UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	ENERGY ENGINEERING AND RENEWABLE ENERGIES
SUBJECT	ELEMENTS OF ELECTRICAL ENGINEERING
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50298-Ingegneria elettrica
CODE	05767
SCIENTIFIC SECTOR(S)	ING-IND/31
HEAD PROFESSOR(S)	ALA GUIDO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	12
INDIVIDUAL STUDY (Hrs)	192
COURSE ACTIVITY (Hrs)	108
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

PREREQUISITES	Sufficient knowledge of the basic concepts and methods of mathematical analysis and geometry. Sufficient knowledge of the basic concepts of physics.
LEARNING OUTCOMES	Knowledge and understanding At the end of the course, the students will have acquired knowledge and understanding capacity on: • methods of analysis of linear electrical network; steady-state, transients and steady-state sinusoidal behaviour; • frequency domain analysis of linear electric network; • three-phase systems; • steady-state electromagnetic fields analysis, particularly with reference to industrial applications. Verification of this objective is made during the final exam. Applying knowledge and understanding The student, at the end of the course, will be able to: • discern, in the context of linear electrical networks, different physical phenomena, identifying cause-and-effect relationships, identifying, formulating and analyzing these phenomena by means of methods, techniques and instruments up to date; • apply the main theorems of linear electrical networks; • set the time domain analysis of linear electrical networks; • set the frequency analysis of linear electrical networks; • set the symmetrical, balanced and unbalanced three-phase systems analysis; • identify, formulate and analyze electromagnetic problems, typically encountered in industrial applications, by using methods, techniques and tools up to date. Verification of this objective is made during the final exam. Making judgements The student will have acquired the necessary autonomy to be able to assess critically stationary electromagnetic analysis results and circuit analysis. Verification of this objective is made during the written test and the interview. Communications skills The student will have acquired the ability to communicate, using appropriate technical language, the fundamental aspects related to the steady-state electromagnetic analysis and the analysis of linear circuits at any scheme, proposing standard solutions in specialized contexts. The acquisition of communication skills will be verified through the final exam. Learning skills The student will be able to study electromagnetic devices and electrical machines, typically used in industrial engineering, and will have acquired the main criteria and terms associated with their design; The student will be able to study electrical power systems with particular reference to the electrical systems in civil and industrial applications; The student will be able to study electronic systems. The student will be able to address more advanced topics, through the use of bibliographic resources and with growing independence. The learning skills will be tested during the final test in which the student will give evidence of awareness achieved, critical capacity of analysis and synthesis of theoretical and practical aspects of the course.
ASSESSMENT METHODS	The assessment of learning is carried out through a final written test, structured both with numerical resolution exercises and with open-ended questions. Passing the written test, which is awarded a mark > = 18/30, allows the student to subsequently access a short interview (aimed at completing the assessment of the achievement of the expected results) in which both the written test and the exercises carried out during the course and collected by the student in a single file / booklet, even in an exclusively digital form, are discussed. The student may also request, in addition, the formulation by the Examination Commission of an additional question on an extemporaneous topic, with the aim of a possible limited improvement of the evaluation reported in the written test. At the end of the interview, the grade assigned to the written test may be confirmed or modified in relation to the results of the interview itself. The written test deemed insufficient precludes the completion of the exam and the student will have to repeat the test itself. There will be a trial in progress, even in a structured way, to be held at the end of the first module. Its aim is to initiate actions of self-control of the cognitive

	process aimed to verify its temporal stability at the short and medium term.
	The final exam is taken by the student at the end of the cycle of lessons and exercises, in one of the exam sessions foreseen in the teaching calendar of the Engineering Department. The final written test can be taken in any session of the active exam session without any restrictions regarding the possibility of repeating the test itself. The subsequent interview to complete the test is held in one of the days immediately following the day of the written test, with reference to the active exam. The passed written test can still be used to sit the final interview in any session of the active exam session. Once the exam session has been completed without having taken the subsequent interview, any written test passed can no longer be used in another session.
	As already underlined, the written test is evaluated by a mark out of thirty. The evaluation criteria are described below.
	Grade: 28-30 (excellent knowledge and ability to understand the topics, excellent ability to analyze and synthesize, the student has excellent ability to apply the acquired knowledge to solve the proposed problems). Grade: 25-27 (good knowledge and ability to understand the topics, good ability to analyze and synthesize, the student has good ability to apply the acquired knowledge to solve the proposed problems). Grade: 21-24 (fair knowledge and ability to understand the topics, fair ability to analyze and synthesize, the student has a fair ability to apply the acquired knowledge to solve the proposed problems). Grade: 19-20 (sufficient knowledge and ability to understand the topics, sufficient ability to analyze and synthesize, the student has sufficient ability to apply the acquired knowledge to solve the proposed problems). Grade: 18 (minimum knowledge and ability to understand the topics, minimum ability to analyze and synthesize, the student has just enough ability to apply the knowledge acquired to solve the proposed problems). Judgment: insufficient (insufficient knowledge and ability to understand the topics, insufficient ability to analyze and synthesize, the student has not acquired the ability to apply the knowledge acquired to solve the proposed problems).
	The subsequent interview is passed if a grade> = 18/30 is assigned. The evaluation criteria are described below.
	Grade: 30 with honors (the student has excellent knowledge and understanding of the topics, excellent ability to apply the acquired knowledge, expresses himself with excellent language properties and demonstrates full autonomy of judgment, has full awareness and full ability 'critique of analysis and synthesis of the theoretical and applicative aspects of teaching, demonstrating the ability to undertake subsequent studies with full autonomy).
	Grade: 28-30 (the student has excellent knowledge and understanding of the topics, excellent ability to apply the knowledge acquired, expresses himself with good language skills and demonstrates good autonomy of judgment, has good awareness and good ability 'critique of analysis and synthesis of the theoretical and applicative aspects of teaching, demonstrating the ability to undertake subsequent studies with good autonomy).
	Grade: 25-27 (the student has good knowledge and ability to understand the topics, good ability to apply the acquired knowledge, expresses himself with a good property of language and demonstrates a good autonomy of judgment, has good awareness and good ability 'critique of analysis and synthesis of the theoretical and applicative aspects of teaching, demonstrating the ability to undertake subsequent studies with discrete autonomy).
	Grade: 21-24 (the student has more than sufficient knowledge and understanding of the topics, a more than sufficient ability to apply the acquired knowledge, expresses himself with sufficient language properties and demonstrates a more that sufficient autonomy of judgment, has a more than sufficient awareness and a more than sufficient critical capacity of analysis and synthesis of the theoretical and applicative aspects of the teaching, demonstrating to have the ability to undertake subsequent studies with autonomy more than enough).
	Grade: 18-20 (the student has sufficient knowledge and understanding of the topics, a sufficient ability to apply the acquired knowledge, expresses himself with sufficient language properties and demonstrates sufficient autonomy of judgment, has sufficient awareness and a sufficient critical capacity of analysis and synthesis of the theoretical and applicative aspects of teaching, demonstrating the ability to undertake subsequent studies with sufficient

