



Electronic &  
Electrical  
Engineering

## EEE163 System Design Analysis

### ***Printer Analysis***

#### *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 printer.

#### *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 questions listed below.

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!). It will probably be necessary to irreversibly break the product in order to dismantle it. This is OK, but please take care. Do not use excessive force and wear the safety goggles provided. If in doubt, ask a demonstrator.

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 the product, since parts may fly-off at high speed. Take especial care with pulleys and springs.

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

Use the fume extractor unit when de-soldering and be careful to avoid burning yourself or your work mates!

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

## EEE163 Lab Sheet for Printer

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

The printer may contain ink cartridges and tubing. Try to avoid making a mess. Again, wear goggles. Gloves will be available if needed.

### 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/sectioning of any components.

### Assessment

Within your group you should address all the tasks listed below. At the start of the next session you will be expected to individually report back your findings on some of the tasks to a demonstrator. This report will be given verbally, but should be with reference to accompanying notes in your lab book.

### Tasks

A	Product <i>name</i> / part number / manufacturer?
B	<i>Function(s)</i> of the product?
C	What <i>physical principles</i> allow the product to achieve this/these function(s)?
D	Construct a <i>diagram</i> describing the function of the system.
E	Devise the method(s) by which the product was <i>assembled</i> .
F	Describe the electrical <i>power source(s)</i> and their distribution. AC/DC? Voltage? Transformers?
G	Describe the signal <i>inputs and outputs</i> from the system. Data bus?
H	Produce a <i>parts list</i> for the product.
I	Produce a breakdown of the <i>materials</i> used in the product.
J	Suggest likely <i>failure mechanisms</i> for the product.
K	Identify any components that can be <i>replaced or repaired</i> .
L	How should the product be <i>recycled</i> ?
M	Characterise any <i>printed circuit boards</i> (PCB) in the product (line width, line pitch, metal thickness, board thickness, number of layers. To help with this, you should ask a demonstrator to help you section one of the PCBs, then examine it using the digital microscope.
N	Characterize the <i>assembly</i> of components onto the PCBs. Surface mount? Through hole? Flip chip?
O	Characterize the printer <i>actuators</i> . How does it achieve its designated print quality (dots per inch - dpi), contrast (greyscale) and colour?
P	Identify all the <i>motors</i> in the product and explain their purpose.
Q	Comment on the <i>safety</i> features of the product.
R	Comment on the aesthetic <i>design</i> , ergonomics, packaging and appearance of the product.
S	Identify three ' <i>good</i> ' and ' <i>bad</i> ' features of the product.
T	How might the product be <i>manufactured</i> a) more cheaply and b) more reliable?

End