

FACULTY OF **ENGINEERING**

DEGREE COURSE: **COMPUTER AND CONTROL ENGINEERING BS**

SUBJECT: AUTOMATION MEASUREMENT AND INSTRUMENTATION

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OBJECTIVES

This course is aimed at:

- 1) allowing students to approach the manufacturing systems according to instrumentation, sensors and information technology for industry.
- 2) providing an overview of the state of the art related to measurement and control techniques in automation.
- 3) introducing the wide spectrum of sensors and instruments (traditional and virtual) available in the industry according to any different application needs.
- 4) explaining the links between different technological and engineering items and industrial measurements.
- 5) providing a systemic and rigorous overview, rather than detailed knowledge, and embracing a wide range of topics, so as to favour further specialisations.

CONTENTS

The course is divided into 4 parts.

1. Theory of measurement and data acquisition.
2. Classification, measurement principles and the features of conventional sensors according to the detected variable: process and kinematic variables, temperature, optical, pneumatic, electric and proximity sensors.
3. Measurement systems from the point of view of the application scenario, particularly in emerging and strategic sectors: robotics sensors, safety and security systems, sensors in the infrastructure, organic, chemical, environmental, electrical measures, network analysis, instrumentation medical applications.
4. Topical issues closer to high engineering: virtual instrumentation, smart sensors, WSNs (Wireless Sensor Network), thermography, miniaturized measurement systems, technical norms and product documentation.

LEARNING OUTCOMES

At the end of the course, students will have:

- awareness of the basic theoretical and practical aspects of measurement processes, transduction, calibration, analysis and control;
- comprehension of the classification and principles of operation of the main sensors and transducers used in industry;
- ability to identify the application requirements and typical application areas of electronic instrumentation;
- ability to understand the features and characteristics of measuring instruments, both as stand-alone components or as part of evolving complex systems.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

Course Lessons and official academic book

Bibliography

- Dally J. W., Riley W. F., McConnell K. G., Instrumentation for Engineering Measurement, John Wiley & Sons, Inc., 1984
- Asch, Les Capteurs en Instrumentation Industrielle, Dunod
- Cerni, Foster, Instrumentation for Engineering Measurements, J. Wiley & Sons
- Paratte-Robert, Systèmes de mesure, Presses Polytechniques Romandes
- Savino, Fondamenti di scienze delle misure, NIS
- Trietley, Transducers in mechanical and electronic design, Dekker
- P.M. Azzoni, Strumenti e misure per l'ingegneria meccanica, Hoepli
- E. O. Doebelin, "Measurement Systems", McGraw-Hill, 1990.
- R. Pallas-Areny, J. G. Webster, "Sensors and signal conditioning", J. Wiley & sons, 1991
- Lang T.T. "Electronics of Measuring Systems". J. Wiley & Sons.
- Tompkins W.J., Webster J.G.: "Interfacing Sensors to the IBM PC". Prentice Hall.
- G.Horn, J.L.Huijsing, Integrated Smart Sensors: Design and Calibration, Kluwer Academic Press, 1998

On-line resources

AUTOMATION WORLD: www.automationworld.com

CONTROL ENGINEERING: www.controleng.com

SENSORS MAGAZINE: www.sensorsmag.com

Automation Magazine: <http://www.automationmag.com/>

Automation: <http://www.automation.com/>

Control Global: <http://www.controlglobal.com/industrynews/>
