# SYLLABUS

## 1. Program information

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|---|---|
| 1.1 Higher education institution | Technical University of Cluj-Napoca |
| 1.2 Faculty | Faculty of Electronics, Telecommunications and Information Technology |
| 1.3 Department | Bases of Electronics |
| 1.4 Field of study | Electronic engineering, telecommunications and information technologies |
| 1.5 Cycle of study | Bachelor of Science |
| 1.6 Study program / Qualification | Electronic engineering, telecommunications and information technologies/ Engineer |
| 1.7 Form of education | IF – full-time education |

## 2. Course information

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|---|---|---|---|---|---|---|
| 2.1 Course title | Fundamental Electronic Circuits | | | | Course code | 20.00 |
| 2.2 Course coordinator | Assoc.prof. Laura-Nicoleta IVANCIU, PhD<br>laura.ivanciu@bel.utcluj.ro | | | | | |
| 2.3 Seminar/ laboratory/ project/ practical activity coordinator | Assoc.prof. Laura-Nicoleta IVANCIU, PhD<br>laura.ivanciu@bel.utcluj.ro<br>Assoc.prof. Emilia ȘIPOS, PhD<br>emilia.sipos@bel.utcluj.ro | | | | | |
| 2.4 Year of study | II | 2.5 Semester | 1 | 2.6 Type of assessment | | E |
| 2.7 Course status | Formative category | | | | | DD |
| | Optionality | | | | | DOB |

## 3. Estimated total time

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|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1 Hours per week | 5 | of which: | 3.2 Lecture | 2 | 3.3 Seminar | 1 | 3.3 Laboratory | 2 | 3.3 Project | | 3.3 Practical training | |
| 3.4 Hours per semester | 70 | of which: | 3.5 Lecture | 28 | 3.6 Seminar | 14 | 3.6 Laboratory | 28 | 3.6 Project | | 3.3 Practical training | |

| 3.7 Time distribution (hours per semester) for individual study and assessment: | |
|---|---|
| (a) Assessment | 3 |
| (b) Study using textbook, course materials, bibliography, and notes | 21 |
| (c) Additional documentation in the library, on specialized electronic platforms, and in the field | |
| (d) Preparation for seminars/laboratories, assignments, reports, portfolios and essays | 28 |
| (e) Tutoring | 3 |
| (f) Other activities | |
| 3.8 Total hours of individual study and assessment (sum of (3.7(a)...3.7(f)) | 55 |

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| 3.9 Total hours per semester (3.4+3.8) | 125 |
| 3.10 Number of credits | 5.0 |

**4. Prerequisites** (where applicable)

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| 4.1 curriculum | Electronic Devices |
| 4.2 competencies | Relations and theorems for electric circuits, frequency response representation; operating principles for electronic devices: diode, operational amplifier, MOSFET and BJT transistors; use of electronic devices in electronic circuits; analysis methods for electronic circuits; voltage transfer characteristics; transfer function. |

**5. Requirements** (where applicable)

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| 5.1. for the development of the lecture | Amphitheater, Cluj-Napoca |
| 5.2. for the development of the seminar/ laboratory/ project | Electronic Devices and Circuits Lab, Cluj-Napoca |

**6. Specific competencies acquired**

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| Professional competencies | C1 Use of fundamental elements related to electronic devices, circuits, systems, instrumentation and technology<br>C1.1 Description of the operation of electronic devices and circuits and of the fundamental methods for measuring electrical quantities<br>C1.2 Analysis of low-/medium-complexity electronic circuits and systems for their design and measurement<br><br>C2 Application of basic methods for signal acquisition and processing<br>C2.1 Time-domain, spectral and statistical characterization of signals<br>C2.2 Explanation and interpretation of signal acquisition and processing methods<br><br>C4 Design and use of low-complexity hardware and software applications specific to applied electronics<br>C4.1 Definition of the concepts, principles and methods used in: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures<br>C4.2 Explanation and interpretation of the requirements specific to hardware and software structures in the fields of: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures |

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| | C5 Application of basic knowledge, concepts and methods from: power electronics, automatic systems, electrical energy management and electromagnetic compatibility<br>C5.1 Definition of the specific elements that characterize electronic devices and circuits in the fields of: power electronics, automatic systems, electrical energy management, medical electronics, automotive electronics and consumer goods |
| Professional competencies | C5.2 Qualitative and quantitative interpretation of the operation of circuits in the fields of: power electronics, automatic systems, electrical energy management, medical electronics, automotive electronics and consumer goods; analysis of operation from the standpoint of electromagnetic compatibility<br>C5.3 Preparation of technical specifications, installation and operation of equipment in the fields of applied electronics: power electronics, automatic systems, electrical energy management, medical electronics, automotive electronics and consumer goods<br>C5.4 Evaluation, based on technical quality and environmental impact criteria, of equipment in the fields of applied electronics: power electronics, automatic systems, electrical energy management, medical electronics, automotive electronics and consumer goods<br>Fundamental Electronic Circuits<br>C5.5 Design, using established principles and methods, of low-complexity subsystems in the fields of applied electronics: power electronics, automatic systems, electrical energy management, medical electronics, automotive electronics and consumer goods |
| Transversal competencies | |

