ELEC 207
Instrumentation and Control

1 – Module Introduction

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Module overview

Aims and learning outcomes

Aims:

To gain a basic understanding of industrial instrumentation with the ability to design a suitable measurement system for a given application.

Learning outcomes:

On successful completion of this module, the student will be able to demonstrate knowledge and understanding of:

- The basic principles of measurement systems and some common electrical transducers;
- The interface between the measurand and the sensor, and between the sensor and the electronic circuit;
- An appreciation of some common factors that can affect the performance of a measurement system;
- How the sensor may be integrated into a larger system.

Module overview

Syllabus (Part A)

Part A – Instrumentation (taught by Dr Roberto Ferrero in Semester 1):

- Introduction to measurement systems;
- Measurement errors and uncertainty;
- Measurement of strain;
- Measurement of temperature;
- Measurement of displacement;
- Transient and frequency responses of systems;
- Signal acquisition and processing.

Part B – Control will be taught by Prof Simon Maskell in Semester 2.

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Module overview

Why are measurements important?

Why do we need measurements?

Think at:

- Every-day life examples (air temperature, …);
- Engineering problems (control system, …);
- Scientific discoveries (Higgs boson, …);
- Commercial activities (petrol pump, …);
- Legal issues (DNA analysis, …);
- Health and safety (radiation levels, …);
- …

Module structure

Teaching (Part A)

~18 teaching hours (1-2 hours per week):

- Lectures (~14 hours);
- Problem classes (~4 hours).

Timetable (please check online for the most recent updates):

- Tuesdays 2-3 pm – 502 Teaching Hub, Lecture Theatre 2;
- Thursdays 12-1 pm – Chadwick Building, Muspratt Lecture Theatre.

NOTE: Some time slots will not be used, please check announcements and emails regularly for updates.

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Module structure

Assessment

Written exam:

- Final written exam (3 hours) at the end of semester 2, with resit in August;
- It covers both part A and B (Instrumentation and Control);
- It is worth **95%** of the final mark.

Lab activity:

- One lab experiment in Semester 2 (Part B);
- It is worth **5%** of the final mark.

Module structure

Learning resources (Part A)

Lecture slides:

- PowerPoint slides used for lectures and tutorials will usually be uploaded in VITAL a few days before each lecture.

Tutorial sheets:

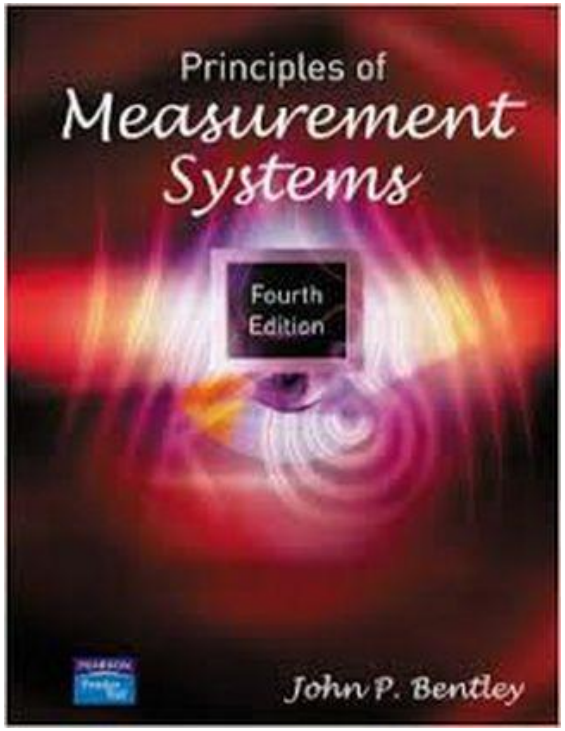
- At least 4 tutorial sheets will be provided during the module, with both theoretical questions and numerical problems similar to exam questions;
- Step-by-step solutions to numerical problems will be provided a week later.

Textbooks:

- Electronic versions of all recommended textbooks are available in the library and accessible through the Reading List in VITAL.

Reading list – Part A

Key textbooks (1)



Bentley

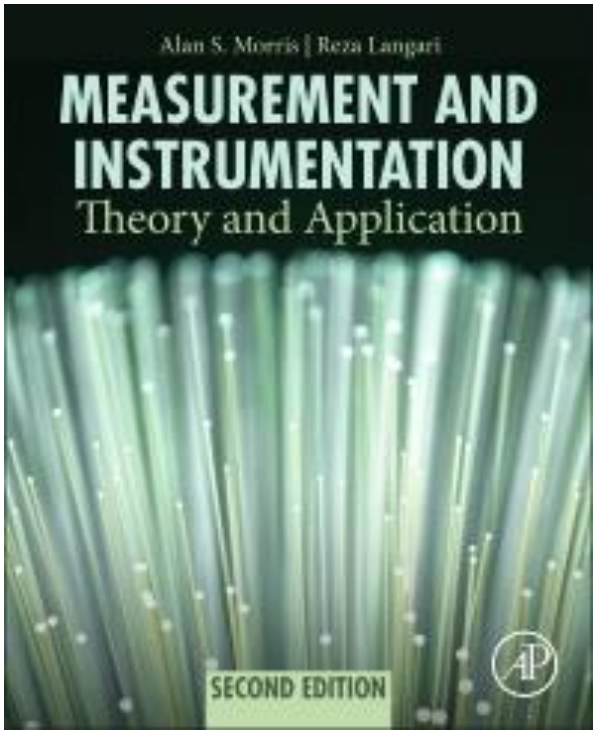
Principles of Measurement Systems, 4th ed.

Pearson, 2005

NOTE: Both the **e-book** and printed copies are available in the library, so there is no need to purchase this textbook.

Reading list – Part A

Key textbooks (2)



Morris, Langari

Measurement and Instrumentation: Theory and Application, 2nd ed.

Academic Press, 2015

NOTE: Both the **e-book** and printed copies are available in the library, so there is no need to purchase this textbook.

Reading list – Part A

Other recommended textbooks

- Dunn
  Fundamentals of Industrial Instrumentation and Process Control
  McGraw-Hill, 2005

- Fraden
  Handbook of Modern Sensors: Physics, Designs, and Applications, 4th ed.
  Springer Verlag, 2010

- Boyes
  Instrumentation Reference Book, 3rd ed.
  Butterworth-Heinemann, 2003

NOTE: These textbooks are not essential for the module, but can be used for additional reference.

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