is required | **Written exam**<br>Students receive for solving each a form with 3 subjects of theory and an application. | 60 % |
| 10.5 Laboratory | - cunoştinţe pentru nota 5:<br>utilizarea indicatorilor statistici de variaţie şi de grupare;<br>cunoştinţe pentru nota 6 realizarea fişei de control prin măsurare;<br>cunoştinţe pentru nota 7: realizarea histogramelor, | **Test + aplicaţie practică**<br>La fiecare laborator studenţii primesc un test şi o notă. De asemenea, fiecare student primeşte o notă pentru activitatea la laborator în timpul semestrului şi pentru dosarul cu lucrările de | 40% |

| | | | |
|---|---|---|---|
| | graficelor Gantt<br>cunoştinţe pentru nota 8:<br>analiza SWOT;<br>cunoştinţe pentru nota 9<br>utilizarea corelaţiilor in metodele de analiza a calităţii<br>cunoştinţe pentru nota 10<br>Interpretarea indicatorilor statistici ai procesului. | 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:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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 | **As. Prof. PhD eng. Sanda DALE** | | | | | | |
| 2.3 Holder of the academic seminar/laboratory/project | **As. Prof. 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 | |

**5. Conditions** (where applicable)

| | |
|---|---|
| 5.1. for the development of the course | - minimum 50% course attendance<br>- the course can be held face-to-face or online |
| 5.2.for the development of the academic seminary/laboratory/project | - Students have to pick-up the project theme<br>- The students have to participate to all the project phases<br>- project can be held 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.<br><br>**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<br>▪ During the project, 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.<br>1.1. Hybrid control systems. Definitions and concepts.<br>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<br>2.1. Generalities<br>2.2. Aspects related to analog-discrete systems control<br>2.3. Conclusions | | 4h |
| CAP 3. Intelligent hybrid systems<br>3.1. Generalities. Classifications.<br>3.2. Neuro-symbolic systems<br>3.3. Hybrid conventional-fuzzy systems<br>3.4. Hybrid interpolative-adaptive systems<br>3.5. Hybrid geno-neural control systems | | 20h |

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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 Project | Teaching methods | No. of hours/ |
|---|---|---|

| | | Observations |
|---|---|---|
| Theme of the project: Design of an adaptive-interpolative-type hybrid control systems for a DC motor<br>Design stages:<br>1. Theme project presentation.<br>2. DC motor characteristics study<br>3. Mathematical modeling of the DC motor<br>4. Hybrid control strategies study<br>5. Block-scheme for the adaptive-interpolative type hybrid control system<br>6. Controller design<br>7. System simulation in MATLAB-SIMULINK. Experimental data for control solution validation<br>8. Projects evaluation. | Students receive the theme of the project and the design methodology and they go through the stages of the project, assisted by the teacher | 2h<br>2h<br>4h<br>4h<br>2h<br>6h<br>6h<br>2h |
| Bibliography<br>1. **S. Dale**, Sisteme de control hibride, îndrumător de proiectare, variantă electronică. | | |

**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 Automatic systems engineering or Informatics systems from 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<br>For 10: throughout knowledge of all subjects | **Oral exam**:<br>Students receive subjects to debate and they are trying to find solutions individually and as teams.<br>The evaluation can be done face to face or online. | 70% |
| 10.5 Project | Minimum required conditions for passing the examination (grade 6): in accordance with the minimum performance standard: completion of all design stages, without final calculus<br>For 10: going through all the design stages, with the completion of the calculations and the experimental data for validation done | **Oral presentation**<br>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.<br>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

Project:
- 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 processe

**Completion date:**
01.09.2023
**Date of endorsement in the department:**
18.09.2023
**Date of endorsement in the Faculty Board:**
29.09.2023
-

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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 | **SD** |

**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<br>- 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;<br>- The project can be carried out face to face or online<br>- Students come with the observed laboratory works<br>- A maximum of 2 works can be recovered during the semester (30%);<br>- 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<br><br>**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.<br><br>**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 and technology management.<br><br>♣ Training the necessary competencies for the objective assessment and retention by 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 |

Bibliography

1.Abudi, Gina (2010): *Project Managers Need Ledership Skills*, URL: http://www.projectsmart.co.uk/project-managers-need-leadership-skills.html, site accesat ultima dat la: 24.01.2012.

