Fire University of Warsaw, Poland
Faculty of Security Engineering and Civil Protection
Syllabus 2018 -

Electrical Engineering and Electronics in Fire Service

profile	general academics
degree	first degree
programme	ERASMUS
semester	1
part time / full time	full time
ECTS	6
coordinator	mł. bryg. dr inż. Szymon Ptak

form of the activity: exercise

hours	15
prerequisites	Knowledge of the basics of physics in the field of electric and magnetic field theory and basic laws of electrical engineering. In the field of mathematics, knowledge at the level of the first year of studies
objectives	Familiarize the students with basic electrical symbols, methods of constructing and analyzing electrical circuits. Familiarize with the basic laws of electrical engineering. Prepare to independently connect circuits during laboratory classes. Basics of measurement, measurement uncertainty and presentation of measurement results.
methods	Blackboard exercises, multimedia presentation, discussion.
own work	Solving tasks, studying literature
basic literature	1. R. Chybowski: Bezpieczeństwo pożarowe i porażeniowe eksploatacji urządzeń elektrycznych, Warszawa 2012 2. Ptak S., P. Kustra,: Pracownia podstaw elektrotechniki i elektroniki w pożarnictwie, Warszawa 2018 3. Ptak S., Zagrożenia elektroenergetyczne w środowisku pracy / Warszawa 2020. 3. S. Bolkowski, Podstawy Elektrotechniki, WSiP, Warszawa 2005 4. .Elmar Dehler i inni „Podstawy elektroniki" wydawnictwo Rea 2007, 5. Filipkowski A. „Układy elektroniczne analogowe i cyfrowe" WNT 2002,
supplementary literature	1. Praca zbiorowa: Elektrotechnika i elektronika dla nieelektryków, WNT, Warszawa 2001. 2. H. Markiewicz: Instalacje elektryczne, WNT, Warszawa 2008 3. H. Markiewicz: Bezpieczeństwo w elektroenergetyce, WNT, Warszawa 2002 4. T. Uczciwek, BHP oraz ochrona przeciwpożarowa w elektroenergetyce COS SEP, Warszawa 1998. 5. Markiewicz H. „ Bezpieczeństwo w elektroenergetyce" WNT 2002, 6. Rusek M. i Pasierbiński J. „Elementy i układy elektroniczne w pytaniach i odpowiedziach" WNT 2007, 7. P. Kaźmierkowski, J. Matysik, Wprowadzenie do elektroniki i energoelektroniki, Oficyna Wydawnicza PW, Warszawa, 2005

contents	hours
DC Circuits. Basic Symbols and Designations in Electrical Circuits	2

Current arrow, voltage arrow, Ohm's law, series, parallel and series-parallel connections	2
Kirchhoff's Laws. Power dissipated on resistance (Joule law)	3
Selected methods of electrical circuit analysis	2
AC Circuits	2
Phasor diagrams, impedance, circuit reactance, phase shift - selected calculation methods	2
Harmonic waveforms	1
Final test	1

form of the activity: exercise

hours	30
prerequisites	Knowledge of the basics of physics in the field of electric and magnetic field theory and basic laws of electrical engineering. In the field of mathematics, knowledge at the level of the first year of studies
objectives	Familiarize the students with the structure and operating principle of basic electrical systems and devices. Provide information on fire hazard phenomena occurring in electrical devices. Through laboratory exercises, familiarize yourself with practical aspects of fire and shock prevention related to the operation of electrical power equipment installations in commercial and industrial applications. Familiarize the students with practical aspects of shock safety for firefighters during rescue and firefighting operations. Develop the attitude of a future officer of fire brigade who is able to recognize and effectively prevent threats related to electrical fire hazards. Master basic knowledge of electronic components occurring in technical fire protection systems and telecommunications systems
methods	Laboratory: 30 laboratory exercises covering the most important issues from the point of view of fire and shock protection of electrical power devices and basic knowledge of electronics, its application in fire protection devices. Independent work of groups of students on the construction of measurement systems, direct supervision of the instructor, detailed information on practical and theoretical threats that raise doubts of students. Independent carrying out of measurements, synthesis of knowledge and practical issues, group preparation of reports and conclusions from the conducted classes.
own work	Studying the literature, exercise script (preparing for the test at the beginning of each class, the so-called "entry pass"), independent assembly of measurement systems, independent performance of measurements (supplementing the exercise protocol) and development of results (in the form of a report). Synthesis of theoretical and practical knowledge acquired during laboratory tests, preparation for the final test and exam in the subject. Studying the literature, development of indicated issues, Internet.
basic literature	1. R. Chybowski: Bezpieczeństwo pożarowe i porażeniowe eksploatacji urządzeń elektrycznych, Warszawa 2012 2. Ptak S., P. Kustra,: Pracownia podstaw elektrotechniki i elektroniki w pożarnictwie, Warszawa 2018 3. Ptak S., Zagrożenia elektroenergetyczne w środowisku pracy / Warszawa 2020. 3. S. Bolkowski, Podstawy Elektrotechniki, WSiP, Warszawa 2005 4. .Elmar Dehler i inni „Podstawy elektroniki” wydawnictwo Rea 2007, 5. Filipkowski A. „Układy elektroniczne analogowe i cyfrowe” WNT 2002,