	autonomy).
EDUCATIONAL OBJECTIVES	Development of professional knowledge and insight in the field of steady-state electromagnetics applied to industrial engineering. Ability to solve linear circuits and to make performance evaluation of electrical systems.
TEACHING METHODS	Teaching activities are organized as follows. Lectures and setting of the exercises (also using a circuit simulation software) carried out by the teacher in the classroom, or in mixed mode, or in teledidactics. The interaction and the continuous dialogue between teacher and students during the lectures, through questions asked in an impromptu way, allow to stimulate attention and communication skills, to acquire the property of language, to increase the autonomy of judgment. The exercises are then carried out in the classroom by the students under the guidance of the teacher; in this case the teacher interacts directly with the individual student by encouraging the reworking of the knowledge and its application, the ability to learn and the autonomy of judgment. In order to develop and strengthen the ability to work in a team, the collaboration between the students is encouraged to develop the exercises both in the classroom and independently through the use of the IT platform remotely outside the class hours.
SUGGESTED BIBLIOGRAPHY	•G. Chitarin, F. Gnesotto, M. Guarnieri, A. Maschio, A. Stella: "Elettrotecnica 1 - Principi" – Societa' Editrice Esculapio, 2017, ISBN 9788893851893 •R Perfetti: "Circuiti elettrici" - Zanichelli, 2012 ISBN: 9788808178886 •M. Repetto, S. Leva: "Elettrotecnica - Elementi di teoria ed esercizi" – CittaStudi Edizioni, II Ed. 2018. ISBN: 8825174217 •D.J. Griffiths: "Introduction to Electrodynamics" – Cambridge University Press, 2017. ISBN: 9781108420419 •Esercitazioni proposte dal docente, disponibili sul portale studenti unipa. English textbook •A. R. Hambley: "Elettrotecnica" – Pearson - Prentice Hall, IV Ed. 2013. ISBN: 9788871925561 --- •Bagatin, Chitarin, Desideri, Dughiero, Gnesotto, Guarnieri, Maschio: Esercizi di Elettrotecnica - reti elettriche - Societa' Ed. Esculapio, 2013. ISBN: 8874885806 •Geri, Maccioni: Raccolta di esercizi d'esame di Elettrotecnica - Societa' Ed. Esculapio, 2013. ISBN: 8874886063 •Liberatore, S. Manetti, M.C. Piccirilli, A. Reatti: "Circuiti elettrici ed elettronici - Esercizi commentati e risolti" – Progetto Leonardo, Bologna, 2003. ISBN: 8874880782 --- •C. Desoer, E. Kuh: "Fondamenti di teoria dei circuiti" - Edizioni Franco Angeli, 2001. ISBN-13: 9788820427566 •M. Guarnieri, G. Malesani: Elettromagnetismo Stazionario e quasi stazionario - Ed. Progetto Padova, 2002. ISBN: 9788887331127

SYLLABUS

Hrs	Frontal teaching
18	Analytical and circuital models of electromagnetic field for steady-state and dynamical analysis in linear media.
22	Principles, theorems and methods for the analysis of linear circuits (DC circuits, transients, steady-state sinusoidal circuits), in time domain and in frequency domain.
10	Transfer functions. Frequency domain analysis of passive circuits. Characterization of two-port circuits.
6	Magnetic materials; magnetic circuits.
4	Induction phenomena, electrodynamics and theory of operation of electromechanical converters.
9	Three-phase systems: properties and general methods of analysis.

Hrs	Practice
17	Time domain analysis of electrical linear circuits. Steady-state sinusoidal analysis of electrical linear circuits.
8	Transfer functions; resonance conditions and characterization of passive circuits filter behavior. Characterization of two-port circuits. Applications of Laplace transform for linear circuits analysis.
5	Analysis of magnetic circuits.
4	Induction phenomena, electrodynamics and theory of operation of electromechanical converters.
5	Three-phase systems analysis.