Name of the subject: Electrotechnics	NEPTUN code: KEXETBABNE	Weekly hours: 2 lec + 2 pr + 0 lab	Credit: 5 Req: exam
Subject leader: Dr. Balázs Kovács, PhD	Gradation: associate professor	Prerequisites: Physics, KEXFI2ABNE	

Description of the subject:

This course introduces the basic concepts and practices of the electrotechnics. It makes the attendees to be familiar with the basic electronic components and the basic circuit's theory. The relation with the management practice will be demonstrated through practical examples.

Topics:

The structure of the matter. Atom, electron, proton. The electric charge, electric force, electrostatic field: electrostatic field strength, displacement, potential, voltage. The electric current, current density, specific conductance and specific resistance. Direct and alternating current. The resistance. Ohm's Law. Electric power, work, energy, dissipation. Voltage sources. Schematics.

DC circuits, serial and parallel circuits. Current and voltage distributions, total resistance and conductance. Open and short circuit. Voltage divider. Kirchoff's Laws.

DC Resistor's network. Y to Δ conversion. Superposition theorem. Thevenin's and Norton's theorem. Voltage and current source. Wheatstone bridge. The maximum output powers.

Alternating voltages and current's parameters: cycle time, frequency, propagation speed, wavelength. Phase relationship, phasors. Power, effective values. Application of complex numbers to describe the phase relationships.

The type of conductors, resistance, temperature and frequency dependence, skin effect. The different type of resistors. Potentiometers and rheostats. Standard values' set, tolerances. Design of resistors and conductors.

Electrical parameters of insulators (dielectrics). Relative dielectric constant, breakdown field. Power density. Dielectrics of the practice.

The capacitor and its parameters: charge, voltage, capacitance, current. Energy storage. Phase relationship, phasors. Capacitive reactance and susceptance. Serial and parallel circuits.

Losses of capacitors and their physics reasons. The figure of merit and the loss factor. Equivalent circuits. Type of capacitors, construction's and working parameters. Nominal values and tolerances. Adjustable capacitors, characteristic curves, construction. Value calculations.

The nature of magnetism. Para-, dia-, ferro- and ferri-magnetism. The parameters of magnetic field: field strength, induction. Energy density, magnetic force. Magnetic material, magnetization curves, hysteresis, permeability. Soft and hard magnets, their applications. Permanent magnets. Simple magnetic circuits. The analogy of electric and magnetic circuits.

Electromagnetic induction. Chokes: self-induction, induction, energy storage. Air- and iron-core coils. Phase relationship, phasors. Inductive reactance and susceptance. Losses and their physics reasons. The figure of merit and the loss factor.

Mutual inductance. Transformers, voltage, current, impedance transformation. Parameters of ideal and real transformers. Parallelly and serially connected coils.

Summary of electric and magnetic units.

Calculation of RLC circuits, frequency dependance, applications.

DC energy sources, primary and secondary cells, photo-electric, thermo-electric systems, DC generators. AC generators, energy supply systems, power losses, reactive power. Phase corrections. DC and AC motors, electro-mechanical actuators.

Literature

M. Gussow: Schaum's Outline of Basic Electricity, Second Edition, 2007, The McGraw-Hill Companies, Inc.