#### card of course

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| Subject name | Foundations of electrical engineering |

1. The placement of the subject in the study system

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| 1.1. Field of study | Computer science |
| 1.2. Form and path of study | Full-time/Part-time |
| 1.3. Level of education | First-cycle studies |
| 1.4. Study profile | Practical |

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| 1. 5. Specialty | - |
| 1.6. Subject Coordinator | Dr Oleksandr Boiko |

2. General characteristics of the subject

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| 2.1. Belonging to a subject group | Interdisciplinary/Practical |
| 2.2. Number of ECTS | 4 |
| 2.3. Language of lectures | Polish |
| 2.4. Semesters in which the subject is taught | II |
| 2.5.Criteria for selecting course participants | - |

1. Learning outcomes and course delivery
	1. Subject Objectives

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| No. | Subject Objectives |
|
| C1 | To familiarize students with the issues of modern electrical and electronic technology in connection with physical phenomena. |
| C2 | To provide the student with practical knowledge and skills in calculating electrical and electronic circuits. |
| C3 | To familiarize students with the basics of measuring electrical quantities. |
| C4 | To develop students' skills in using acquired knowledge in practice. |

* 1. Subject-specific learning outcomes, divided into knowledge , skills and competences , with reference to the directional learning outcomes

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| --- | --- | --- | --- |
| No. | Description of subject learning outcomes | Reference to directional effectslearning (symbols) | Method of implementation (mark "X") |
| ST | NST |
| Classes at the University | Activities on the platform | Classes at the University | Activities on the platform |
| After passing the course, the student knows and understands **the knowledge** |
| W1 | Has knowledge of concepts and definitions used in electrical engineering and electronics, useful for formulating and solving simple problems | INF\_W01INF\_W06 | X |  |  | X |
| W2 | Knows the phenomena occurring in electric and magnetic fields and the basic laws describing phenomena related to the flow of electric current | X |  |  | X |
| W3 | Possesses knowledge of the analysis of simple electric and magnetic circuits | X |  |  | X |
| W4 | Knows the principles of operation of electromagnetic and electronic components and systems and their applications | X |  |  | X |
| W5 | Has knowledge of the basics of electrical meters and measurement methods | X |  |  | X |
| After passing the course, the student is **able** to: |
| U1 | Can analyze simple single-phase DC and AC circuits and selected magnetic circuits | INF\_U04INF\_U05 INF\_U07 INF\_U08INF\_U11INF\_U22 | X |  | X |  |
| U2 | Is able to describe the operation of selected elements in electrical and electronic circuits | X |  | X |  |
| U3 | Formulates basic laws and uses them in electrical engineering | X |  | X |  |
| U4 | Is able to determine basic electrical quantities in simple electric and electronic circuits. | X |  | X |  |
| U5 | Is able to select the method and devices for measuring basic electrical quantities. | X |  | X |  |
| After completing the course, the student is ready to take part in **social competences.** |
| K1 | Demonstrates the need for continuous learning and is able to transfer his/her knowledge and skills | INF\_K05INF\_K06 | X |  | X |  |
| K2 | Complies with the rules of proper conduct in a group and occupational health and safety | X |  | X |  |
| K3 | Demonstrates care for order and respect for community property | X |  | X |  |

3.3. Forms of teaching and their number of hours - Full-time studies (ST), Part-time studies (NST)

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Path | Lecture | Exercises | Design | Workshop | Laboratory | Seminar | Lecturer | Classes conducted using distance learning methods and techniques in the form of ………………. | Other | **ECTS points** |
| **ST** | 30 |  |  |  | 30 |  |  |  |  | 4 |
| **NST** | 15 |  |  |  | 15 |  |  |  |  | 4 |

3.4. Content of education (separately for each form of classes: (W, ĆW, PROJ, WAR, LAB, LEK, OTHER). It should be marked (X) how the given content will be implemented (classes at the university or classes on the e-learning platform conducted using distance learning methods and techniques)

