UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2017/2018
BACHELOR'S DEGREE (BSC)	COMPUTER ENGINEERING
SUBJECT	ELECTRICAL DEVICES AND CIRCUITS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10655-Attività formative affini o integrative
CODE	02965
SCIENTIFIC SECTOR(S)	ING-IND/31
HEAD PROFESSOR(S)	ALA GUIDO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ALA GUIDO** Monday 10:00 11:00 ufficio 2022, edificio 9, viale delle Scienze, Palermo

DOCENTE: Prof. GUIDO ALA

PREREQUISITES	Mandatory: None. Recommended: Knowledge of basic topics of mathematical analysis, analytical geometry, General Physics.
LEARNING OUTCOMES	D.1: KNOWLEDGE AND UNDERSTANDING SKILLS At the end of the course, the student will have acquired the knowledge on the analysis of linear electrical circuits in steady state and sinusoidal state (also three-phase systems) and as a function of frequencies. In this context he will have acquired the necessary knowledge of the most common methods of resolution of linear electrical circuits, also dealing with the solution with the aid of advanced textbooks. D.2: SKILLS TO APPLY KNOWLEDGE AND UNDERSTANDING The student will be able to analyze and understand the functioning of the components and linear circuits, will be able to apply the knowledge and understanding gained in analyzing circuits different from those approached during lessons and in elementary problems of circuit synthesis using the correct terminology and demonstrating a professional approach. D.3: JUDGING AUTONOMY The student will be able to assess the implications and results of the study of linear circuits, establishing the necessary links with mathematics and physics, and he will have acquired the skills necessary to independently assess the implications of the topics discussed with the topics of the rest of the course. D.4: ENABLE COMMUNICATION The student will acquire the ability to communicate and express issues concerning the object of the course with adequate technical terminology, about the problems related to electrical circuits and express and offer ideas and original solutions to the problems of analysis and synthesis of circuits communicating with specialist and non. D.5: LEARNING CAPACITIES The student will have learned the interactions between the principles and methods of circuit theory and analysis and synthesis problems of linear electrical circuits, meanwhile acquiring the skills necessary to pursue their own path with greater autonomy training.
ASSESSMENT METHODS	Written exam with a final mark; possible interview only in exceptional cases and for those who do not accept the mark concerning the written test. The written test consists in solving circuits similar to those carried out during the exercises. The written test has a duration of 1 hour. In the written test the following skills are evaluated: - mastery and ability to use the basic circuit analysis concepts; - Ability to argue and analyze your choices. The written test is passed if the mark is equal to or greater than 18/30: this mark is proposed as a final judgment. A possible interview may be accessed only in exceptional cases and for those who do not accept the mark concerning the written test. In the interview the following skills are evaluated: knowledge and understanding of the course content and the ability to apply these skills to problems; clarity of presentation and argumentation; capacity to connect and build upon the skills, and build and make judgments in disciplinary and / or interdisciplinary contexts. The final mark takes into account of the result of the written test. EVALUATION CRITERIA The elements that contribute to the mark are depicted by the following diagram (see the context of expected learning outcomes, D.1-D.5 descriptors). - 28-30 / 30 cum laude D.1 / D.2: full mastery of contents; absence of errors; correcting inaccuracies or integration of the responses independently; sound and rigorous approach of the problems; complete solutions, correct and effective; elements of originality. D.3 / D4 / D5: Effective knowledge reproduction, autonomy and coherence orienting or comment on disciplinary / interdisciplinary contexts; excellent clarity, articulate arguments; full property of language. - 24-27 D.1 / D.2: good command of the contents; a few minor errors / omissions, corrections / additions partially guided; good set of problems, substantially correct solutions. D.3 / D4 / D5: good consistency in connecting the concepts and orienting in disciplines or related to them; good clarity in, correct properties of language. - 18-23 D.1 / D.2: sufficient knowledge of the content, acceptable approach to the problems, being adequate solutions; limited autonomy, errors / omissions are not serious; D.3 / D4 / D5: orienting consistency and connect concepts in disciplinary matters, although so uncertain and driven; sufficient property of language, acceptable presentation.
EDUCATIONAL OBJECTIVES	• Being able to solve still complex linear circuits in steady state and sinusoidal state (also three-phase systems), through the knowledge of the behavior of the main circuit elements and the main circuit analysis methods. • Evaluating the behavior of the linear circuits in the frequency domain.
TEACHING METHODS	Lectures, classroom exercises. The activities are organized in order to facilitate the achievement of the expected learning outcomes. In detail, the contents of the course are offered through frontal lectures and guided exercises. The lectures are supplemented by exercises during which you can gradually apply the theoretical principles to the solution of electrical circuits, thus stimulating 'the development of the capacity' of application of knowledge and skills' acquired.

