Faculty of Electrical Engineering / ELECTRONICS, TELECOMMUNICATIONS AND COMPUTERS / BASICS OF ELECTRICAL ENGINEERING II

Course:	BASICS OF ELECTRICAL ENGINEERING II			
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
99	Mandatory	2	7	3+2+1
Programs	ELECTRONICS, TELECOMMUNICATIONS AND COMPUTERS			
Prerequisites	None			
Aims	To master the basic laws of the stationary magnetic field, the time-varying electric and magnetic fields; To introduce students to methods of analysis and to train them to solve linear AC electric circuits.			
Learning outcomes	Passing the exam in this subject means that the student is able to: 1. Define the concept of a stationary magnetic field and the basic quantities that describe it; 2. Calculate magnetic flux density by applying the Biot-Savart and Amperes law; 3. Define Faradays law of electromagnetic induction, interpret the direction of the induced emf and distinguish between its static and dynamic components; 4. Define the concepts of self and mutual inductance and calculate inductance in typical cases (solenoid, toroidal winding, two-wire line, coaxial line); 5. Explain the need to introduce the concept of rotating vector, phasor and complex calculus in the analysis of linear AC circuits; 6. Define the concept of complex impedance and admittance, complex power; 7. Interpret symbols and conventions in magnetically coupled circuits and define an ideal transformer; 8. Define the concept of voltage and current resonance, Q factor, amplitude and phase characteristics; 9. Define a balanced three-phase circuit and understand the wye and delta connections; 10. Solve the linear AC circuit using elementary transformations, methods and theorems, both using the phasor diagram in simple cases and using complex calculus.			
Lecturer / Teaching assistant	Prof. dr Gojko Joksimović, Aldin Kajević, MSc			
Methodology	"ex cathedra" teaching, blackboard exercises, laboratory exercises, consultations			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Introduction, concept of a stationary magnetic field, permanent magnet, vector of magnetic flux density, Biot-Savart law			
I week exercises	Calculation of the magnetic flux density vector in high symmetry cases			
II week lectures	The theorem on the conservation of magnetic flux (Gauss law for magnetic field), Amperes law			
II week exercises	Magnetic flux calculation			
III week lectures	Ferromagnetic materials, generalized Amperes law, magnetic circuits			
III week exercises	Solving linear and non-linear magnetic circuits			
IV week lectures	Faradays law of electromagnetic induction, self and mutual induction coefficients			
IV week exercises	Calculation of induced electromotive force (emf)			
V week lectures	Magnetic field energy. Transients in first-order electric circuits.			
V week exercises	Calculation of the energy stored in the magnetic field.			
VI week lectures	Mid-term exam			
VI week exercises	Mid-term exam			
VII week lectures	Basic concepts of simple periodic quantities, rms value, the rotation vector and the phasor			
VII week exercises	Resistor, capacitor and inductor in AC circuits			
VIII week lectures	Elements and structure of AC circuits. General equations			
VIII week exercises	Circuit solution by means of phasor diagram - series and parallel RLC circuit, impedance, admittance			
IX week lectures	Power in AC circuits			
IX week exercises	Impedance triangle, power triangle, active, reactive and apparent power			
X week lectures	Introduction to complex analysis of AC circuits			
X week exercises	Solving an alternating current circuit using complex effective representatives			

XI week lectures	Mesh current method and node potential method
XI week exercises	Application of two basic methods for solving AC circuits in the complex domain
XII week lectures	Basic principles and theorems of linear AC circuits
XII week exercises	Application of basic principles and theorems to linear AC circuits
XIII week lectures	Resonant circuits - voltage resonance and current resonance (antiresonance)
XIII week exercises	Analysis of resonant circuits
XIV week lectures	Magnetically coupled circuits. The ideal transformer
XIV week exercises	Analysis of magnetically coupled circuits.
XV week lectures	Symmetrical three-phase circuits - analysis of wye and delta connection
XV week exercises	Solving simple symmetrical three-phase electrical circuits
Student workload	9 hours and 20 minutes per week (3 hours of lectures + 2 hours of computing exercises + 1 hour of laboratory exercises + 3 hours and 20 minutes of individual work)

Per week	**Per semester**
7 credits x 40/30=9 hours and 20 minuts 3 sat(a) theoretical classes 1 sat(a) practical classes 2 excercises **3 hour(s) i 20 minuts** of independent work, including consultations	Classes and final exam: **9 hour(s) i 20 minuts x 16 =149 hour(s) i 20 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **9 hour(s) i 20 minuts x 2 =18 hour(s) i 40 minuts** Total workload for the subject: **7 x 30=210 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **42 hour(s) i 0 minuts** Workload structure: **149 hour(s) i 20 minuts (cources), 18 hour(s) i 40 minuts (preparation), 42 hour(s) i 0 minuts (additional work)**
Student obligations	Attending lectures and calculus (blackboard) exercises, laboratory exercises
Consultations	As a rule, on the day when classes and calculus exercises are organised - after calculus exercises. In any other term - compulsory announcement by e-mail.
Literature	Gojko Joksimović, Fundamentals of Electrical Engineering II, Edition ETF Textbooks; Gojko Joksimović, Calculation exercises from OEII, textbook
Examination methods	Mid-term exam worth 40 out of a total of 100 points that can be achieved during the semester. The final exam is worth 60 marks. Both types of examinations are written examinations. However, the professor reserves the right to invite the student to an oral examination if he considers that the written examination is questionable.
Special remarks	Laboratory exercises are compulsory. During the semester, students are required to complete the laboratory exercises. Completed labs are a prerequisite for taking the final exam.
Comment	The number of hours per week is 3+2+1 (3 hours of lectures, 2 hours of blackboard exercises and 1 hour of laboratory exercises). The course is worth 7 ECTS credits.

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points