Kielce University of Technology

FACULTY OF MECHATRONICS AND MECHANICAL ENGINEERING

Annex 9
to the Rector's Ordinance No. 35/19
of 12 June 2019

COURSE SPECIFICATION

Course code	**M#1-S1-ME-109**
Course title in Polish	**Elektrotechnika**
Course title in English	**Electrical Engineering**
Valid from (academic year)	**2019/2020**

GENERAL INFORMATION

Programme of study	**MECHANICAL ENGINEERING**
Level of qualification	**first-cycle**
Type of education	**academic**
Mode of study	**full-time**
Specialism	**all**
Department responsible	**Department of Automation and Robotics**
Course leader	**Prof. dr hab. inż. Dariusz Janecki**
Approved by	

COURSE OVERVIEW

Course type	**programme-specific**
Course status	**compulsory**
Language of instruction	English
Semester of delivery	**semester 1**
Pre-requisites	**mathematics, physic**
Examination required (YES/NO)	YES
ECTS value	**4**

Mode of instruction	**lecture**	**class**	**laboratory**	**project**	**seminar**
No. of hours per semester	**30**	**15**			

LEARNING OUTCOMES

Category of outcome	Out-come code	Course learning outcomes	Corresponding programme outcome code
Knowledge	W01	Have knowledge and understanding of the basic laws of physics related to electric and magnetic fields, properties of electric circuits.	MiBM1_W01 MiBM1_W02
	W02	Have knowledge of analysing linear electric circuits of direct and sinusoidal current, have knowledge of Kirch-hoff's laws, Thevenin and Norton theorems, have knowledge of mesh analysis, nodal analysis and method of superposition.	MiBM1_W06
	W03	Have knowledge and understanding of the concept of average, effective and momentary value in electrical signals.	MiBM1_W06
	W04	Have a basic knowledge of circuits with magnetic field and have knowledge of operation of transformers.	MiBM1_W06
	W05	Have a basic knowledge of three-phase circuits, princi-ples of formation of a rotating magnetic field, and under-standing of construction of induction motors.	MiBM1_W06
	W06	Have a basic knowledge of the methods of production, generating and storing electricity.	MiBM1_W06
Skills	U01	Are able to calculate forces interacting between electric charges, parameters of the generated electric field by the system of electric charges.	MiBM1_U01
	U02	Are able to calculate resistance and conductance of a conductor with defined dimensions and determine changes in resistance and conductance as a function of temperature.	MiBM1_U01
	U03	Are able to calculate the values of currents and voltages in circuits of direct and sinusoidal current.	MiBM1_U01
	U04	Are able to calculate power and energy in DC circuits.	MiBM1_U01
	U05	Are able to calculate active, reactive and apparent power in circuits of sinusoidal current, are able to select capaci-tors for reactive power compensation.	MiBM1_U01
Competence	K01	Are aware of the way of generating and using electricity has impact on the natural environment.	MiBM1_K02
	K02	Understand the need for running a rational economy of electricity for economic reasons.	MiBM1_K02

COURSE CONTENT

Type of instruction*	Topics covered
lecture	Basic electrical quantities: electric charge, electric current, Coulomb law, electric field, electric potential and voltage, Ohm's law, resistive conductance and conductance of conductors, dependence of resistance on tempera-ture, work and power of electricity, source of electricity.
	DC circuits: graphic designations of circuit elements, Kirchhoff's laws, voltage and current sources, unbranched and branched circuits, the principle of sperposition, Wheatstone bridge, Thevenin and Norton theorem, mesh method and nodal analysis of electrical circuits.
	Electric field: electrostatic induction, Gauss theorem, electric field w conductors, electric field in dielectrics, capacitor structure, capacitance of capacitor, capacitor connections, electric field energy in the capacitor.

	Magnetic field: magnetic induction, magnetic flux, magnetic field strength, flow law, Biot-Savart law, magnetic properties of materials, magnetization curve, coil inductance, mutual inductance, phenomenon of electromagnetic induction, eddy currents.
	Single-phase alternating current electrical circuits: alternating voltage sources value, mean value, RMS value of currents and voltages, analysis of fault circuits RLC elements, phasor charts, instantaneous power, active, reactive and apparent power.
	Symbolic method of solving electric circuits: the basics of arithmetic complex numbers, symbolic form of voltage and current signals, reactant complexation and impedance, active, reactive and apparent power.
	Resonant circuits: series resonance, coil Q factor, resonance in parallel circuit. Magnetically coupled circuits: analysis of circuits with magnetic couplings, examples of coupled circuits, transformers, imperfect transformer.
	Three-phase currents: vector voltage diagrams, star and delta connections of receivers, unbalanced receivers, three-phase current power. Rotating magnetic field, structure and operation of synchronous and asynchronous induction motors.
	Production, processing and storage of electricity.
class	Basic electric quantities: electric charge, electric current, Coulomb law, electric field, electric potential and voltage.
	Ohm's law, resistance and conductance, resistivity and conductivity values, dependence of resistance on geometrical dimensions of a conductor, dependence resistance to temperature, work and power of electric current. Calculation of replacement resistance.
	Calculation of voltage, current, wattage and power in branched circuits with one active element.
	Real voltage and current source, resistive voltage divider, Wheatstone bridge, star and a triangle connection, applying Kirchhoff's laws to calculate currents and voltages in circuits with several active sources.
	Use of symbolic method to calculate circuit voltages and currents in alternating circuits, serial and parallel inductance capacitance connection, calculation of equivalent impedance for a system composed of R, L and C elements.
	Power in AC circuits, resonance of currents and voltages, correction of the power factor by the use of compensating capacitors.
	Three-phase circuits, voltage and power in three-phase circuits, magnetic circuits.

*) Please delete rows in the table above that are not applicable.

ASSESSMENT METHODS

Outcome code	Methods of assessment *(Mark with an X where applicable)*					
	Oral examination	Written examination	Test	Project	Report	Other
W01 – W06	X	X				
U01 – U05			X			
K01 – K02						X

ASSESSMENT TYPE AND CRITERIA

Mode of instruction*	Assessment type	Assessment criteria
lecture	**examination assessment**	The pass mark is a minimum of 50% for the examination.
class	non-examination assessment	The pass mark is a minimum of 50% for all the in-class tests.

*) Please delete rows in the table above that are not applicable.

OVERALL STUDENT WORKLOAD

ECTS weighting							
	Activity type	**Student workload**					**Unit**
1.	Scheduled contact hours	L	C	Lab	P	S	h
		30	15				
2.	Other contact hours (office hours, examination)	4	2				h
3.	**Total number of contact hours**	**51**					h
4.	**Number of ECTS credits for contact hours**	**2,0**					ECTS
5.	**Number of independent study hours**	**49**					h
6.	**Number of ECTS credits for independent study hours**	**2,0**					ECTS
7.	**Number of practical hours**	**33**					h
8.	**Number of ECTS credits for practical hours**	**1,3**					ECTS
9.	**Total study time**	**100**					h
10.	**ECTS credits for the course** *1 ECTS credit = 25-30 hours of study time*	**4**					ECTS

READING LIST

1. Thomas L. Floyd, David M Buchla, Principles of Electric Circuits: Conventional Current Version
2. James Nilsson, Electric Circuits
3. Ravish Singh, Basic Electrical Engineering
4. T. R. Kuphaldt, Lessons In Electric Circuits, http://www.ibiblio.org/kuphaldt/electricCircuits/