	During the lessons, in part dialogues and interactive, as well as' on the occasion of the exercises, students are expected to analyze the proposals issues critically, thus developing 'its capacity' of analysis and independent judgment. Simultaneously the student and 'incentive to develop communicative skills, argumentation and properties' of language, through the various opportunities for interaction and dialogue with the teacher and other students. All the activities of the course ultimately contribute to the development of learning skills, through the revision of the knowledge acquired, the references to real and interdisciplinary applications and the urge to face the resolution of circuits not covered during the course independently.
SUGGESTED BIBLIOGRAPHY	- R. Perfetti: “Circuiti Elettrici” - Zanichelli, 2013. - Esercitazioni proposte dal docente (testi disponibili sul portale studenti unipa). Bibliografia di consultazione: • G. Chitarin, F. Gnesotto, M. Guarnieri, A. Maschio, A. Stella: “Elettrotecnica 1 - Principi” – Societa' Editrice Esculapio, 2017. • M. Repetto, S. Leva: “Elettrotecnica - Elementi di teoria ed esercizi” – CittaStudi Edizioni, II Ed. 2018. • Bagatin, Chitarin, Desideri, Dughiero, Gnesotto, Guarnieri, Maschio: Esercizi di Elettrotecnica - reti elettriche - Societa' Ed. Esculapio, 2013. • Geri, Maccioni: Raccolta di esercizi d'esame di Elettrotecnica - Societa' Ed. Esculapio, 2013.

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course. Lumped circuits. Limits and validity of the model. Electrical values, principles of Kirchhoff. Topological equations. Dipoles and multipoles.
3	Electrical circuit theorems. Substitution theorem. Superposition theorem. Thevenin's theorem and Norton. Millmann theorem.
3	Elements to one door. Parallel series connections. Voltage and current dividers. Star-delta transformation, and vice versa. Thevenin and Norton equivalent resistive circuits.
4	Analysis of linear electrical circuits in steady state. General methods for troubleshooting electrical circuits. Sources transformation. Nodes and mesh analysis.
8	Analysis of linear electrical circuits in sinusoidal steady state. Phasor. Kirchhoff's laws with phasors. Impedance and admittance. Solution of circuits in sinusoidal regime with phasors. Power in AC circuits. RMS values. Power factor correction. Maximum power transfer theorem. Three-phase systems.
4	Parallel RLC circuit series in sinusoidal steady state. Resonance. Transfer function. Frequency response of passive circuits.
4	Two doors linear circuits in steady state and sinusoidal steady state

Hrs	Practice
2	Lumped circuits. Limits and validity of the circuit model. Electrical values, Principles of Kirchhoff. Topological equations. Dipoles and multipoles.
3	Theorems of electrical circuits. Substitution theorem. Superposition theorem. Theorems of Thevenin and Norton. Millmann Theorem.
3	Elements to one door. Parallel series connections. Voltage and current dividers. Star-delta transformation, and vice versa. Thevenin and Norton equivalent resistive circuits.
4	Analysis of linear electrical circuits in steady state. systematic methods for troubleshooting electrical circuits. Source transformation. Analysis of nodes and rings.
4	Analysis of linear electrical circuits in sinusoidal steady state. Phasor. Kirchhoff's laws with phasors. Impedance and admittance. Solution of circuits in sinusoidal regime with phasors. Power in AC circuits. RMS values. Power factor correction. Maximum power transfer theorem.
2	Parallel RLC circuit series in sinusoidal steady state. Resonance. Circuit frequency response. Network functions and passive filters.
2	Two doors linear circuits in steady state and sinusoidal steady state.