**7. Expected learning outcomes**

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| Knowledge | - The student/graduate describes, identifies and summarizes elementary concepts and methods related to electronic devices, circuits and instrumentation, as well as their application in concrete problems. |
| Skills | - The student/graduate uses fundamental methods for measuring electrical quantities and assesses electronic devices and circuits, as well as linear and digital integrated circuits of low/medium complexity.<br>- The student/graduate designs, measures, evaluates performance, diagnoses and troubleshoots functional blocks composed of low/medium-complexity electronic devices and/or circuits. |
| Responsibility and autonomy | - The student/graduate carries out project management processes in electronics, telecommunications and information technologies, taking on different team roles and clearly and concisely describing the results, both orally and in writing. |

**8. Course objectives** (based on the grid of specific competencies acquired)

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| 8.1 General objective of the course | Developing the competences regarding the use of electronic devices, regarding the use, analysis and (re)design of fundamental electronic circuits. |
| 8.2 Specific objectives | 1. Understanding the operating principles of the fundamental electronic circuits<br>2. Recognizing and understanding basic concepts specific to fundamental electronic circuits.<br>3. Developing skills and abilities necessary for the use of electronic circuits<br>4. Developing skills and abilities for the analysis and (re)design of electronic circuits. |

**9. Contents**

| **9.1 Lecture** | **No. of hours** | **Teaching methods** | **Remarks** |
|---|---|---|---|
| 1. Introduction. Transistors - recap. Transistor digital circuits. | 2 | Presentation, euristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation | Use of .ppt presentation, projector, blackboard |
| 2. Transistor amplifiers. DC biasing. | 2 | | |
| 3. MOSFET basic amplifiers | 2 | | |
| 4. BJT basic amplifiers | 2 | | |
| 5. Frequency response. Current sources and current mirrors. | 2 | | |
| 6. Power amplifiers - class A, B, AB | 2 | | |
| 7. Feedback circuits | 2 | | |
| 8. DC voltage regulators | 2 | | |
| 9. Integrated voltage regulators. Switched-mode power supplies. | 2 | | |
| 10. Sinusoidal oscillators | 2 | | |
| 11. Non-sinusoidal signal generators | 2 | | |
| 12. 555 Timer | 2 | | |
| 13. Class D amplifier | 2 | | |
| 14. Recap. Preparation for the exam. | 2 | | |

Bibliography

1. Emilia ȘIPOȘ, Laura IVANCIU, Dispozitive electronice, Cluj-Napoca, editura UTPRESS, ISBN 978-606-737-576-3, 2022
2. Oltean, G., Circuite Electronice, UT Pres, Cluj-Napoca, ISBN 978-973-662-300-4, 203 pag., 2007
3. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, Oxford University Press, ISBN: 0-19-514252-7, 2004.
4. Thomas Floyd, Dispozitive electronice, Ed. Teora, 2007
5. Boylestad Robert L., Electronic Devices and Circuit Theory

***On – line references***

| 9.1 Lecture | No. of hours | Teaching methods | Remarks |
|---|---|---|---|
| 1. Ivanciu, L, Fundamental Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec<br>2. Ivanciu, Laura, Sipos, Emilia, Electronic Devices, UTPress, Cluj-Napoca, ISBN 978-606-737-639-5, 2023<br>3. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, 2016<br>4. Paul Falstad, Circuit Simulator, https://www.falstad.com/circuit/ | | | |

| 9.2 Laboratory | No. of hours | Teaching methods | Remarks |
|---|---|---|---|
| 1. Introductory lab. Workplace safety. | 2 | Didactic and experimental proof, didactic exercise, team work | Use of laboratory instrumentation, experimental boards, computers, smart board |
| 2. BJT operating regions | 2 | | |
| 3. MOSFET logic circuits | 2 | | |
| 4. Single-Stage MOSFET amplifiers | 2 | | |
| 5. Single-Stage BJT amplifiers | 2 | | |
| 6. Current sources w/ OpAmp and T | 2 | | |
| 7. Class B power amplifiers | 2 | | |
| 8. Effects of negative feedback on an amplifier | 2 | | |
| 9. Voltage regulators with OpAmp | 2 | | |
| 10. Integrated voltage regulators | 2 | | |
| 11. Sinusoidal oscillators | 2 | | |
| 12. Lab test | 2 | | |
| 13. Multivibrator circuits using the 555 Timer | 2 | | |
| 14. Lab do-overs. Finalization of lab activity. | 2 | | |
| Bibliography<br>***On-line references***<br>1. Ivanciu, L, Fundamental Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec<br>2. Ivanciu, Laura, Sipos, Emilia, Electronic Devices, UTPress, Cluj-Napoca, ISBN 978-606-737-639-5, 2023<br>3. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, 2016<br>4. Paul Falstad, Circuit Simulator, https://www.falstad.com/circuit/ | | | |

