

# **M.Sc. in Smart Control Systems for Energy Management**

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## **Course Structure**

**Course Code :** SM7311

**Course Title :** Industrial Robotics

**Credit Hours :** 3

## **Course Description**

Introduction to robotics, Robot Sensors, Electric Motors and actuators, Power sources, DC Drives, AC drives, Microcontroller PIC.

## **Course Objectives**

- Training in all the parts of the power systems in robotics: motors, drives, power supplies, sensors and actuators, signal conditioning.

## **Course Topics**

- Lesson 1.- Introduction to robotics (2h). Type of robots, characteristics, applications.
- Lesson 2. Robot Sensors I.- Strain/force, acceleration, distance transducers: (2h). Practices. Applied electronics lab (AEL). Lesson 1- Measuring distances and angles. (2h)
- Lesson 2. Robot Sensors I: Accelerometer, ultrasonic, light sensor (2h). AEL. Lesson 2- Measuring with sensors (2h).
- Lesson 3. Electric Motors and actuators.-DC motors, gear motors (2h)
- Lesson 3.- Electric motors II.- Seminar.- (2h) Brushless dc motors, miniature vibrating motors, stepper motors. AEL. Lesson 3- Controlling the speed in a DC motor (2h).
- Lesson 4.- Power sources I.- Batteries, PV cells, (2h)
- Lesson 4.- Power sources II.- Ultracapacitors, fuel cell. (1h) AEL. Lesson 3- Electrical characterization of power sources(2h).
- Lesson 5.- DC Drives.- DC drives, Brushless DC Drives (2h) AEL. Lesson 3- Implementing a DC drive (2h).
- Lesson 5.- AC Drives.- Induction motor drives, Synchronous Motor Drives (2h)
- Lesson 6.- Lesson 6.- Microcontroller PIC.- Programing, Ports (2h). AEL.- Activation of digital devices connected to the ports (2h).
- Lesson 6.- Microcontroller PIC.- PWM, Timers (2h).

## **References**

- Walt Boyes. Instrumentation Reference Book (Fourth Edition). Elsevier Inc. ISBN: 978-0-7506-8308-1
- Shimon Y. Nof Handbook of Industrial Robotics,. John Wiley & Sons, Inc.. DOI 10.1002/9780470172506
- D.V.S. Murty Transducers and Instrumentation (2nd Edition). PHI learning 2011. ISBN 978-81-2013-3569-1
- Rashid. Power Electronics Handbook. Academic Press ISBN-10: 0123820367