



Department of Electronic Engineering

2019/20 assessment for ELE00040I: Design, Construction and Test

Important information:

This assessment has been reviewed and where appropriate updated in the light of the COVID-19 situation. Please read it carefully and if you have any questions please send an email to both Martin Robinson and Dave Pearce.

Assessment weighting and submission details:

This assessment **Coursework** contributes **100%** of the assessment for this module.

Clearly indicate your **Name** on every document submitted.

All assessment submissions are subject to the Department's policy on plagiarism and, wherever appropriate, will be checked by the Department using Turnitin software.

Submission is via the VLE and is due by **12:00 noon** on **28 April 2020**.

Summary information regarding assessment review in light of COVID-19 situation

The original assessment specification has been amended as follows:

See details in the text box on the next page.

Summary of Changes to this Assessment

In response to the Covid-19 situation, and because access to labs has been removed, this assignment has been reissued to make the following changes:

- Group demonstration removed (due to no lab access)
- 100% Individual Report
- Acknowledgement that full implementation is not possible
- Allows you to *plan* your product in detail if not yet complete
- More emphasis on personal contribution
- Room for reflection on group processes in extraordinary times.

These changes allow us to:

- Ensure you meet the learning outcomes even with reduced lab time
- Give you credit for work done, and plan for work not done
- Let you complete the assignment remotely.

Changes are noted in **red italic text** throughout this revised assignment.
Explanations are in **Blue italic text**.

1. Assignment Structure

This assignment contributes 100% towards the module mark and consists of group work with individual submissions. The assignment consists of an **individual report (100%)**, which is *not* anonymous.

1.1 Assignment Task

Your task is to design, develop and **test as far as possible** a microprocessor-based digital multimeter which **(in its full implementation, not necessarily completed in the time allowed):**

- Can measure component and circuit parameters including voltage, current and resistance
- Will accept DC and AC inputs
- Provides measurements to a specified level of accuracy and precision
- Is usable by the operator
- Has been designed with consideration to sustainability and waste management.

You are to work in a group following the principles covered in the associated project management lectures. The aim of the group work is to give you practical experience of working in teams on a complex task, where you each are assigned specialist roles or areas of responsibility.

Part of the assignment involves an element of peer assessment, which is outlined later in this document. A good group will work together consistently throughout the project period, will have good procedures and management in place, will allocate and monitor individuals' workload and contribution throughout the process, ***and will cope with and adapt to unforeseen changes (minor or major).***

1.2 Technical Research

This assignment scenario has been set up to emulate the conditions that you might find in a company where you are given a complex technical task to carry out, but you do not currently have training in all of the required technical areas. In order for you to carry out this task effectively, you will need to:

- Find out about how analogue-to-digital conversion can be implemented on a microprocessor
- Read up on how the STM32F4 microprocessor (and its ARM Cortex-M4F core) operate.
- Investigate how to design and build a digital multimeter with appropriate input ports and a user interface.

This will give you insight into how test equipment companies produce professional instrumentation for electronic measurements. You may wish to take this further than the basic V, I and R measurements if you have time / interest. For instance, you could look into averaging functions, or an alarm feature.

In making the above choices you should aim to strike a balance between:

- Engineering ambition and challenge
- Ensuring that you can get something working
- Crafting a usable product that enables the user to make the measurements of electrical parameters and which would be sustainable in long-term use
- ***Creating a detailed plan of how a final product would be implemented.***

1.3 Product Design

You should think about the target users for your system, and design the user-interface accordingly. Use this information to construct a marketing plan for the product (Who would buy this and why? What price point would be suitable? How would the customers first hear about the product? etc.) What instructions will they need for setting up and using the system?

2. Assignment Deliverables

2.1 Individual Report (**100%**)

This report must be written individually and should detail your individual contribution to the project, as well as describing the group work as a whole. Details of contents are listed in the marking scheme below. The report should be *between 8 and 15 pages* in length including illustrations, code or circuit diagrams etc. Even though you will have been working on a good deal of technical material it is always important as engineers to be able to summarise a whole project in an Executive Summary. This report assignment gives you practice and feedback on that skill.

