STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Semiconductor Devices**			Code **1010804131010840023**
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**		Year /Semester **2 / 3**
Elective path/specialty **-**	Subject offered in: **Polish**		Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**		
No. of hours Lecture: **20** Classes: **15** Laboratory: **15** Project/seminars: **-**			No. of credits **6**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **from field**		
Education areas and fields of science and art **technical sciences** **Technical sciences**			ECTS distribution (number and %) **6 100%** **6 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra and theory of probability. Has a detailed, systematic knowledge of the fundamentals of circuit theory, together with necessary mathematical background; this knowledge allows him/her to understand, analyze and evaluate the operation of electrical circuits.
2	**Skills**	Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.
3	**Social competencies**	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.

Assumptions and objectives of the course:

Acquaintaining students with basic electronic components, the principles of their operation and possible applications in electronic circuits. Calculation examples for basic circuit design are given.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has the basic knowledge about electonic components, their properties and basic characteristics. Is familiar with basic semiconductor components. Has the knowledge about electronic devices applications. Is familiar with the most basic typical circuits. - [K1_W08]
2. Knows history and contemporary developments in application and production of electronic components. - [K1_W24]

Skills:

1. Is able to search for required information about electronic components, select the components for basic applications - [K1_U01]
2. Is able to find information about new electronic components and their applications - [K1_U05]
3. Is able to select appropriate components for a given application. - [K1_U12]

Social competencies:

1. Is aware of fast development of electronics and understands the necessity of constant development of the knowledge - [K1_K01]

Assessment methods of study outcomes

1. AUDITORY EXERCISES :
written final test,
short tests during the term.

2. LECTURES :
final written and oral exam.

Course description

LECTURES:

1. Basic properties of the semiconductors
2. Properties of a PN junction
3. Types of diodes and their applications
4. Bipolar transistor properties
5. JFET transistor properties
6. MOSFET transistor properties
7. MESFET transistor properties
8. Operational amplifier properties
9. Thyristor types and properties
10. IGBT transistor and its applications in power electronics

AUDITORY EXERCISES:

1. Using load lines and current-voltage curves to calculate quiescent point of diode and transistor circuits.
2. Using maximum power hyperbole to establish an optimal working area for a semiconductor device.
3. Calculating voltage gain in CE, CS circuits as well as in operational amplifier circuits (inverting and non-inverting configuration).
4. Calculating large signal properties of transistors from current-voltage curves.

LABORATORY EXERCISES:

1. Multimeter parameters, measuring bipolar transistor properties
2. Transistor amplifiers
3. Operational amplifier circuits

Basic bibliography:

1. P. Horowitz, W. Hill, ?Sztuka Elektroniki?, WKiŁ 2006
2. T.L. Floyd, ?Electronic Devices: Conventional Current Version", Pearson Education 2011
3. S. Kuta ?Elementy i Układy Elektroniczne cz. I?, Wydawnictwo AGH 2000
4. U. Tietze, Ch. Schenk, ?Układy Półprzewodnikowe?, WNT 2009
5. A. Guziński, Liniowe elektroniczne układy analogowe, WNT 1994
6. A. Filipkowski, ?Układy elektroniczne analogowe i cyfrowe", WNT 1995
7. K. Antoszkiewicz, Z. Nosal, ?Zbiór zadań z układów elektronicznych liniowych", WNT 1997

Additional bibliography:

1. A.S. Sedra, K.C. Smith, ?Microelectronic Circuits?, Oxford University Press 2004
2. R.C. Jaeger, ?Microelectronic Circuit Design?, McGraw-Hill 1997

Result of average student's workload

Activity	Time (working hours)

1. lectures attendance	20
2. auditory exercises attendance	15
3. laboratory exercises attendance	15
4. preparation for labs	5
5. preparation of lab reports	10
6. homeworks, literature study	45
7. preparation for auditory exercises	15
8. exam preparations	30
9. exam	3

Student's workload

Source of workload	hours	ECTS
Total workload	158	6
Contact hours	53	2
Practical activities	30	2