Course Unit Descriptor

Study Programme: Biomedical engineering
Course Unit Title: Fundamentals of Electrical Engineering
Course Unit Code: BMI94
Name of Lecturer(s): Herceg Dejana
Type and Level of Studies: Bachelor
Course Status (compulsory/elective): compulsory
Semester (winter/ summer): winter
Language of instruction: english
Mode of course unit delivery (face-to-face/distance learning): face-to-face
Number of ECTS Allocated: 6
Prerequisites: none
Course Aims:. The objective of the course is introduce and professional training of students in the field of fundamentals of electrical engineering, by reviewing the basic physical laws of electrostatics, the time constant electric current, electromagnetism, time-varying electric currents and time-varying electric and magnetic fields. By presenting and analyzing the fundamental laws, students gain a new and moreover deepen existing knowledge about fundamentals of electrical engineering and interaction of this scientific field with other research areas.
Learning Outcomes: The aim of this course is to prepare students to acquire knowledge and skills, through individual and team work, for applying, improving and developing methods for solving problems in the field of electrostatics, electromagnetism, and electrical networks with time-constant and time-varying electric currents. Based on the acquired knowledge, students will be able to calculate the electric field distribution of simple structure, charged by the time constant electrical charge, to calculate the capacitance of simple homogeneous symmetric structure, to solve circuits with time constant electric currents, to calculate the distribution of the magnetic field of simple symmetric structure, to calculate the inductance of simple structure with windings, to solve simple electrical and magnetic circuits with sinusoidal currents, to calculate the current, active and reactive power in electrical networks.
Syllabus. This course is intended to present some of the existing theoretical knowledge in the field of fundamentals of electrical engineering. It is planned to cover the following areas: 1 Electrostatics (The electric field vector, Voltage and electric field potential, Gauss's law, Conductors in electrostatic field, Capacitance and capacitors, Dielectrics in the electrostatic field, Boundary conditions, Energy and forces in electrostatic field). 2. Time constant electric current (Vector of electric current density and current intensity, Ohm's law and resistors, Joule's law, Kirchhoff's laws, Generators, Maximum power transmission condition, Method fro electrical circuits solving, Theorem of superposition, Norton's theorem, Tevenen's theorem, Theorem of compensation, Basic electrical measurements). 3. Time constant magnetic field (Magnetic induction vector, Bio-Savart law. Magnetic flux, Ampere's law, Magnetic material properties, Ferromagnetic, Boundary conditions, Magnetic circuit). 4. Time slowly varying electric and magnetic fields (Electromagnetic induction, Faraday's law, Lenz's law, Eddy currents, Skin effect and proximity effect, self and mutual inductance, Magnetic coupling, Transformers, Energy and forces in the magnetic field). 5. Electrical circuits with time varying electrical currents (Impedance, Complex power, Maximum power transfer condition, Power factor improvement, Simple resonant circuits, Coupled circuits).
Required Reading:

Weekly Contact Hours: 2	**Lectures: 3**	**Practical work: 2**

Teaching Methods: Through lectures, auditory and laboratory exercises, group and individual consultations.
Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Attendance			

Computer exercises			
Tests (4x)			