supplementary literature	1. Praca zbiorowa: Elektrotechnika i elektronika dla nieelektryków, WNT, Warszawa 2001. 2. H. Markiewicz: Instalacje elektryczne, WNT, Warszawa 2008 3. H. Markiewicz: Bezpieczeństwo w elektroenergetyce, WNT, Warszawa 2002 4. T. Uczciwek, BHP oraz ochrona przeciwpożarowa w elektroenergetyce COS SEP, Warszawa 1998. 5. Markiewicz H. „ Bezpieczeństwo w elektroenergetyce" WNT 2002, 6. Rusek M. i Pasierbiński J. „Elementy i układy elektroniczne w pytaniach i odpowiedziach" WNT 2007, 7. P. Kaźmierkowski, J. Matysik, Wprowadzenie do elektroniki i energoelektroniki, Oficyna Wydawnicza PW, Warszawa, 2005

contents	hours
Basic measurements of electric quantities	2
Single phase transformer	2
Overcurrent protection in electrical grids	2
Electrical grid maintenance	2
Rectifying devices	2
Induction motors and AC generators	2
Eddy currents	2
Failures of electric cables	2
Nonlinear electronic components	2
Bipolar transistors	2
p-n diodes and light emitting diodes	2
photovoltaic installations	2
Additional classes for absence making-up	4
Final test	2

form of the activity: exercise

hours	30
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objectives	Familiarize the students with the structure and operating principle of basic electrical systems and devices. Provide information on fire hazard phenomena occurring in electrical devices. Through laboratory exercises, familiarize yourself with practical aspects of fire and shock prevention related to the operation of electrical power equipment installations in commercial and industrial applications. Familiarize the students with practical aspects of shock safety for firefighters during rescue and firefighting operations. Develop the attitude of a future officer of fire brigade who is able to recognize and effectively prevent threats related to electrical fire hazards. Master basic knowledge of electronic components occurring in technical fire protection systems and telecommunications systems
methods	multimedia presentation, slide projector, board, discussion
own work	Studying literature, self-study

basic literature	1. R. Chybowski: Bezpieczeństwo pożarowe i porażeniowe eksploatacji urządzeń elektrycznych, Warszawa 2012 2. Ptak S., P. Kustra,: Pracownia podstaw elektrotechniki i elektroniki w pożarnictwie, Warszawa 2018 3. Ptak S., Zagrożenia elektroenergetyczne w środowisku pracy, Warszawa 2020 4. S. Bolkowski, Podstawy Elektrotechniki, WSiP, Warszawa 2005 5. .Elmar Dehler i inni „Podstawy elektroniki" wydawnictwo Rea 2007, 6. P. Kaźmierkowski, J. Matysik, Wprowadzenie do elektroniki i energoelektroniki, Oficyna Wydawnicza PW, Warszawa, 2005 7. J. Baranowski, Z. Nosal, Układy elektroniczne cz. I. Układy analogowe liniowe, WNT, Warszawa, 1998
supplementary literature	1. Praca zbiorowa: Elektrotechnika i elektronika dla nieelektryków, WNT, Warszawa 2001. 2. H. Markiewicz: Instalacje elektryczne, WNT, Warszawa 2008 3. H. Markiewicz: Bezpieczeństwo w elektroenergetyce, WNT, Warszawa 2002 4. T. Uczciwek, BHP oraz ochrona przeciwpożarowa w elektroenergetyce COS SEP, Warszawa 1998. 5. Markiewicz H. „ Bezpieczeństwo w elektroenergetyce" WNT 2002, 6. Rusek M. i Pasierbiński J. „Elementy i układy elektroniczne w pytaniach i odpowiedziach" WNT 2007,

contents	hours
Low voltage electrical installations, construction, power supply systems, installation protection requirements.	4
Basic knowledge of sinusoidal AC circuits, R, L, C elements in the above circuits, AC power, three-phase systems	2
generation, transmission and distribution of electrical energy, principles of operation of generators, power system, power lines, switchboards	2
Basic electrical machines, transformers, motors	2
Fire-hazardous phenomena in electrical devices, overloads, short circuits, leakage current, electric arc, overvoltages, excessive contact resistance, electric lighting - fire hazard.	4
Static electricity, hazards resulting from the above-mentioned phenomenon, methods of eliminating static electricity, conditions for the occurrence of electrostatic discharge, hazards associated with it.	2
Lightning discharges, threats from the above-mentioned phenomenon, types of protection against the effects of lightning discharges, Overvoltages in electrical installations, internal overvoltages, external overvoltages, surge arresters.	2
Protection against electric shock, direct protection, indirect protection. Emergency lighting - construction requirements	2
Types of semiconductors, intrinsic and non-intrinsic - structure. Nonlinear semiconductor elements - resistors, thermistors, photoresistors, and electrical properties and applications. Diodes - structure, properties, applications, rectifier circuits	2
Transistors construction principle of operation. Transistor as an amplifier element. Amplifiers - static and dynamic characteristics, the role of negative feedback in amplifiers, power amplifiers, classes of operation of low-frequency power amplifiers - acoustic amplifiers	2
Voltage amplifiers, operational and selective. Power supplies and voltage and current stabilizers, application in technical systems of security systems.	2
Counters, registers, application in fire protection systems. Integrated circuits, microprocessors, application in the structure of technical security systems.	2
Elements of digital technology – combinational digital circuits (logical gates, sequential circuits, flip-flops)	2