Electronic &
Electrical
Engineering

EEE163 System Design Analysis

Light Bulb Laboratory Sheet

Introduction

In these laboratory classes you will be analysing the design of an electronic/electrical product. This document contains general information about the lab session and further information about the specific product – a modern light bulb.

Aims

The aim of the EEE163 laboratory sessions is to allow you to explore the design, manufacture and functioning of electronic/electrical systems. By the end of the laboratory sessions you will have an appreciation of the way in which electronic systems are put together. The knowledge gained will be relevant background material to many other modules on your course. The laboratory sessions are highly investigative by nature – we want you to explore the system and to think about what you find.

Groups

You will work in groups of three/four. Your group allocation will be decided for you. If you have any overriding objection to your group allocation, please contact one of the demonstrators.

Method

Within your group you will be given an item of electronic/electrical equipment. Your task is to 'reverse engineer' the product and answer the generic questions listed below and further questions specific to your product.

You are encouraged to *carefully* dismantle the product, using the tools at your disposal. Some extra 'specialist' tools are available from the demonstrators. Make notes about the order in which you dismantle the product (taking photos may help!). Once you have dismantled the product and made your analysis you should attempt to reassemble the product. In some cases it may be necessary to irreversibly break the product in order to dismantle it. This is OK, but please check first with a demonstrator, in case there is a less-drastic alternative.

Internet access is available in the lab. Please use it to find data sheets, etc if necessary.

Please use your laboratory books for all working. These will be examined.

Safety

Wear safety glasses whilst disassembling and reassembling products, since parts may fly-off at high speed.

Do not use excessive mechanical force – if you are stuck, consult a demonstrator.

Use the fume extractor unit when soldering and be careful to avoid burns.

Do NOT connect the product or any sub-components to mains power.

If using the 12V DC power supply, check wiring with demonstrator beforehand. Do not touch anything while power is on. Wear safety glasses.

Some of the products may be factory-sealed units, in which case you will need to ask for assistance to break in to them. Do NOT smash the glass!

Support

A number of demonstrators will be available during the lab classes to help you with your work. In addition, technical support will be available if you need help with disassembly/reassembly of any components.

Assessment

Towards the end of the lab class each student will be given a specific question(s) to research. They will be expected to report back their findings to a demonstrator at the start of the following lab class, before starting investigation of another product. This report will be given verbally, but should be accompanied by notes in your lab book.

For one of the lab classes (yet to be specified) the verbal report will be replaced by a short written report, submitted at the following lab class.

Towards the end of the course each *group* will be required to present a short verbal presentation on their analysis of a specified product.

Generic Tasks

A	Product name / part number / manufacturer?
B	Function(s) of the product?
C	How does the product achieve this/these function(s)?
D	Construct a diagram describing the function of the system.
E	Devise the method(s) by which the product was assembled.
F	Describe the electrical power source(s) and their distribution.
G	Describe the signal inputs and outputs from the system.
H	Produce a Parts List for the product.
I	Produce a breakdown of the materials used in the product.
J	Suggest likely failure mechanisms for the product.
K	Identify any components that can be replaced or repaired.
L	Is any indication given as to how the product should be recycled?
M	Characterise any printed circuit boards (PCB) in the product.
N	Characterize the assembly of electronic components onto the PCBs.
O	Characterize the electrical/electronic components on the PCB
P	Characterize any actuators or sensors within the product.
Q	Comment on the safety features of the product.
R	Comment on the ergonomics, packaging and appearance of the product.
S	Identify three ‘good’ and three ‘bad’ features of the product.
T	How might the product be made a) more cheaply and b) more reliable?

Extra tasks for Light Bulb

U	This is a comparatively simple electronic system. In place of generic task D see if you can work out the complete circuit diagram.
V	Compare and contrast the packaging and performance of this bulb in comparison to a filament (incandescent) light bulb.