UNIVERSITÀ DI PAVIA

Anno Accademico 2021/2022

LINEAR ELECTRIC CIRCUITS

Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-INF/01 (ELECTRONICS)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	ELECTRONIC AND COMPUTER ENGINEERING
Curriculum	PERCORSO COMUNE
Year of study	1°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	54 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	CABRINI ALESSANDRO (titolare) - 6 ECTS
Prerequisites	Knowledge of the basic mathematical tools, such as systems of linear equations, complex numbers, derivatives and integrals, first and second order constant coefficients differential equations.
Learning outcomes	Knowledge of the electrical quantities of interest in the study of the electric circuits and of their measurement units; knowledge of the behavior of two terminal elements and of their energy properties; knowledge of the circuit laws and of the linear circuit analysis methods; ability to solve simple circuits in DC, at low and high frequency, in resonant and transient conditions; knowledge of the basics of electromagnetic theory determining the behavior of electric circuits
Course contents	Basic concepts and fundamental laws Measurement unit system, electric charge and current, voltage, power and energy, circuit elements, Ohm's law, circuit topology, Kirchhoff laws,

	resistors connected in series and in parallel, voltage and current divider. Analysis methods and circuit theorems Node voltage method, mesh current method. Linearity, superposition, transformation of sources, Thevenin's theorem, Norton's teorema, maximum power transfer, equivalent model for real sources. Capacitors and inductors Theory of operation. Interconnection in series and in parallel. First and second order circuits in transient regime Transient analysis of RC and RL circuits: natural and forced response, initial and steady-state conditions, time constant. Transient analysis of RLC series and parallel circuits: initial and steady-state conditions, over-damped, critically damped, and under-damped response. General response of a first and second order circuit. Electric circuits in alternate current regime Sinusoidal functions and phasors, relationships between phasors for different circuit elements, impedance and admittance. Kirchhoff laws in frequency domain, combination of impedances, phase-shifting circuits, AC bridge circuits, series and parallel resonances, nodal and mesh analyses, superposition, source transformation, Thevenin and Norton equivalent circuits; instantaneous, mean, apparent, complex power; maximum mean-power transfer, effective voltage, power factor, conservation of power, rephasing. four terminal elements, representation through impedance, admittance, transmission and hybrid matrixes. Magnetically coupled circuits Mutual inductance, energy in a magnetically coupled circuit, linear transformers, ideal transformers, Circuit frequency response Transfer function; the decibel scale; the Bode diagram; series and parallel resonances; low-pass, high-pass, band-pass, band-stop filters.
Teaching methods	The course consists of theoretical lessons and practical exercises.
Reccomended or required readings	C. Alexander, M. Sadiku. Circuiti Elettrici. McGraw–Hill. Notes provided by the teacher. L. Perregrini, M. Pasian. Circuiti Elettrici. Collana "Gli eserciziari", McGraw-Hill.
Assessment methods	Written and oral exam. The candidate must achieve at least 15/30 in the written test to be admitted to the oral examination. On demand, students may be exempted from the oral examination. In this case, the registered mark is the minimum between the mark of the written exam and 22/30.
Further information	.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile