POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)
pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electrical engineering and electronics

Course

Field of study	Year/Semester
Education in Technology and Informatics	3/5
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
First-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
26		
Tutorials	Projects/seminars	
30		

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr inż. Karol Bednarek

Faculty of Control, Robotics and Electrical
Engineering

Institute of Electrical Engineering and
Electronics

Piotrowo 3a, 60-965 Poznań

email: karol.bednarek@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of physics and mathematics (general level). Knows and understands the mathematical apparatus necessary to describe and analyze the basic problems of electrical engineering and electronics, including: linear algebra, basics of differential and integral calculus, elements of mathematical logic, statistics and numerical methods. K1_W01 (P6S_WG (S / T). Is able to use acquired mathematical knowledge to describe processes, create models, write algorithms and other activities in the field of technology and computer science. K1_U04 (P6S_UW) (S / T) Is aware of the importance of engineering and non-technical activities aspects, including environmental impact. K1_K06 (P6S_KK) (general).

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

Course objective

1. Provision of knowledge in electrical engineering and electronics to students specializing in the area of IT and Technical Education. Acquainting students with the construction, principles of operation and application possibilities of electrical and electronic devices (lecture).

2. Developing students' skills to achieve optimal solutions, analyze the results of computer simulations, prepare research reports and publicly present the results and discuss them in the forum (exercises).

3. Shaping students' teamwork skills (exercises).

4. Presentation of new possibilities in the field of electricity conversion (lecture).

Course-related learning outcomes

Knowledge

1. Has knowledge of the ecological aspects of technical activities undertaken. K1_W05.

2. Has elementary knowledge of electrical engineering and electronics. K1_W13.

3. Has basic knowledge of the operation and diagnostics of technical systems, including the life cycle of devices. K1_W19.

Skills

1. Can obtain information from literature, databases and other properly selected sources, integrate them, interpret them and draw conclusions, formulate and justify opinions. (K1_U01).

2. Can work individually and in a team, including managing his own time as well as making and keeping commitments. (K1_U05).

3. Can correctly choose analytical or numerical tools to solve technical problems; can evaluate the results of numerical analysis. (K1_U08).

4. Can identify a technical problem, define its complexity level, and then propose a diagram of its analysis and solution. (K1_U16).

5. When formulating and solving engineering tasks, can see their social, economic, ecological and legal aspects. (K1_U25).

Social competences

1. Can work on a designated task independently and work in a team taking different roles in it; demonstrates professionalism and responsibility for the decisions made. (K1_K01).

2. Can think and act in an entrepreneurial and innovative way. (K1_K08).

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect	Form of evaluation	Assessment criteria
W05,W13,W19	Lecture. Written or oral exam. Additionally, continuous assessment	50.1%-70.0% (3)

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

(rewarding activity and quality of perception during classes).   70.1%-90.0% (4)

U01,U05,U08, U13, U25   from 90.1% (5)

K01, K08

Auditorium exercises:

Assessment (completion)

Assessment of knowledge and skills related to the implementation   50.1%-70.0% (3)

of a computational task, assessment of answers to questions,   70.1%-90.0% (4)

ability to analyze results and draw conclusions.   od 90.1% (5)

Programme content

Lecture:

Basic concepts in the field of electrotechnics, basics of electrostatics, circuit elements, laws of electric circuits, matching the receiver to the source for maximum power, basics of magnetism and electromagnetism, types of materials due to electrical and magnetic interactions, the formation of sinusoidal voltage, physical quantities and electrical parameters in AC circuits, methods of analysis of DC and sinusoidal current circuits (methods: Kirchhoff's laws, superposition, loop currents, nodal potentials), circuit theorems (Thevenin, Norton, Tellegen, on reciprocity and compensation), power and energy in sinusoidal variable circuits, RLC elements (phasor diagrams), voltage and current resonance, reactive power compensation, power and energy measurements in electric circuits. Creation and properties of three-phase systems. System analysis in the case of distorted excitations (application of the Fourier series, RMS current and voltage, powers: active, reactive, apparent, distortion, harmonics). Basic electronic components: diodes, transistors, thyristor, hall effect sensor, thermistor, varistor, photo-optical elements. Selected electronic systems: rectifiers and filters, amplifiers, vibration generators, power supplies, etc. Measuring instruments and methods in electrical engineering. Measurements of selected non-electrical quantities using electrical methods (sensors and their applications in industry and vehicles). Mutual electromagnetic interactions of devices – electromagnetic compatibility (problem outline). Transformers and rotating machines – structure, principle of operation, design solutions, functional properties. Energy storage. Quality and reliability of electricity supply – uninterruptible power supply systems.

Auditorium exercises (computational tasks):

Determination of equivalent resistance and impedance, voltage and current sources, time and complex form of sinusoidal currents and voltages, calculation of currents and voltages in branched circuits, Kirchhoff's law method, superposition principle / method, matching the receiver to the source for maximum power, the loop current method and nodal potentials, Thevenin and Norton theorem / method, determination of active, reactive and apparent power, reactive power compensation, voltage and current resonance, magnetically coupled circuits.

