UNIVERSITÀ DI PAVIA

Anno Accademico 2019/2020

STATIC ENERGY CONVERSION

Enrollment year	2019/2020
Academic year	2019/2020
Regulations	DM270
Academic discipline	ING-INF/01 (ELECTRONICS)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	INDUSTRIAL AUTOMATION ENGINEERING
Curriculum	Industrial Technologies and Management
Year of study	1°
Period	2nd semester (02/03/2020 - 12/06/2020)
ECTS	6
Lesson hours	45 lesson hours
Language	
Activity type	ORAL TEST
Teacher	ZANCHETTA PERICLE - 6 ECTS
Prerequisites	Basic theory of passive linear networks. Principles of electrical engineering.
Learning outcomes	The first module of this course is focused on the main analog linear and non-linear applications of junction diodes, field effect transistors and operational amplifiers. Moreover, it offers a basic knowledge of MOS logical families and digital circuits. The final goal of the course is to teach the students how to analyze and perform measurements on analog circuits, and the design of simple circuits with op-amps and discrete MOS devices. The second module of this course is focused on the analisys of the characteristics of semiconductor power devices, electronic power converters and related industrial applications.
Course contents	This course includes two modules: Electronics (prof. Annovazzi Lodi) and Static energy conversion (prof. Dallago). The first module is an

	introduction to linear and non-linear analog electronics, and to digital electronics. The second module is an introduction to static power converters and their industrial applications. Programme of the module of Static energy conversion Introduction. The electrical energy and applications . The electrical energy processing. Static conversions. Electromagnetic transformer. The power electronic converter. Thermal problems and cooling. Electronic devices. The silicon and pn junction. Static characteristics of power electronic devices: diode. Bipolar junction transistor, thyristors (SCR, TRIAC, GTO), mosfet, insulated gate bipolar transistor. Assembly of diodes and SCRs. AC/DC conversion Introduction: loads and direct current employment. Assumptions on which is based the study of rectifier circuits. Monophase rectifiers. Poliphase rectifiers. Three-phase transformers and interphase transformers. The phase control. The natural commutation of diodes and SCRs. Voltage drops. Harmonics. Applications: dc electrical drives and High Voltage Direct Current (HVDC) transmission. DC/DC conversion. Working principle of the chopper. SCR chopper and GTO chopper. Application of the chopper in electrical traction. DC/AC conversion. Introduction. The monophase inverter: output voltage- frequency control. Voltage source three-phase inverter. Current source inverter. Square wave three-phase inverter. The pulse width modulation technique. AC/AC conversion The cycloconverter. Applications.
Teaching methods	Lectures (hours/year in lecture theatre): 68 Practical class (hours/year in lecture theatre): 36 Practicals / Workshops (hours/year in lecture theatre): 12
Reccomended or required readings	A.Sedra, K.Smith. Microelectronic Circuits, III or newer ed. Oxford University Press . G. Moeltgen.. I tiristori: circuiti di conversione, teoria ed impiego. . Etas libri. . J. Schaefer. . Rectifier Circuits: Theory and Design.. John Wiley & Sons. . B. W. Williams. . Power Control Electronics. . Prentice-Hall. .
Assessment methods	Electronics: Written examination consisting of the analysis of an amplifier stage with discrete devices, and of a circuit with an operational amplifier. Oral examination on the whole program. Static energy conversion: Oral examination on the whole program.
Further information	Electronics: Written examination consisting of the analysis of an amplifier stage with discrete devices, and of a circuit with an operational amplifier. Oral examination on the whole program. Static energy conversion: Oral examination on the whole program.
Sustainable development	

goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile