**Nazwa przedmiotu:**

Electronics I

**Koordynator przedmiotu:**

Prof. Tadeusz Skoczkowski, Ph.D., El. Eng.

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Aerospace Engineering

**Grupa przedmiotów:**

Wspólne

**Kod przedmiotu:**

ANW 135

**Semestr nominalny:**

4 / rok ak. 2009/2010

**Liczba punktów ECTS:**

2

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

**Język prowadzenia zajęć:**

polski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład: | 15h |
| Ćwiczenia: | 15h |
| Laboratorium: | 0h |
| Projekt: | 0h |
| Lekcje komputerowe: | 0h |

**Wymagania wstępne:**

Electric Circuit I, Electric Circuit II

**Limit liczby studentów:**

**Cel przedmiotu:**

To obtain basic knowledge on analogue and digital electronic circuit. To understand the principle of operation, construction and characteristics of basic semiconductor devices. To learn the terminology of electronics. To understand the functions performed by typical analogue and digital components and circuits. To be able to analyse simple electronic circuit. To get familiar with troubleshooting in electronic circuits. To get familiar with manufactures specification sheets and application guidelines.

**Treści kształcenia:**

ANALOGUE FUNDAMENTALS. Fundamental Solid-State Principles. Atom Theory. Doping. PN Junction. Bias. Diodes. PN-Junction Diode. Ideal Diode. Practical Diode Model. Other Practical Considerations. Complete Diode Model. Diode Specification Sheets. Zener Diodes. Zener Diode Specification Sheets. Light-Emitting Diodes (LEDs). Diode Testing. Common Diodes Applications. Basic Power Supply Circuits. Transformers. Half-Wave Rectifiers. Full-Wave Rectifiers. Full-Wave Bridge Rectifiers. Working with Rectifiers. Filters. Zener Voltage. Special Application. Regulators. Clippers, Clampers. Voltage Multipliers. Displays. Special application Diodes. Varactor Diodes. Transient Suppressors and Constant-Current Diodes. Tunnel Diodes. Other Diodes. Bipolar Junction Transistors. Bipolar Junction Transistors (BJTs). Transistor Construction and Operation. Transistor Current and Voltage Ratings. Transistor Characteristic Curves. Transistor Specification Sheets. Transistor Testing. DC Biasing Circuits. DC Biasing. DC Load Line. Base Bias. Voltage-Divider Bias. Other Transistor Biasing Circuit. Introduction to Amplifiers. Amplifier Properties. BJT Amplifier Configurations. Amplifier Classifications. Decibels Common-Emitter Amplifiers. AC Concepts. Roles of Capacitors in Amplifiers. Common-Emitter AC Equivalent Circuit. Amplifier Gain. Gain and Impedance Calculations. Swamped Amplifiers. h-Parameters. Amplifier Trouble Shooting. Other BJT Amplifiers. Emitter Follower (Common-Collector Amplifier). Emitter Follower AC Analysis. Emitter Followers: Practical Considerations. Applications. Darlington Emitter-Follower. Common-Base Amplifier. Common-Base Applications. Power Amplifiers. AC Load Line. RC-Couple Class A Amplifiers. Transformer-Coupled Class A Amplifiers. Class B Amplifiers. Class AB Amplifiers (Diode Bias). Field-Effect Transistors. Introduction to JFETs. JFET Biasing Circuits. Common-Source Amplifier. Common-Drain Amplifier. Common-Gate Amplifier. Trouble Shooting JFET Circuits. JFET Specification Sheets. Applications. MOSFETs. D-MOSFETs. E-MOSFETs. Dual-Gate MOSFETs. Power MOSFETs. Complementary MOSFETs (CMOS). MOSFET Applications. Amplifier Frequency Response. Basic Concepts. BJT Amplifier Frequency Response. FET Amplifier Frequency Response. Multistage Amplifiers. Operational Amplifiers. Op-Amps: An Overview. Operation Overview. Differential Amplifiers and Op-Amp Specifications. Inverting Amplifiers. Non-inverting Amplifiers. Troubleshooting Basic Op-Amp Circuits. Op-Amp Frequency Response. Negative Feedback Additional Op-Amp Applications. Comparators Integrators and Differentiators Summing Amplifiers. Instrumentation Amplifiers Other Op-Amp Circuits. Tuned Amplifiers. Tuned Amplifier Characteristics. Active Filters: An Overview. Low-Pass and High-Pass Filters. Band-Pass and Notch Filters. Active Filter Applications. Discrete Tuned Amplifiers. Class C Amplifiers. Oscillators. Introduction Phase-Shift Oscillators. Wien-Bridge