



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electronics

Course

Field of study

Aviation

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

Basic information from mathematics and physics at level of High School. Skills in understanding and interpretation of information and effective self-education in field of science related with chosen academic discipline. Student should have consciousness of necessity of improving his competences, readiness to work individual and cooperate within groups.

Course objective

Introduction of physical quantities and basic laws and theorems in the field of electric engineering in direct current circuits, one-phase alternating current circuits. Introduction of analytical methods of calculations for electric circuits and rules of connection and carrying on measurements. Introduction of



the properties, characteristics, and principles of application of electronic components - an active and passive. Understanding the basic methods of analysis of the analog and digital electronics circuits.

Course-related learning outcomes

Knowledge

1. has basic knowledge of the generation and processing of signals in the form of currents, electric voltages and electromagnetic fields

Skills

1. is able to properly plan and perform experiments, including measurements and computer simulations, interpret the obtained results, and correctly draw conclusions from them

Social competences

1. is aware of the importance of knowledge in solving engineering problems and knows examples and understands the causes of faulty engineering projects that have led to serious financial and social losses, or to a serious loss of health and even life

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

– assess the knowledge and skills listed on the written exam of theory of circuits.

Laboratories:

– the test and awarding a bonus to the essential knowledge of problems for the accomplishment stated in the given area of laboratory tasks,

– evaluation of the knowledge and the abilities associated with the performance of a task exercise,

– assessment of the report of the exercise performed.

Obtaining additional points for activity during exercises, in particular way for:

– proposing to discuss additional aspects of the subject,

– effective use of knowledge obtained during solving of given problem,

– comments related to improve teaching material,

– aesthetic care of the developed tasks within self-study.

Programme content

Properties of basic semiconductor devices and electronics components: diodes, bipolar and field effect transistors, passive elements. Their operating circuits. Semiconductor optoelectronics devices – properties, applications. Feedback in analog circuits. Operational amplifiers – parameters, applications. Power amplifiers – parameters, applications. Electronics generators – conditions of self-exciting, types



and applications of generators. Analog filters – properties, design principles. Fundamentals of digital technology: binary numbers coding system, basic mathematical operations, logical functors, digital combination and sequential systems. Digital circuits of the TTL family. Semiconductor memories – general classification, properties.

PART - 66 (THEORY - 11.25 hours, PRACTICE - 11.25 hours)

MODULE 4. BASIC INFORMATION ON ELECTRONICS

4.1 Semiconductors

4.1.1 Diodes

a) LED symbols;

Properties of diodes;

Diodes connected in series and in parallel;

Main properties and application of silicone-controlled rectifiers (thyristors),

light emitting diodes, photoconductive diodes, varistor, rectifier diodes;

Diode functional testing. [2]

b) Materials, electron configuration, electrical properties;

P and N type materials: effects of impurities on conduction;

PN junction in a semiconductor, development of a potential at a PN junction under non-polarization, positive bias and reverse bias conditions;

Diode parameters: peak reverse voltage, maximum forward current, temperature, frequency, leakage current, power dissipation;

Operation and functions of diodes in the following circuits: clipping circuits, clamping circuits, full and half wave rectifier, bridge rectifier, voltage doubler and triple;

Detailed operation and characteristics of the following devices: silicon controlled rectifiers (thyristors), light emitting diode, Schottky diode, photoconductive diode, capacitive diode, varistor, rectifier diode, Zener diode. [-]

4.1.2 Transistors

a) Transistor symbols;

Description of the components and their directionality;

Properties of the transistor. [1]



b) Construction and operation of PNP and NPN transistors;

Base, collector and emitter configurations;

Testing of transistors;

Basic evaluation of other transistor types and their uses;

Application of transistors: amplifier classes (A, B, C);

Basic circuits including: polarization, decoupling, feedback and stabilization;

Principles of a multi-stage circuit: cascade, push-pull, oscillator, multivibrator, flip-flop. [-]

4.1.3 Integrated circuits

a) Description and operation of logic circuits and linear circuits / operational amplifiers. [1]

b) Description and operation of logic and linear circuits;

Introduction to the operation and functions of an operational amplifier used as: integrator, derivative circuit, voltage follower, comparator;

Operation and amplifier stages connection methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct;

Advantages and disadvantages of positive and negative feedback. [-]

MODULE 5. ELECTRONIC INSTRUMENT SYSTEMS, DIGITAL TECHNIQUES

5.10. Fiber optic technique

Advantages and disadvantages of fiber optic data transmission over electric wire transmission;

Fiber optic data bus;

Fiber optic related terms;

Terminal equipment;

Connectors, control terminals, remote terminals;

The use of fiber optics in aircraft systems. [1]

5.11 Electronic display monitors

Principles of operation of common types of display monitors used in modern aircraft, including a picture tube, light-emitting diode, and liquid crystal display. [1]

5.12 Electrostatically sensitive devices



Special handling of components sensitive to electrostatic discharge;

Awareness of risks and possible damage, devices for antistatic protection of components and personnel. [2]

MODULE 6. MATERIALS AND EQUIPMENT

6.11 Electrical cables and connectors

Cable types, structure and properties;

High voltage and coaxial cables;

Notching;

Types of fittings, plugs, sockets, insulators, current rating and voltages, coupling, identification codes. [2]

Teaching methods

Lectures: – lecture with multimedia presentation (including: drawings, photos, animations) supplemented with examples given on the board, – initiate discussion during the lecture, – theory presented in connection with current knowledge of students, – presenting a new topic preceded by a reminder of related content known to students from other subjects.

Laboratories: – demonstrations, – work in teams, – instructors detailed review of the reports and discussions about comments

Bibliography

Basic

1. Bolkowski S., Teoria obwodów elektrycznych, WNT, Warszawa 2008.
2. Frąckowiak J., Nawrowski R., Zielińska M., Podstawy elektrotechniki. Laboratorium, Wydawnictwo Politechniki Poznańskiej, Poznań 2011.
3. Szabatin J., Śliwa E., Zbiór zadań z teorii obwodów. Część 1, Wydawnictwo Politechniki Warszawskiej, Warszawa 2015.
4. Horowitz P., W. Hill, Sztuka elektroniki. Część 1 i 2, WKŁ, 2014.
5. Górecki P., Wzmacniacze operacyjne, Wydawnictwo BTC, Warszawa, 2004.
6. Kalisz J., Podstawy elektroniki cyfrowej, WKiŁ, Warszawa, 2002.

Additional

1. Krakowski M., Elektrotechnika teoretyczna, PWN, Warszawa 1995.



2. Chua L. O., Desoer C. A., Kuh E. S., Linear and nonlinear circuits, McGraw-Hill Inc., New York 1987.
3. Kaźmierkowski M.P., Matysik J.T., Wprowadzenie do elektroniki i energoelektroniki, Oficyna Wyd. PW, Warszawa, 2005.
4. Scherz P., Monk S., Practical Electronics for Inventors, Fourth Edition, Mc Graw Hill, 2016, ISBN-13: 978-1259587542.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for laboratory classes, preparation for exam, preparation of laboratory reports) ¹	20	0,5

¹ delete or add other activities as appropriate