| 9.3 Seminar | No. of hours | Teaching methods | Remarks |
|---|---|---|---|
| 1. Logic circuits with transistors. DC equivalent circuit - OP | 2 | Didactic and experimental proof, didactic | Use of .ppt presentation, projector, blackboard |
| 2. Basic amplifiers with MOSFET | 2 | | |
| 3. Basic amplifiers with BJT. Current sources and current mirrors | 2 | | |

| 9.3 Seminar | No. of hours | Teaching methods | Remarks |
|---|---|---|---|
| 4. Power amplifiers. NF Circuits | 2 | exercise, team work | |
| 5. DC voltage regulators | 2 | | |
| 6. Sinusoidal oscillators | 2 | | |
| 7. Nonsinusoidal oscillators. Recap | 2 | | |

Bibliography
1. Emilia ȘIPOȘ, Laura IVANCIU, Dispozitive electronice, Cluj-Napoca, editura UTPRESS, ISBN 978-606-737-576-3, 2022
2. Oltean, G., Circuite Electronice, UT Pres, Cluj-Napoca, ISBN 978-973-662-300-4, 203 pag., 2007
3. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, Oxford University Press, ISBN: 0-19-514252-7, 2004.
4. Thomas Floyd, Dispozitive electronice, Ed. Teora, 2007
5. Boylestad Robert L., Electronic Devices and Circuit Theory

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5. Ivanciu, L, Fundamental Electronic Circuits, on-line: http://www.bel.utcluj.ro/dce/didactic/fec
6. Ivanciu, Laura, Sipos, Emilia, Electronic Devices, UTPress, Cluj-Napoca, ISBN 978-606-737-639-5, 2023
7. Sipos, Emilia, Ivanciu, Laura, Dispozitive Electronice. Probleme rezolvate, 2016
8. Paul Falstad, Circuit Simulator, https://www.falstad.com/circuit/

**10. Alignment of the course contents with the expectations of the epistemic community, professional associations, and representative employers in the field related to the program**

The course content and the teaching-learning-assessment methods are aligned with the current requirements of the Electronics, Telecommunications, and Information Technology Engineering field, considering the expectations of the academic and professional community, representative employers, as well as the national quality assurance standards in higher education. The course helps prepare students in line with employer expectations and the quality requirements set for engineering study programs.

**11. Assessment**

| Activity type | 11.1 Assessment criteria | 11.2 Assessment methods (and type of assessment: continuous/ summative) | 11.3 Weight in final grade |
|---|---|---|---|
| 11.4 Lecture | The level of theoretical knowledge and practical skills acquired for the analysis and (re)design of electronic circuits | - Written exam: problem solving | 70% |
| 11.5 Laboratory | The level of the abilities acquired for experimental analysis of electronic circuits | - Continuous formative evaluation<br>- Lab test | 20% |
| 11.6 Seminar | The level of the abilities acquired for problem solving | - Continuous formative evaluation | 10% |

11.6 Minimum performance standard

**Qualitative level:**

**Minimum knowledge:**

1. Transistor circuits
2. Transistor biasing circuits for transistor amplifiers
3. Small-signal models of transistors and transistor amplifiers
4. Feedback circuits, equation of negative feedback circuits
5. Structure, operating principle and analysis of fundamental electronic circuits: fundamental amplifiers with transistors, logic circuits with transistors, current sources and current sinks, linear voltage regulators, sinusoidal and nonsinusoidal signal generators, power amplifiers
6. Design and redesign fundamental electronic circuits

**Minimum competencies:**

1. To be able to determine the performance of electronic circuits
2. To be able to use, design and redesign fundamental electronic circuits
3. To be able to use the lab instrumentation and experimental boards.

**Quantitative level:**

1. Full laboratory attendance
2. Minimum grade for exam and lab - 5
3. Final grade computed as: Grade = 0.7*Exam + 0.2*Lab + 0.1*Seminar

| **Completion date:** | **Course coordinators** | **teaching rank, title First name LAST NAME** | **Signature** |
|---|---|---|---|
| 23.06.2026 | Lecture | Assoc.prof. Laura IVANCIU, PhD | |
| | Applications | Assoc.prof. Laura IVANCIU, PhD | |
| | | Assoc.prof. Emilia ȘIPOS, PhD | |
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| Approval of the Head of the Department coordinating the course, only if this differs from the department organizing the study program | Head of the Bases of Electronics Department |

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| Date of approval by the Council of the Department of Bases of Electronics<br><br>26.06.2026 | Head of the Bases of Electronics Department<br>Prof. Sorin HINTEA, Ph.D. |
| Date of approval by the Council of the Faculty of Electronics, Telecommunications and Information Technology<br>30.06.2026 | Dean,<br>Prof. Ovidiu-Aurel POP, Ph.D. |