TYPE OF CLASS: LECTURE

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| --- | --- | --- | --- |
| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") |
| ST | NST |
| **Classes at the University** | **Activities on the platform** | **Classes at the University** | **Activities on the platform** |
| 1. | Electrical Engineering Concepts. DC Circuits. Resistance of Conductors. Ohm's Law. Kirchhoff's Laws. | W1, W2 | X |  |  | X |
| 2. | Passive and active elements of an electric circuit and methods of connecting them. | W3, W4 | X |  |  | X |
| 3. | Energy and power of electric current. Joule's law. Classical method of analysis of electric circuits. | W1, W2, W3 | X |  |  | X |
| 4. | Magnetism and electromagnetism. Magnetic induction. Flow law. Ohm's law and Kirchhoff's laws for magnetic circuits. | W1, W2, W3 | X |  |  | X |
| 5. | Electromagnetic induction. | W1, W2, W3 | X |  |  | X |
| 6. | Electrical signals. Average and effective value of current and voltage. | W1, W2, W3 | X |  |  | X |
| 7. | Single-phase electrical circuits of sinusoidal alternating current. | W2, W3 | X |  |  | X |
| 8. | Power and Energy in AC Circuits. Resonance Phenomenon. | W1, W2, W3 | X |  |  | X |
| 9. | Analysis of sinusoidally alternating current circuits. | W2, W3 | X |  |  | X |
| 10. | Transients in circuits containing R, L, C elements. | W1, W2, W3 | X |  |  | X |
| 11. | Electric machines and transformers. | W1, W4 | X |  |  | X |
| 12. | Measurements of electrical quantities, classification of measurement errors, analog and digital measuring instruments, measurement methods. | W1, W5 | X |  |  | X |
| 13. | Elements of electronic systems - diodes, transistors, thyristors. | W1, W4 | X |  |  | X |
| 14. | Operational amplifier, selected electronic circuits. | W1, W4, W5 | X |  |  | X |
| 15. | Digital circuits, basic logical elements. Implementation of complex functions. | W1, W4 | X |  |  | X |
| 16. | Summary of classes and discussion of grades. |  | X |  |  | X |

TYPE OF CLASS: LABORATORY

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| --- | --- | --- | --- |
| No. | Content of the course | Reference to subject-specific learning outcomes | Method of implementation (mark "X") |
| ST | NST |
| **Classes at the University** | **Activities on the platform** | **Classes at the University** | **Activities on the platform** |
| 1. | The program content of the auditorium exercises is consistent with the above-formulated topics of the lecture preceding the laboratory classes. |  | X |  | X |  |
| 2. | Checking the validity of Ohm's law. | U1, U3, U4, U5, K1, K2, K3 | X |  | X |  |
| 3. | Laboratory verification of the validity of Kirchhoff's laws. | U1, U3, U4, U5, K1, K2, K3 | X |  | X |  |
| 4. | Determination of equivalent values of resistance and capacitance of series and parallel connected elements R and C. | U1, U2, U3, U4, U5, K1, K2, K3 | X |  | X |  |
| 5. | Colloquium IStudy of the differentiating and integrating system, determination of the time constant by calculation and measurement methods. | U1, U2, U3, U4, U5, K1, K2, K3 | X |  | X |  |
| 6. | Testing the LED circuit. | U2, U4, U5, K1, K2, K3 | X |  | X |  |
| 7. | Checking the operation of basic logic circuits NOT, AND, OR, BUFFER. | U2, U4, U5, K1, K2, K3 | X |  | X |  |
| 8. | Colloquium II.Design and implementation of simple combinational logic circuits. | U1, U2, U3, U4, U5, K1, K2, K3 | X |  | X |  |
| 9. | Summary of classes and discussion of grades. |  | X |  | X |  |

3.5. Methods of verifying learning outcomes (indication and description of methods of conducting classes and verification of achievement of learning outcomes and method of documentation)

* Traditional lecture (deriving mathematical relationships on the board), with partial use of multimedia tools, analysis and interpretation of the knowledge provided, brainstorming,
* Problem-based method, problem-solving, discussion, simulations - multimedia techniques,
* Laboratory experiment, interpretation of obtained results, verification of results obtained on the basis of measurement and calculations.

