

FACULTY OF **ENGINEERING**

DEGREE COURSE: **COMPUTER AND CONTROL ENGINEERING**

MASTER DEGREE: **COMPUTER AND CONTROL ENGINEERING**

**SUBJECT:** INSTRUMENTATION FOR AUTOMATION

**LECTURER:** ALESSANDRO FREDDI

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## **OBJECTIVES**

This course provides knowledge in the following fields:

- classification and description of the instrumentation which is typically employed in the field of automation;
- fault diagnosis systems for addressing faults both at process and instrumentation level;
- management and design of data acquisition systems for automation, and elaboration of the acquired signals, paying attention to diagnostic problems.

This course also provides skills needed for the development of the described systems and techniques using simulation softwares.

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## **CONTENTS**

The main subjects of the course are:

- supervision systems;
  - fault detection;
  - fault diagnosis and fault tolerant systems;
  - sensors for automation;
  - signal conditioning, filtering and processing;
  - actuators for energy and motion control;
  - architectures and networks for automation;
  - principle of fuzzy logic and neural networks, with applications to diagnosis systems;
  - applicative examples using simulation softwares.
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## **LEARNING OUTCOMES**

Upon course completion, the student will be able to:

- choose and design instrumentation for control, automation and monitoring applications;
- design and develop fault detection and isolation systems;
- analyze and design signal conditioning and filtering systems for monitoring, automation and control applications.

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## **ASSESSMENT**

Written exam: multiple choice tests and open-ended questions

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## **RECOMMENDED TEXTBOOKS**

- R. Isermann, "Fault-Diagnosis Systems: An Introduction from Fault Detection to Fault Tolerance", Springer-Verlag Berlin, 2006.
  - J. Fraden, "Handbook of Modern Sensors – Physics, Designs and Applications", Springer, 2010.
  - W. Boyes, "Instrumentation Reference Book", Butterworth Heinemann, 2009.
  - H. T. Nguyen, N. R. Prasad, C. L. Walker, E. A. Walker, "A First Course in Fuzzy and Neural Control", Chapman&Hall/CRC, 2002.
  - L. H. Chiang, R. D. Braatz, E. L. Russell, "Fault Detection and Diagnosis in Industrial Systems", Springer-Verlag London, 2000.
  - S. M. Kuo, B. H. Lee, W. Tian, "Real-Time Digital Signal Processing", Wiley, 2001.
  - A. V. Oppenheim, R. W. Schaffer, "Discrete-Time Signal Processing", Pearson Education Limited, 2013.
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