# Syllabus

## 1. Data about the program of study

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| 1.1 Institution | Technical University of Cluj-Napoca |
| 1.2 Faculty | Automation and Computer Science |
| 1.3 Departament | Automation |
| 1.4 Field of study | Systems Engineering |
| 1.5 Cycle of study | Bachelor of Science |
| 1.6 Program of study/Qualification | Automation and Applied Informatics (English) |
| 1.7 Form of education | Full time |
| 1.8 Codul disciplinei | 10.00 |

## 2. Data about the subject

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|---|---|---|---|---|---|
| 2.1 Subject name | Electrotechnics | | | | |
| 2.2 Course responsible/lecturer | Prof.Eng.Ec. Claudia PĂCURAR, Dr.Habil - Claudia.Pacurar@ethm.utcluj.ro | | | | |
| 2.3 Teachers in charge of applications | Assist.Eng. Sergiu ANDREICA, PhD - Sergiu.Andreica@ethm.utcluj.ro | | | | |
| 2.4 Year of study | 1 | 2.5 Semester | 2 | 2.6 Assessment *(E/C/V)* | C |
| 2.7 Type of subject | *DF – fundamental, DID – in the field, DS – specialty, DC – complementary* | | | | DD |
| | *DOB – compulsory, DOP – elective, FAC – optional* | | | | DI |

## 3. Estimated total time

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3.1 Number of hours per week | 4 | of which: | Course | 3 | Seminar | 0 | Laboratory | 1 | Project | 0 |
| 3.2 Number of hours per semester | 56 | of which: | course | 42 | Seminar | 0 | Laboratory | 14 | Project | 0 |

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| 3.3 Individual study | |
| (a) Manual, lecture material and notes, bibliography | 30 |
| (b) Supplementary study in the library, online and in the field | 15 |
| (c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays | 28 |
| (d) Tutoring | 5 |
| (e) Exams and tests | 5 |
| (f) Other activities: | 0 |

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| 3.4 Total hours of individual study (sum of (3.3(a)…3.3(f))) | 83 |
| 3.5 Total hours per semester (3.2+3.4) | 125 |
| 3.6 Number of credit points | 5 |

## 4. Pre-requisites (where appropriate)

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| 4.1 Curriculum | Mathematics |
| 4.2 Competence | Differential and integral equations, vectorial calculation |

## 5. Requirements (where appropriate)

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| 5.1. For the course | Attendance is not required |
| 5.2. For the applications | The laboratory classes can be recovered according with the ECTS rules!!! All the presences are required to be allowed at the laboratory colloquium (test) and then at the exam!!! |

## 6. Specific competences

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| 6.1 Professional competences | Ability to identify, formulate, and solve engineering problems in a systemic approach<br>Ability to approach and manage specific applications of electrical engineering<br>Ability to know the particularities of electrical circuits in different function regimes<br>The ability to determine the flow of currents, voltage drops and to perform power balances in specific applications of electrical circuits. |
| 6.2 Cross competences | Flexibility in approaching and using in practice the latest existing technologies in the assumed areas of competence<br>Ability to work in a team<br>Flexibility to use the knowledge acquired in the subjects previously studied |

| | Flexibility to apply the knowledge acquired to the specialized subjects of the following years |
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## 7. Course objectives

| 7.1 General objective | Development of skills, abilities and competencies in the domains of the electromagnetic field and electrical circuit analysis by acquiring fundamental knowledge, for the correct approach and solution of the electromagnetic field problems and electrical circuits problems, in permanent regime (steady state - direct current (dc) and/or single-phase (sinusoidal) and three-phase alternating current (ac)), in transient regime, respectively in permanently periodically non-sinusoidal regime, for the purpose of designing and measuring them for use in concrete applications |
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| 7.2 Specific objectives | Ability to address specific issues of electromagnetic fields and electrical circuits Ability to solve specific problems of electromagnetic fields and electrical circuits Ability to use in practical applications the fundamental theorems of electromagnetic fields and electrical circuits |

