Engineering Tripos Part IIA Project, SB3: Data Logger, 2017-18

Leader

Dr I C Lestas [1]

Timing and Structure

Thursdays 11-1pm and Mondays 9-11am plus afternoons

Prerequisites

3B1 / 3B2 advised

Aims

The aims of the course are to:

- To introduce electronic system design concepts.
- To gain familiarity with computer-aided design methodology required for electronic system realisation.
- To gain experience in testing and performance evaluation of electronic systems.

Content

This project is based on designing an electronic system which can capture data and store/process it on a PC. It is intended to serve as a practical introduction to a number of aspects of embedded electronic system design and to result in the development of a prototype electronic product.

The project will utilise a microcontroller development board and custom hardware to produce a prototype device. There is a free choice of application, but all projects involve the design and implementation of analogue data capture electronics, firmware for the microcontroller, a communications protocol, and a Windows application.

A reference design will be provided to the students in the first instance. By the first week, students will have constructed and tested a simple device which can demonstrate PC-control (via blinking a LED) and read a voltage and display it on their PC. All source code is provided for this reference design. The ultimate goal is to build PC-based application, for example a digital/analogue oscilloscope. The second week will be spent on deciding on the system specifications (eg. the voltage range, frequency range etc in the case of an oscilloscope), functions (eg. gain control, offset control, triggering, etc) and data processing (eg. on-screen measurement, fast fourier transform). The students will then need to produce a design for their specification and a bill-of-materials (on a fixed budget). This must be submitted during the second week. The last two weeks will be based on the implementation and testing to specification of the prototype. The end result of the project is a portable data logger-based device which students can take home and use on their own PC.

This project will involve analogue and digital electronic hardware design. There will also be a significant amount of software development with respect to microcontroller firmware and Windows application software, mainly in C/C++. Some prior experience of one or more of these areas would be useful.

FORMAT

Students will work in groups of two, with each group designing and testing their own data logger.

ACTIVITIES

Week 1:?Build and test your reference design data logger

Week 2:?Specification issue, design (circuit, comms protocol, Windows application interface) and bill of materials (interim report).

Week 3:?Circuit construction and test.

Week 4:?Final testing and demonstration of data logger (final report).

Coursework

Coursework	Due date	Marks
First report	end of week 2	10
Demonstration	end of week 4	30
Final report	4pm end of week 4	40

Examination Guidelines

Please refer to [Form & conduct of the examinations](#) [2].

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