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

Teaching methods

Lecture:

The lecture with blackboard or multimedia presentation (including drawings, photos, animations, films), taking into account various aspects of the issues presented, including: economic, ecological, legal, social and practical examples known to students in everyday life. Presenting a new topic preceded by a reminder of the content of the previous lecture. Presenting material in connection with other objects.

Auditorium exercises:

Solving tasks related to the basics of electrical engineering on the board, discussions and comments on how to solve tasks.

Bibliography

Basic

1. Bolkowski S., Teoria obwodów elektrycznych, WNT, Warszawa 2017, (dowolne wydanie).

2. Kurdziel R., Podstawy elektrotechniki, WNT, Warszawa 1973.

3. Krakowski M., Elektrotechnika teoretyczna, tom 1 – Teoria obwodów (tom 2 - Pole elektromagnetyczne), PWN, Warszawa 1999, (dowolne wydanie).

4. Pr. zbior., Elektrotechnika i elektronika dla nieelektryków, WNT, W-wa 1999 (1995, 1991).

5. Nawrocki W., Elektronika: układy elektroniczne, Wydawnictwo Politechniki Poznańskiej, Poznań 2010.

6. Bolkowski S., Brociek W., Rawa H., Teoria obwodów elektrycznych. Zadania., WNT, 2015.

7. Majerowska Z., Majerowski A., Elektrotechnika ogólna w zadaniach, PWN, W-wa 1999 (1984).

8. Jastrzębska G., Nawrowski R., Zbiór zadań z elektrotechniki ogólnej, Wydawnictwo Politechniki Poznańskiej, Poznań 1995.

9. Szabatin J., Śliwa E., Zbiór zadań z teorii obwodów, WPW, 2008.

Additional

1. Hempowicz P. i in., Elektrotechnika i elektronika dla nieelektryków, WNT, W-wa, 2004 (1999).

2. Chua L. O., Desoer C. A., Kuh E. S.: Linear and nonlinear circuits, McGraw-Hill Inc., New York 1987.

3. Charoy A., Zakłócenia w urządzeniach elektronicznych. Zasady i porady instalacyjne, cz. 1-4, z serii: Kompatybilność elektromagnetyczna, WNT, Warszawa 1999-2000.

4. Opydo W., Elektrotechnika i elektronika dla studentów studiów zaocznych wydziałów nieelektrycznych politechnik, skrypt Politechniki Poznańskiej nr1757.

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

5. Czarnywojtek P., Kozłowski J., Machczyński W., Teoria obwodów w zadaniach, Kalisz 2008.

6. Frąckowiak J., Nawrowski R., Zielińska M.: Teoria obwodów. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2017.

7. Bednarek K., Elektromagnetyczne oddziaływania i bilans energetyczny w sieci zasilającej w budynku banku, Przeglad Elektrotechniczny, 90 (2014), nr 12, 188-191.

8. Bednarek K., Kasprzyk L., Kształtowanie jakości energii i niezawodności w systemach zasilania elektrycznego, Przeglad Elektrotechniczny, 92 (2016), nr 12, 9-12.

9. Bednarek K., Zasilacze UPS i agregaty prądotwórcze, czyli jak zapewnić niezawodność zasilania i odpowiednią jakość energii, Sektor Elektroenergetyczny, nr 1, 2019, s. 94-102, ISSN 2544-316X.

10. Putz Ł., Bednarek K., Nawrowski R., Disturbances Generated by Lighting Systems with LED Lamps and the Reduction in Their Impacts, Applied Sciences, Vol. 9, issue 22, 2019, p. 1-18, DOI: 10.3390/app9224894.

11. Bednarek K., Typańska D., Misiorny J., Pietkiewicz A., Dostosowanie emisji zaburzeń elektromagnetycznych generowanych przez oprawę oświetleniową ze źródłami LED do wymagań norm EMC, Przeglad Elektrotechniczny, Nr 12 (94), 2018, s. 214-217, DOI: 10.15199/48.2018.12.48

12. Praca zbiorowa: Czujniki w pojazdach samochodowych. Informatory techniczne Bosch, WKiŁ, Warszawa 2014.

13. Bednarek K., Bugała A., Budzińska N., Wielogórski M., Stanowiska do badań i prezentacji funkcjonowania czujników prędkości obrotowej oraz położeń liniowych i kątowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 100, Poznań 2019, s. 199-210, DOI: 10.21008/j.1897-0737.2019.100.0018.

14. Bednarek K., Kasprzyk L., Zasobniki energii w systemach elektrycznych – Część 1. Charakterystyka problemu, Część 2. Analizy porównawcze i aplikacje, Poznan University of Technology Academic Journals, Electrical Engineering, Poznań, No 69, Poznań 2012, p. 199-218.

15. Bednarek K., Bugała A., Własności użytkowe akumulatorów kwasowo-ołowiowych, Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 47-60.

Breakdown of average student's workload

	Hours	ECTS
Total workload	124	5,0
Classes requiring direct contact with the teacher	66	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	94	3,0

---

[1] delete or add other activities as appropriate