

Title: Fundamentals of Electrical Engineering I

Lecturer: Assist. Prof. Dr. Iztok Humar (VSP), Assoc. Prof. Dr. Dejan Križaj (VSP),
Assoc. Prof. Dr. Anton R. Sinigoj (UNI),

Aim of the course:

To acquire fundamental knowledge on electrostatic field, current field and DC electric circuits.

Required (pre)knowledge:

Physics, Mathematics (secondary school level), Final/Matura Exam

Contents:

Electric charge and current. Charge distributions. Electric current density. Conservation of charge. Continuity equation. Kirchhoff's current law. Electric force. Coulomb's law. Electric field. Electric field strength. Gauss law of electric field. Work of electric force. Electric potential energy. Electric potential. Voltage. Kirchhoff's voltage law. Electric dipole. Conductor and electric field. Electric influence. Image theory. Dielectric material and electric field. Electric polarization. Electric flux, Electric flux density. Dielectric permittivity. Boundary conditions of electric field. Dielectric breakdown. Capacitance. Capacitor. Partial capacitances. Electric field energy. Forces and torques. Capacitor circuits. Current field. Ohm's law. Joule's law. Specific electric conductivity. Boundary conditions of current field. Resistance and conductance. Grounding resistance. Resistor. Non-linear resistor. Voltage-Current characteristic. Voltage and current sources. DC electric circuits. Analyses and theorems.

Selected references:

Duffin W. J.: Electricity and magnetism, McGraw-Hill, London, 1990.
Notaros B.M.: Electromagnetics. Pearson Education. 2010.
Halliday D, Resnick R., Walker J., Fundamentals of Physics, Wiley, 1997.
Popović D. B.: Osnovi elektrotehnike 1 in 2, Građevanska knjiga, Beograd, 1986.
Purcell E. M.: Electricity and magnetism, McGraw-Hill, New York, 1965.
Albach M.: Grundlagen der Electrotechnik, Pearson Studium, Muenchen, 2005.
Web page: <http://torina.fe.uni-lj.si/oe/>