Oscillator. Colpitts Oscillator. Other LC Oscillators Crystal-Controlled Oscillators. Oscillator Troubleshooting. Solid-State Switching Circuits. Introductory Concepts. Basic Switching Circuits: Practical Considerations. Schmitt Triggers. Thyristor and Optoelectronics Devices. Introduction to Thyristors: Silicon Unilateral Switch (SUS). Silicon-Controlled Rectifiers (SCRs). Diacs and Triacs. Unijunction Transistors (UJTs). Discrete Photodetectors. Optoisolators and Optointerrupters. Discrete and Integrated Voltage Regulators. Voltage Regulation: An Overview. Series Voltage Regulators. Shunt Voltage Regulators. Linear IC Voltage Regulators. Switching Regulators. DIGITAL FUNDAMENTALS. Number Systems, Operations, and Codes. Decima1Numbers. Binary Numbers. Decima1-to-BinaryConversion. Binary Arithmetic. First and Second Comp1ements of Binary Numbers Signed Numbers. Arithmetic Operations with Signed Numbers. Hexadecimal Numbers. Octal Numbers. Binary Coded Decimal(BCD). Digital Codes. Error Detection and Correction Codes. Logic Gates. Inverter. AND Gate. OR Gate. NAND Gate. NOR Gate. Exclusive-OR and Exclusive-NOR Boolean Algebra and Logic Simplification. Boolean Operations and Expressions. Laws and Rules of Boolean Algebra. DeMorgan's Theorem. Boolean Analysis of Logic Circuits. Simplification Using Boolean Algebra. Standard Forms of Boolean Expressions. Boolean Expressions and Truth Tables. Kamaugh Map. Kamaugh Map SOP Minimization. Karnaugh Map POS Minimization. Five-Variable Kamaugh Maps. Combinational Logic Analysis. Basic Combinational Logic Circuits. Imp1ementing Combinational Logic. Universal Property of NAND and NOR Gates. Combinational Logic Using NAND and NOR Gates. Logic Circuit Operation with Pulse Waveform Inputs. Functions of Combinational Logic. Basic Adders. Parallel Binary Adders. Ripple Carry versus Look Ahead Carry. Comparators. Decoders. Encoders. Latches, Flip-Flops, and Timers. Latches. Edge-Triggered Flip-Flops. Flip-Flop Operating Characteristics Flip-Flop Applications. One-Shots. The 555 Timer. Counters. Asynchronous Counter Operation. Synchronous Counter Operation. Up/Down Synchronous Counters. Design of Synchronous Counters. Cascaded Counters. Counter Decoding. Counter Applications. Logic Symbols with Dependency Notation. Shift Registers. Basic Shift Register Functions. Serial In/Serial Out Shift Registers. Serial In/Parallel Out Shift Registers. Parallel In/Serial Out Shift Registers. Parallel In/Parallel Out Shift Registers. Bidirectional Shift Registers. Shift Register Counters. Shift Register Applications. Logic Symbols with Dependency Notation. Memory and Storage. Basics of Semiconductor Memory. Random-Access Memories (RAMs). Read-Only Memories (ROMs). Programmable ROMs (PROMs and EPROMs). Flash Memories. Memory Expansion. Special Types of Memories. Magnetic and Optical Storage. Introduction to Digital Signal Processing. Digital Signal Processing Basics. Converting Analog Signals to Digital. Analog-to-Digital Conversion Methods. Digital Signal Processor (DSP). Digital-to-Analog Conversion Method. Integrated Circuit Technologies. Basic Operational Characteristics and Parameters. CMOS Circuits. TTL Circuits. Practical Considerations in the Use of TTL. Comparison of CMOS and TTL Performance. Emitter-Coupled Logic (ECL) Circuits. PMOS, NMOS, and E2CMOS.

**Metody oceny:**

lesson quizzes +two tests + final assessment

**Egzamin:**

**Literatura:**

Paynter R. T.: Introductory electronic devices and circuits, Person Prentice Hall, 7th edition. Floyd T .L.: Digital Fundamentals Person Prentice Hall, 9th edition. Further Readings: Irwin J. D., Nelms R. M.: Basic Engineering Circuit Analysis, Willey,8th edition. Paynter R. T., Boydell B. J. T.: Electronics Technology Fundamentals Electron Flow Version and Conventional Flow Version, Person Prentice Hall, 2nd Edition. EWB MultiSim Student Edition Lite v.10. Buchala D.M.: Experiments in Digital Fundamentals, Person Prentice Hall, 2006. Boydell B. J. T.: Experiments in Digital Fundamentals, Person Prentice Hall,2005. Mohan N., Undeland T.M. Robbins W.P.: Power Electronics, J. Wiley&Sons, Inc, 2003.

**Witryna www przedmiotu:**

**Uwagi:**

## Efekty przedmiotowe