Verification of achieved learning outcomes is performed through:

* evaluation of the results of 2 tests (laboratory)
* assessment of problem-solving, conducting laboratory experiments - developing measurement results and preparing reports (laboratory)
* evaluation of exam results (lecture)

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| --- | --- | --- | --- |
| Subject Effects | Teaching methods | Methods of verifying learning outcomes | Documentation methods |
| KNOWLEDGE |
| W1-W5 | Traditional lecture (deriving mathematical relationships on the board), with partial use of multimedia tools, analysis and interpretation of the knowledge provided, brainstorming | Written exam – passing the lecture | Graded exam |
| SKILLS |
| U1-U5 | Problem-based method, problem-solving, discussion, simulations - multimedia techniques, laboratory experiment | Colloquium I – 25% of the final laboratory grade;Colloquium II – 25% of the final laboratory grade;Solving tasks and conducting laboratory experiments, developing results and preparing reports – 50% of the final grade from the laboratory | Graded colloquiaEvaluated reports |
| SOCIAL COMPETENCES |
| K1-K3 | Problem-based method, problem-solving, discussion, simulations - multimedia techniques, laboratory experiment | Colloquium I – 25% of the final laboratory grade;Colloquium II – 25% of the final laboratory grade;Solving tasks and conducting laboratory experiments, developing results and preparing reports – 50% of the final grade from the laboratory | Graded colloquiaEvaluated reports |

3.6. Assessment criteria for the achieved learning outcomes

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| Learning effect | For a grade of 3 or "pass."the student knows and understands/is able to/is ready to | For a grade of 3.5, the student knows and understands/is able to/is ready to | For a grade of 4, the student knows and understands/is able to/is ready to | For a grade of 4.5, the student knows and understands/is able to/is ready to | For a grade of 5, the student knows and understands/is able to/is ready to |
| W | 51-60% of knowledge indicated in learning outcomes | 61-70% of knowledge indicated in learning outcomes | 71-80% of knowledge indicated in learning outcomes | 81-90% of knowledge indicated in learning outcomes | 91-100% of knowledge indicated in learning outcomes |
| U | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |
| K | 51-60% of skills indicated in learning outcomes | 61-70% of skills indicated in learning outcomes | 71-80% of skills indicated in learning outcomes | 81-90% of skills indicated in learning outcomes | 91-100% of skills indicated in learning outcomes |

3.7. Literature

**Basic**

1. Hempowicz P., *Elektrotechnika i elektronika dla nieelektryków*, Wydawnictwa Naukowo-Techniczne, Warszawa 2009.
2. Miedziński B., Elektrotechnika. Podstawy i instalacje elektryczne, Wydawnictwo naukowe PWN, Warszawa, 2000.
3. Pasko M., Piątek Z., Topór-Kamiński L., Elektrotechnika ogólna. Cz.1, Wydawnictwo Politechniki Śląskiej, Gliwice, 2004.

**Supplementary**

1. Majerowska Z., Majerowski A., Elektrotechnika ogólna w zadaniach, Państwowe Wydawnictwo Naukowe, Warszawa, 1999.
2. Rusek M., Pasierbiński J., *Elementy i układy elektroniczne w pytaniach i odpowiedziach*, Wydawnictwo Naukowo-Techniczne, Warszawa 2006.
3. Bolkowski S., Elektrotechnika, WSiP, Warszawa, 2005.
4. Shamieh C., McComb G., Elektronika dla bystrzaków, Helion, Gliwice, 2012.

4. Student workload - ECTS points balance

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| --- | --- |
| **Types of student activity** | **Student Load** |
| **ST** | **NST** |
| **Classes requiring direct contact between the student and the academic teacher at the university premises** | **60** | **30** |
| Classes included in the study plan | 60 | 30 |
| **Student's own work** | **40** | **70** |
| Ongoing preparation for classes, preparation of project work/presentations/etc. | 20 | 35 |
| Preparation for passing classes | 20 | 35 |
| **TOTAL STUDENT HOURLY LOAD** | **100** | **100** |
| **Number of ECTS points** | **4** | **4** |

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| Last change date | 30/09/2024 |
| The changes were introduced | INF Education Quality Team |
| The changes were approved | Arkadiusz Gwarda, M.A. |