



Tópicos Especiais I: Data Acquisition with Arduino Microcontrollers

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Content:

1. Introduction to data logging with Arduino microcontrollers
 - Quick history of automated data acquisition
 - What are microcontrollers and why are they important to data acquisition
 - Arduino microcontroller system overview
 - What makes Arduino different from normal microcontrollers?
 - Capabilities and limitations of the Arduino UNO
 - Digital and analog input/output signal characteristics
 - System power
 - Distribute class supplies, each student will receive:
 - Arduino UNO, battery pack, display, data storage module and memory, clock circuit, relay module, various electronic components, circuit prototyping supplies, multimeter, and various sensors.

2. Connecting Arduino to a computer
 - Structure and shortcuts for easy programming
 - PC based debugging
 - Programming components; variables, loops, conditional statements, built in functions, and useful libraries.

3. Circuits for data acquisition and control
 - Overview of kit components
 - Introduction to Electronics: Review; Ohm's law, resistor networks, etc.
 - Build and test several circuits on breadboard:
 - Voltage dividers and thermistors
 - LED current limiting circuit
 - Relay control, relay-capacitor circuits, etc.

4. Self-guided exercises using the above circuits combined with Arduino microcontroller

- Step-by-step instructions (with pictures)

5. Assembly and programming of data loggers component one-by-one

- User input buttons
- Real time clock for logging data time stamps
- Data storage, retrieval, and analysis
- Digital display
- Relay module for controlling high power systems
- Combining all components into one data logger and integrating programming components
- Test and debug a data logger
- Extra exercises
- How to deal with different sensor types
- Integrating Arduino with a PC
- Processing programming language example
- Quick project to assess what learned

Recommended references:

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