COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronics and optoelectronics

Course

Field of study
Electromobility

Year/Semester
2/3

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
Grzegorz Wiczyński D.Sc. Eng.

email: grzegorz.wiczynski@put.poznan.pl

tel. 61 6652639

Faculty of Automatic, Robotics and Electrical Engineering

Piotrowo 3 Street, 60-965 Poznań

Responsible for the course/lecturer:
Dariusz Prokop Ph.D. Eng.

email: dariusz.prokop@put.poznan.pl

tel. 61 6652614

Faculty of Automatic, Robotics and Electrical Engineering

Piotrowo 3 Street, 60-965 Poznań

Prerequisites

Basic knowledge of electrical engineering and mathematical analysis.

Using the laws of electrical engineering to analyse direct and alternating current circuits.

Aware of the requirement to expand their competences and willing to cooperate within the team.

Course objective

To understand the characteristics of the basic electronic components and circuits used in practice and the methodology for their analysis and experimental research.

Course-related learning outcomes

Knowledge

1. Have a systematic knowledge of the field of classification of basic electronic components and analogue methods of processing electrical signals.

2. Have knowledge of the functioning of analogue and digital electronic and optoelectronic systems.

3. Knows and can explain the phenomena and properties of electronic and optoelectronic components and their role in electromobile systems.

4. Have knowledge of the diagnosis and testing of electronic circuits.

5. Have knowledge of the life cycle processes of electronic and optoelectronic components used in electromobility.

Skills

1. Recognises basic electronic components and, on the basis of literature sources, can identify their parameters and application conditions.

2. Ability to design simple electronic and optoelectronic systems.

3. Ability to select appropriate electronic components and structures taking into account the specifics of electromobile applications.

4. Be able to perform simple servicing of electronic and optoelectronic devices.

Social competences

1. Understands the importance of acquiring knowledge of the properties of components necessary for the design and testing of electronic and optoelectronic devices.

2. Be aware of the need to make use of expertise in the design and testing of electronic and optoelectronic circuits beyond the competences obtained in the electromobility field.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Assessment of the knowledge and skills shown in a written test and an calculation test (the written test sheet contains the information necessary to perform the calculation). The threshold for passing the test is 50%. Rewards the assessment from the practice classes and presence and activity during the lecture.

Auditorial exercises

Knowledge and skills, as part of the auditory exercises, are verified on the basis of a pass - two tests after 4 and in the last class. The tests contain a set of scoring tasks depending on the level of difficulty. In addition, the exercises are assigned a course on the ecursa platform, which will include obligatory

homework and tests. The activity on the platform is rewarded by obtaining 20% of all points from all possible ones. The pass threshold of the exercises: 50% of the points.

Programme content

Lectures

Passive and active elements used in electronic circuits. Properties and applications of basic semiconductor elements: rectifier/universal diodes, Zener diodes, bipolar and field transistors, optoelectronic. Power supply for electronic circuits. DC and AC voltage amplifiers. The role of negative and positive feedback. Operating amplifiers - properties, parameters and applications. Unstabilised and stabilised power supplies. Basics of signal filtration. Basics of digital technology and simple logic functions. Construction, diagnostics and testing of simple electronic circuits. Properties of optical radiation and applied optical phenomena. Basic optoelectronic radiation emitters (LEDs, LASERs), basic thermal and photoconductive detectors of optical radiation. Optoelectronic systems in industrial and vehicle applications (i.e. fibre optics, optical encoders, distance sensors, lidars, 3D scanners).

Auditing exercises

Analysis of the issues involved:

- systems with passive (passive) elements such as: voltage and current dividers, RC filters

- semiconductor diode systems: role in rectifier circuits, Zener diodes, LED power supply systems, protections

- circuits with bipolar and polar transistors: amplifiers, electronic keys

- circuits with operational amplifiers in basic operating systems (inverting, non-reverting, voltage follower, differential, integrating, differential, comparator, active filters)

- generator systems: RC, relaxation

- digital combination and sequential systems

- optical radiation detectors with photodiode, phototransistor and photoresistorLaboratory exercises are conducted in laboratory groups. During the classes, a connection of the measurement system is performed, the conduct of indicated measurements, preparation of measurement results and a report. In addition, an individual design and assembly of uncomplicated printed circuit boards is performed.

Teaching methods

The lectures are delivered using multimedia presentations illustrated by simulation examples and the necessary mathematical calculations on the board.

Auditorial exercises: it is performed by solving tasks by the teacher with the active participation of students and by students solving homework on their own. The examples analysed are based on their practical applications in industry and vehicles.

The educational methods used are student-oriented and motivate students to actively participate in the learning process through discussions and lectures.

Bibliography

Basic

1. A. Filipkowski, Układy elektroniczne analogowe i cyfrowe , WNT 1993

2. Z. Kulka , M. Nadachowski, Wzmacniacze operacyjne i ich zastosowania cz. 1 i 2 WNT 1983

3. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2007

4. J. Zakrzewski, Czujniki i przetworniki pomiarowe, Wyd. Politechniki Śląskiej, Gliwice 2004

5. J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 2007

6. K. Booth, Optoelektronika, WKiŁ, Warszawa, 2001

7. Z. Bielecki, A. Rogalski - Detekcja sygnałów optycznych, WNT, Warszawa 2001

8. B. Ziętek, Optoelektronika, Wydawnictwo Uniwersytetu Mikołaja Kopernika, cop. 2004

Additional

9. J. Jakubiec, J. Roj, Pomiarowe przetwarzanie próbkujące, wyd. Politechniki Śląskiej, Gliwice 2000

10. Denton J. Dailey, Electronic Devices and Circuits, copyright 2001 by Prentice-Hall, Inc., Upper Sadle River, New Jersey 07548, USA. Warszawa 2002.

11. Bibliografia wyszukana przez studenta ze źródeł drukowanych i elektronicznych

12. S. Tumański, Technika pomiarowa, WNT 2007.

13. W. Kester, Przetworniki A/C i C/A: teoria i praktyka, BTC, 2012.

14. W.E. Ciążyński, Rzeczywiste wzmacniacze operacyjne w zastosowaniach, Wyd. PŚ, Gliwice, 2012.

15. B. Carter, R. Mancini, Wzmacniacze operacyjne: teoria i praktyka, BTC, 2011.

16. Ch. Kitchin, L. Counts, Wzmacniacze operacyjne i pomiarowe: przewodnik projektanta, BTC, 2009.

17. Z. Nawrocki, Wzmacniacze operacyjne i przetworniki pomiarowe, Wyd. PWr, Wrocław, 2008.

18. R.A. Pease, Projektowanie układów analogowych: poradnik praktyczny, BTC, Warszawa, 2005.

19. L. Hasse, Zakłócenia w aparaturze elektronicznej, Radioelektronik, Warszawa,1995.

20. Aviation Electronics Technician - Basic, NAVEDTRA 14028, 2003.

21. www.electropedia.org

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes~~/tutorials~~, preparation for tests/~~exam~~, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate