UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	CYBERNETIC ENGINEERING
SUBJECT	ELECTRONIC POWER CONVERTERS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50285-Ingegneria dell'automazione
CODE	17881
SCIENTIFIC SECTOR(S)	ING-IND/32
HEAD PROFESSOR(S)	PELLITTERI FILIPPO　　Ricercatore a tempo determinato　　Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**PELLITTERI FILIPPO** Thursday　08:30　13:30

DOCENTE: Prof. FILIPPO PELLITTERI

PREREQUISITES	Basic skills of physics and electrotechnics are deeply needed.
LEARNING OUTCOMES	- Knowledge and understanding skills At the end of the class the student will have acquired the knowledge of the working principles, mathematical models, control and design issues of power electronic converters. Particularly he will be able to choice and to design electric components, basing on specific requirements, in the field of power electronic converters. The student will be aware in advanced topics in the field of power electronic converters. - Ability in applying knowledge and understanding The student will be able to use the mathematical, physical and engineering instruments for the investigation, the design and the realization of systems, or parts of them, within power electronic converters. He will be able to pose or hold reasonings dealing with the study, the application, the design and the setting up of power electronic converters. - Autonomy of judgement The student will be able to know and interpret the main electromechanical data and parameters of power electronic converters; he will be able to collect the data in order to carry out the correct sizing, to interpret their operation and to evaluate their correct operation during service. He will be able even to acquire a sufficient general knowledge of many aspects dealing with the power electronic converters. - Communication skills The student will acquire skills to communicate information and ideas and to express issues related to the course topics. In addition, he will be not only able to hold discussions on topics concerning the power electronic converters design, but also to highlight problems on the choice and on the adequate use of power electronic converters, proposing possible solutions. - Learning skills The student will gain learning skills on further comprehension of power electronic converters and their operating principles. He will acquire the ability to synthesize information and to judge the interactions between different topics and between the fundamental branches of knowledge regarding electrical engineering. These abilities will allow the student to continue the study with higher autonomy and discernment.
ASSESSMENT METHODS	Oral test with the presentation and discussion of the numeric exercises carried out during the course. - Learning evaluation The examination consists of an oral test, which will be performed after the conclusion of the semester of the present class. The student must answer at least to three oral questions based on the topics of the class. The assessment is based on the following grades: a) excellent (30-30 cum laude): excellent knowledge of the topics, excellent use of technical language, good analytical ability, the student is able to apply knowledge to solve the proposed problems; b) very good (26-29): good knowledge of the topics, good use of technical language, the student is able to apply knowledge to solve the proposed problems; c) good (24- 25): basic knowledge of the main topics, discrete use of technical language, limited ability to independently apply the knowledge to the solution of the proposed problems; d) satisfactory (21-23): the student knows the main topics but has not a full grasp of them, satisfactory use of technical language, poor ability to independently apply the acquired knowledge; e) sufficient (18-20): minimal knowledge of the main topics and basic use of technical language, very little or no ability to independently apply the acquired knowledge; f) insufficient: the student does not have a minimum acceptable knowledge of the contents of the topics covered in the course.
EDUCATIONAL OBJECTIVES	The Students will be able to address analysis and synthesis of a power electronic converter. In particular, they will be able to use the software instruments for the study, by means of simulation, of power electronic circuits.
TEACHING METHODS	Lectures, numeric exercises and laboratory tests.
SUGGESTED BIBLIOGRAPHY	1) Materiale didattico distribuito durante il corso; 2) N. Mohan, T. M. Undeland, W. P. Robbins: "Elettronica di Potenza: Convertitori e Applicazioni", HOEPLI, Milano, 2005 (testo in lingua italiana); ISBN-10 : 8820334283 ; ISBN-13 : 978-8820334284 3) N. Mohan, T. Undeland, W. Robbins: "Power Electronics", Ed. John Wiley and Sons, NY 1999; USA ISBN: 978-0471226932 ; WIE ISBN: 0471429082

4) R. W. Erickson, D. Maksimovic: "Fundamentals of Power Electronics", Ed. Kluwer Academic Pub, Second Edition, 2001; ISBN-10 : 0792372700; ISBN-13 : 978-0792372707
5) M. H. Rashid: "Power Electronics: Circuits, Devices, and Applications", 3rd Edition, Prentice-Hall, 2003 ; ISBN-10 : 0133125904 ; ISBN-13 : 978-0133125900

SYLLABUS

Hrs	Frontal teaching
4	Components employed in power electronic converters
4	Passive components employed in power electronic converters (inductors, capacitors and transformers)
4	Fourier series, THD, active, reactive and apparent power in distorted steady state
4	AC/DC converters: applications. Diode rectifiers
4	AC-DC convertion. Thyristor Controlled rectifiers.
6	DC/DC converters: applications. Analysis of the main nonisolated topologies.
2	Isolated topologies of DC/DC converters.
1	DC-DC converters: hints on small signal modeling and control techniques.
7	DC/AC converters: applications. PWM inverters.

Hrs	Practice
18	Numeric exercises and laboratory tests on AC/DC, DC/DC and DC/AC power converters