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<br>2. Innovative electricity production systems - photovoltaic panels<br>3. Innovative electricity production systems - wind turbines<br>4. Control by measurement. Completion of the control sheet<br>4. Smart buildings<br>5. Communication protocols in electrical installations<br>6. Electrothermal induction, radio frequency and microwave systems<br>7. Smart relays<br>8. The new generation of low voltage circuit breakers<br>9. Computer and robotics systems<br>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
4. Tidd, Joe; Bessant, John și Pavitt, Keith – Managing Innovation, John Wiley & Sons Ltd,Chichester, West Sussexd, 2001
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 conditions for passing the exam (mark 5): in accordance with the | **Oral examination** Students sustain an oral exam | 60 % |

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

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023

# SUBJECT DESCRIPTION

**1. Data related to the study program**

| | |
|---|---|
| 1.1 Higher education institution | **UNIVERSITY OF ORADEA** |
| 1.2 Faculty | **Faculty of Electrical Engineering and Information Technology** |
| 1.3 Department | **Department of 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<br>- 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<br>- 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***<br>***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.<br>• 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.<br>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.<br>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<br>Project marketing<br>Risk management | Free exposure, with the presentation of the course with video projector, on the board or online | 2h |
| **4.** Controlul şi asigurarea calităţii<br>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<br>The SWOT analysis | Free exposure, with the presentation of the course with video projector, on the board or online | 2h |
| 6. Evaluation techniques<br>Planning techniques<br>Project monitoring | Free exposure, with the presentation of the course with video projector, on the board or online | 2h |
| 7. Redactarea raportului tehnic<br>Raportarea<br>Terminarea proiectelor | Free exposure, with the presentation of the course with video projector, on the board or online | 2h |
| Bibliography<br>1.Laura Coroiu, *Managementul proiectelor,* curs în format electronic, 2010;<br>2.D. Isoc, *Managementul proiectelor de cercetare- Proiecte cu finanţare publică naţională şi internaţională. Capitalizarea şi gestiunea proprietăţii intelectuale. Ghid practic.* Editura Risoprint Cluj Napoca 2007;<br>3. Mariana Mocanu, Carmen Schuster, *Managementul proiectelor Ed a II-a,* Colecţia afaceri, Editura All Beck, Bucureşti, 2004;<br>4.O. Nicolescu, E. Burduş,… *Ghidul managerului eficient, Vol 1,* Editura Tehnică Bucureşti 1993;<br>5.J.L. Koorey, D.B. Medley, *Management Information Systems,* South-Western Publishing Co. Cincinnati,Ohio, 1986;<br>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.<br>Case studies | Students receive the project theme and design methodology and under the guidance of the teacher perform the project stages | 28h |
| Bibliography<br>1. **Laura Coroiu,** *Managementul proiectelor,* curs în format electronic, 2010;<br>2. Lonnie Pacelli, *Consilierul managerului de proiect,* Meteor Press 2007, ISBN 978-973-728-215-6 | | |

**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<br>The evaluation can be done face-to-face or | 10.3 Percent from the final mark |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | | 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<br>For 10:thorough knowledge of all subjects is required | **Oral examination**<br>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<br>For 10: going through all the design stages, with the completion of the calculations | **Oral presentation**<br>Following the presentation of the project completed during the semester, each student receives a grade. | 40% |
| 10.6 Minimum performance standard:<br>Course: Solving and explaining problems of medium complexity, associated with the discipline of Project development technology.<br>Project: Elaboration of a business plan that aims at the management of the enterprise using knoledge of Project development technology.<br>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.<br>Responsible assumption of specific tasks in multi-specialized teams and efficient communication at institutional level.<br>Elaboration and argumentative support of the application of a personal professional development plan. | | | |

**Completion date:**
01.09.2023

**Date of endorsement in the department:**
18.09.2023

**Date of endorsement in the Faculty Board:**
29.09.2023