## 8. Contents

| 8.1 Lecture | No.hours | Teaching methods | Notes |
|---|---|---|---|
| Introduction to the Theory of the Electromagnetic Field. Electrostatic Field. Specific Laws of the Electrostatic Field. Electric Capacitance - Calculation Methods. Applications. Capacitors connections. Applications. Energies and Forces in Electrostatic Field | 3 | The courses presentation in electronic form ppt | Face to face teaching |
| Electrokinetic Field. Specific Laws of the Electrokinetic Field. Resistance – Methods used to calculate resistance. Applications. Resistors Connections. Applications. Magnetic Field. Specific Laws of the Magnetic Field. | 3 | | |
| Inductivities - Calculation Methods. Magnetic Circuit. Law Electromagnetic Induction Law. Energies and Forces in Magnetic Field | 3 | | |
| Introduction to the Theory of Electric Circuit. Elements of Circuit Topology. *Electric Circuits in Steady-state Regime (Direct Current)* | 3 | | |
| Laws and Theorems used to solve Direct Current Electric Circuits. Applications | 3 | | |
| Laws and Theorems used to solve Direct Current Electric Circuits. Applications | 3 | | |
| *Electric Circuits in Harmonic Regime (Alternating Current). Periodic Quantities. Sinusoidal quantities.* Complex impedance. Equivalent Impedance with and without Coupling | 3 | | |
| Powers in Harmonic Regime. Resonance in Electrical Circuits (Series, Parallel, Mixt) | 3 | | |
| Laws and Theorems for solving Electric. Circuits in Alternating Current. Applications | 3 | | |
| Methods for solving Electrical Circuits in Alternating Current. Applications. | 3 | | |
| The Theory of Electric Two Port Networks (Quadripoles) | 3 | | |
| The Three-phase Alternating Current Electric Circuits | 3 | | |
| Study of Electrical Circuits in Transitory Regime | 3 | | |
| Linear Circuits in Non-sinusoidal Regime | 3 | | |

Bibliography

1. C. Păcurar, Electrotechnics Courses, ppt, 2020, Pagina personala Claudia PĂCURAR (utcluj.ro)
2. R. Ciupa, V. Topa, The Theory of Electric Circutis, Casa Cartii de Stiinta, 1998
3. E. Simion, T. Maghiar, Electrotehnica, EDP București, 1981
4. C. Sora, Bazele electrotehnicii, EDP București, 1982
5. C. Mocanu, Teoria circuitelor electrice, EDP București, 1979
6. M Iordache, L. Dumitriu, Teoria moderna a circuitelor electrice, Ed. All Educational, 2000
7. Gh. Mîndru, Teoria circuitelor electrice, Ed. UTPRESS Cluj-Napoca, 2004

8. M. Preda, P. Cristea, F. Manea, Bazele electrotehnicii – probleme, EDP București, 1980
9. R. Răduleț, Bazele electrotehnicii – probleme, EDP București, 1981

| 8.2 Applications (seminar/laboratory/project) | No.hours | Teaching methods | Notes |
|---|---|---|---|
| Labor protection. Presentation of the laboratory and of the equipment | 2 | The laboratory classes are carried out by the practical realization of the different assemblies for the experimental verification of the course chapters, with the active involvement of the students. | Face to face teaching |
| Determining the spectrum and equipotential surfaces of an electric field with an electrokinetic model. Electrical model for Laplace's finite difference equation applied to the determination of equipotential surfaces and the spectrum of an electrostatic field. | 2 | | |
| The study of a magnetic circuit. Drawing a hysteresis cycle and measurement of iron losses with an oscilloscope. | 2 | | |
| Study of a direct current circuit | 2 | | |
| The study of resonance phenomena. Passive dipole study. | 2 | | |
| The study of a passive quadrupole (two ports network). | 2 | | |
| Laboratory colloquium | 2 | | |

Bibliography
1. Păcurar Claudia, Giurgiuman Nicoleta-Adina, Crețu Mihaela, Marian-Răzvan Gliga, Andreica Sergiu-Iulian, Bazele electrotehnicii, Îndrumător de laborator, Editura U.T.Press, Cluj-Napoca, România, ISBN 978-606-737-492-6, 156 pagini, 2020.
2. E. Simion, T.D. Gligor, Gh. Mindru, R. Ciupa, V. Popescu, D. Micu, M. Topa, V. Topa, Bazele electrotehnicii – indrumator de laborator, Atelierul de multiplicare al Institutului Politehnic Cluj-Napoca, 1987.

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

Analyzes electric, magnetic, and electromagnetic phenomena using their quantitative characterizations, and implicitly mathematical modeling of these phenomena, for their technical applications.

## 10. Evaluation

| Activity type | Assessment criteria | Assessment methods | Weight in the final grade |
|---|---|---|---|
| Course | Verification of theoretical (T) and applicative knowledge (P) | Theory- Quiz (T) Applications- 3 problems (P) | 30% 60% |
| Laboratory | Laboratory colloquium | Laboratory test(L) | 10% |
| Minimum standard of performance: |  |  |  |
| $L \geq 5$ $T+P \geq 5$; $N=(0.4T+0.5P+0.1L) \geq 5$ |  |  |  |

| Date of filling in: 23.06.2024 | | Title First name NAME | Signature |
|---|---|---|---|
| | Course | Prof.Eng.Ec. Claudia PĂCURAR, PhD Habil | |
| | Applications | Assist.Eng. Sergiu ANDREICA, PhD | |

Date of approval by the Department Board ……..

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Head of Departament
Prof.dr.ing. Honoriu VĂLEAN

Date of approval by the Faculty Council ……………

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Dean
Prof.dr.ing. Mihaela Dinsoreanu