



SYSTEMS FOR INDUSTRIAL AUTOMATION

Enrollment year	2020/2021
Academic year	2021/2022
Regulations	DM270
Academic discipline	ING-IND/32 (POWER ELECTRONIC CONVERTERS, ELECTRICAL MACHINES AND DRIVES)
Department	DEPARTMENT OF ELECTRICAL, COMPUTER AND BIOMEDICAL ENGINEERING
Course	ELECTRICAL ENGINEERING
Curriculum	Sistemi elettrici
Year of study	2°
Period	2nd semester (07/03/2022 - 17/06/2022)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	BASSI EZIO (titolare) - 3 ECTS BENZI FRANCESCO - 3 ECTS
Prerequisites	Basic electrical drives, power electronics, power systems and control.
Learning outcomes	The course focuses on a number of topics related to industrial automation and electrical drives. Specific components and actuators not studied before are focused here, like special machines and sensors for motion control and robotics. Also communication techniques and protocols, more and more relevant for the more recent automation technology, are introduced and applied both to industrial and civil application (Home automation or Domotics).
Course contents	The course gives an overview on various issues in the field of automation both for industrial and civil applications (e.g. robotics & factory automation, home automation) and is mainly centered on

communication protocols and electrical drives. The main topics comprise:

1. Loads with variable inertia; two-link manipulator: lagrangian formulation and terms of the torque; schemes and algorithms for the reconstruction of the speed in electrical drives;
2. Double-fed induction motor;; drives with synchronous reluctance and switched reluctance motors.
3. Automation Systems Architectures; devices for the automation, industrial PLC & PC, systems for Numeric Control; Levels of Automation; ISO-OSI model; Software for industrial automation;
4. Communication protocols (speed, accuracy, determinism) and standards; automation for continuous and discrete industrial processes;
5. Domotics and buiding automation: standards and case studies.
6. Electric and Hybrid Electric Vehicles (HEV): basic concepts, classification of EHV, series/paralle/series-parallel traction; modes of operation; Electrical Drives for EHV; control.

Teaching methods

The course is made up of module A (points 1, 2, & 6 of the program) by prof. Bassi, and module B (points 3, 4 & 5) by prof. Benzi. The lectures of the two modules are mutually independent and are given in parallel.

Lectures (hours/year in lecture theatre): 36

Practical class /Seminars (hours/year in lecture theatre): 12

Reccomended or required readings

Quaderno tecnico GISI. Bus di campo tra normativa e tecnologia. GISI Milano, 2000. P. Vas. Parameter Estimation, Condition Monitoring, and Diagnosis of Electrical Machines. Oxford University Press, 1993. Daniele Fabrizi. Enciclopedia-Vocabolario dell'Automazione Industriale. Edizioni CEI. 2002. E. Bassi - F. Benzi. Lecture Notes. Available only on a few topics.

Assessment methods

The exam does comprise a written test on fieldbusses, domotics & building automation and an oral presentation (power point accompanied by a written relation, duration: 35-40 minutes) on a subject mainly related to electrical drives.

Further information

Sustainable development goals - Agenda 2030

4, 10, 12, 17.

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