UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2016/2017
BACHELOR'S DEGREE (BSC)	ELECTRONIC 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)	ROMANO PIETRO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ROMANO PIETRO** Monday 09:00 12:00 Laboratorio LEPRE - DEIM, Edificio 9 Tuesday 09:00 12:00 Laboratorio LEPRE - DEIM, Edificio 9 Wednesday 09:00 12:00 Laboratorio LEPRE - DEIM, Edificio 9 Thursday 09:00 12:00 Laboratorio LEPRE - DEIM, Edificio 9 Friday 09:00 12:00 Laboratorio LEPRE - DEIM, Edificio 9

DOCENTE: Prof. PIETRO ROMANO

PREREQUISITES	Mandatory: None. Recommended: Knowledge of basic topics of mathematical analysis courses (functions, derivatives, integrals, sequences, series, matrix calculation, solution of differential equations, complex numbers), analytical geometry (display and analysis functions), General Physics (electrology and magnetic fields).
LEARNING OUTCOMES	D.1: KNOWLEDGE AND UNDERSTANDING SKILLS The student at the end of the course will have acquired the knowledge on the analysis of electrical circuits in adynamic regime, dynamic, single-phase and three-phase sinusoidal and at different frequencies. In this context it will have acquired the necessary knowledge of the major methods of resolution of electrical circuits, however complex, and also deal 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 analyzes of circuits not resolved during lessons and non-complex 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 the analysis and mathematical physics, and 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 and oral exam. The written test consists in solving circuits and problems similar to those carried out during the exercises. Generally the exercises to be performed are three divided by macro issues such circuits in steady state, dynamic circuits and circuits in sinusoidal steady state. The written test has a duration of between 2 and 3 hours depending on the difficulty level. To take the oral test you must pass the written exam with a mark equal to or greater than 18/30. In the written test are evaluated: - mastery and ability to use the basic circuit analysis concepts; - Ability to argue and analyze your choices. The oral test consists of an interview which concerns possible mistakes made in the written test and open-ended questions on the entire course program. In the oral examination are evaluated: knowledge and understanding of the course content and the ability to apply these skills to problems and applications in their areas of the course and / or related to it; of language and clarity of presentation and argumentation; capacity 'to connect and build upon their skills, and build and make judgments in disciplinary and / or interdisciplinary contexts. The final mark takes into account so prevalent of the result of the written test from which it's off to the determination of the final grade. EVALUATION CRITERIA For each test, the voting attribution depends on the overall level of achievements. The elements that contribute to the vote formation are attributable to 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 exposure. - Less than 18 (not attributed vote) D.1-D.5: learning outcomes inadequate.
EDUCATIONAL OBJECTIVES	• Being able, through knowledge of the behavior of the main circuit elements and the main circuit analysis methods, to solve still complex linear circuits in

	adynamic, dynamic and sinusoidal steady state. • Evaluate the behavior of the resonant circuit and not through the analysis in the frequency domain and addressing simple problems synthesis of analog filters. • Know and derive the parametric features of biporta circuits also interconnected. • To acquire the knowledge necessary to know the behavior of the three-phase systems used in electrical networks at industrial frequency. • Understand that the engineer also assumes the role of guarantor of the safety of those around him, acquiring the basic knowledge of electrical safety that any engineer must possess.
TEACHING METHODS	Lectures, classroom exercises. Activities' they 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	Testo di Riferimento: - R. Perfetti: “Circuiti Elettrici” - Zanichelli, 2013. Altri testi utili per consultazione: - C. Desoer, E. Kuh: “Fondamenti di teoria dei circuiti” - Edizioni Franco Angeli, 2001. - F. Viola “Quaderno di Elettrotecnica” Tangram Edizioni Scientifiche, 14.

SYLLABUS

Hrs	Frontal teaching
3	Introduction to the course. Lumped circuits. Limits and validity of the model. Electrical values, principles of Kirchhoff. Topological equations. Dipoles and multipoles.
4	Electrical circuit theorems. Substitution theorem. Superposition theorem. Thevenin's theorem and Norton. Millmann theorem.
4	Elements to one door. Parallel series connections. Voltage and current dividers. Star-delta transformation, and vice versa. Thevenin and Norton equivalent resistive circuits.
5	Analysis of linear electrical circuits in steady state. systematic methods for troubleshooting electrical circuits. Source transformation. Analysis of nodes and rings.
5	Analysis of Dynamic linear electric circuits of the first order. RC and RL circuits series and parallel. The concept of state. Natural frequencies. Differential equation of the first order and initial conditions. Zero-input response. Zero-state response. Complete response. Step response. Impulse response. Generic input response.
5	Analysis of dynamic linear electric circuits of the second order. RLC series and parallel circuits. Second order differential equations and initial conditions. Zero-input response. Zero-state response. Step response. Impulse response. Generic input response. Formulation of differential equations by means of the methods of circuit analysis.
7	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.
6	Parallel RLC circuit series in sinusoidal steady state. Resonance. Circuit frequency response. Network functions and passive filters.
2	Mutually coupled circuits. Circuits with ideal transformers. real transformer.
5	Two doors linear circuits in steady state and sinusoidal steady state
4	Three phase systems symmetrical and balanced and not. Power in three-phase systems. Methods of measuring the power in three-phase systems. Electrical safety elements.

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.

Hrs	Practice
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 Dynamic linear electric circuits of the first order. RC and RL circuits series and parallel. The concept of state. Natural frequencies. Differential equation of the first order and initial conditions. Zero-input response. Zero-state response. Complete response. Step response. Impulse response. Generic input response.
4	Analysis of dynamic linear electric circuits of the second order. RLC series and parallel circuits. Second order differential equations and initial conditions. Zero-input response. Zero-state response. Step response. Impulse response. Generic input response. Formulation of differential equations by means of the methods of circuit analysis.
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.
1	Mutually coupled circuits. Circuits with ideal transformers. real transformer.
2	Two doors linear circuits in steady state and sinusoidal steady state.
2	Three phase systems symmetrical and balanced and not. Power in three-phase systems. Methods of measuring the power in three-phase systems.