2.2 Report Format & Structure

Please produce a PDF file for your report, using 2cm margins all round, 12-point text (Times New Roman), single line spacing, paragraph justified to both margins.

The report should contain a front page with the following information:

- Title,
- Department,
- Date,
- Group Number,
- Members
- Your Name

3. Individual Report Details and Marking Scheme

3.1 Summary of the Group's Product (40%)

- **Product concept** (Main aim, who it's targeted at, marketing ideas, work breakdown) (10%)
- **Description of entire system** (Technical overview, specification, use of ADC, details of constructing your prototype) (10%)
- **Analysis of effectiveness & Future plans** (*achievements against specification, description of test strategy and results, quality of user interfacing, further work needed as a group to complete the product*) (10%). *This has been expanded to allow you flexibility to describe both what you have already done as a group, and what would need to be done in order to complete your product if you had lab access.*
- **Analysis of sustainability** (10%) Describe the impact of your intended product on the environment. Consider the product's entire lifecycle from sourcing components, manufacturing, active operation, and end-of-life (re-use, recycle, disposal). Refer to the official directives on this subject and demonstrate that you understand the effect of your product on the environment and have sought to minimise any negative effects.

3.2 Description of Individual Contribution (40%)

This component has been upweighted to allow you to describe your role, what you've done, and what you would need to do to complete your part of the working prototype.

- Clear statement of individual role and List of contributions to the project **(10%)**
- Technical detail of individual contributions **(30%)** *Here, describe all the work that you have personally contributed (or jointly worked on). If you have managed to produce code and configure hardware, then include code, photos and test data. If, as is likely given the circumstances, you have not managed to **make as much progress as initially expected**, then it is vital that you describe **the progress that you have made, and your plans for future work** in enough technical detail that someone else could **complete the work** in a well-equipped laboratory. For this, you should contemplate including some of the following as appropriate:*
 - *Pseudo-code and flowcharts*
 - *Written (but as yet untested) code*
 - *Test plans*
 - *Circuit diagrams*
 - *Circuit simulations*
 - *A consideration of how well your design has been implemented.*

3.3 Reflective summary of group work – including Peer Review (see below) (10%)

Reflect on and summarise how well your group was structured, and how well it worked in practice. Reflect on your time management and project planning, especially in the light of the major unforeseen circumstances that have occurred since you have started the project. How has your group coped with the change, shown resilience, and reconfigured its working operations? Include any Gantt chart or Work Breakdown Structure that was produced at the start and comment on your progress against it. Did your Risk Register help you mitigate this problem?

After your reflective summary, please give a mark to ALL students in the group, including yourself, as if you had 100 shares to distribute. Allocate shares according to your perception of the effort, effectiveness and overall contribution to the group that each individual made over the lifetime of the project. For example, if you believe that the 5 students in your group worked equally well, then allocate them 20 each. However, a distribution of 40, 20, 20, 20 0 implies that the first student contributed twice as much as the next three, and the final student contributed nothing.

Please add a short paragraph for each student justifying your share allocation.

These reviews and share allocations are private and will not be fed back to the other group members. They will be used to inform the marking panel about the perceived effectiveness of individual contributions to the group. The marking panel will allocate marks based on the description of the individual work, moderated by the perceived effectiveness of each group member as described by the other members of the group.

3.4 Overall Appearance and Structure (10%). Try to produce something that you'd be comfortable passing on to your boss, after you have been asked for a report on a recent project.

This article summarises some of the key features of writing a summary report for your boss:

<https://bizfluent.com/how-7883364-write-report-boss.html>

Do some research on different possible layouts for your report. The following reference gives some useful templates for technical reports:

<https://www.examples.com/business/technical-report-writing-samples-pdf.html>

4. Submission

Your individual report - in PDF format - should be uploaded to the VLE by the date shown on the front cover.