

# PX140-6 Electronics Workshop

**21/22**

**Department**

Physics

**Level**

Undergraduate Level 1

**Module leader**

Gavin Bell

**Credit value**

6

**Module duration**

4 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

Electronic instrumentation is widely used in virtually all areas of experimental physics. Whilst it is not essential for all experimental physicists to know how to build every device, it is extremely useful for them to have some knowledge of electronics. This workshop (and the one next year) introduce some of the electronics used regularly by physicists.

[Module web page](#)

### Module aims

To cover the design and operation of some basic electronic circuits and to familiarise students with the electronic instrumentation used to investigate and monitor circuit performance.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The course is taught by a series of 4 workshops each addressing one of the areas identified above. Students are expected to prepare for the workshops by reading the introductory documentation provided.

Workshop 1: The student builds several simple circuits involving voltage dividers, capacitor charging, high and low pass filters and a rectification and investigates their response to applied steady and alternating voltages.

Workshop 2: The student builds a number of simple circuits in which the bipolar transistor is used in constant current, common emitter amplifier and switching circuits, and is shown how to determine some of the component parameters for one of the circuits.

Workshop 3: The student is introduced to the principal characteristics of the operational amplifier (op-amp) and how it can be used in basic electronic circuits such as non-inverting/inverting/summing/differential amplifiers, buffer circuits and integrating/differentiating circuits.

Workshop 4: The student investigates the principal gates used in Boolean digital operations and their combination in logic circuits, and learns how to analyse the switching function of some logic circuits using appropriate Boolean algebra, truth tables and Karnaugh maps.

## **Learning outcomes**

By the end of the module, students should be able to:

- Describe how circuits involving resistors, capacitors and diodes respond to applied steady and alternating voltages.
- Describe n and p-type semiconductors and their application in diodes and bipolar transistors
- Describe the principal characteristics of the operational amplifier (op-amp) and how it can be used in electronic circuits
- Describe the principal gates used in Boolean digital operations and their combination in logic circuits

## **Indicative reading list**

Horowitz and Hill, The Art of Electronics.

## **Subject specific skills**

Practical understanding of simple circuits, transistors, op-amps and digital logic

## **Transferable skills**

Analytical, communication, problem-solving, familiarity with standard equipment

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## **Study**

## **Study time**

<b>Type</b>	<b>Required</b>
Practical classes	4 sessions of 5 hours (33%)
Private study	40 hours (67%)
Total	60 hours

### **Private study description**

Preparation for each workshop, analysing results, completing lab book, preparing for final test

### **Costs**

No further costs have been identified for this module.

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### **Assessment**

You do not need to pass all assessment components to pass the module.

#### **Assessment group A1**

	<b>Weighting</b>	<b>Study time</b>
Electronics workshop	80%	
Assessment of 4 workshops based on lab book		
Online Quiz	20%	
Timed test of understanding		

#### **Feedback on assessment**

Face-to-face discussion with markers.

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### **Availability**

#### **Courses**

This module is Core for:

- UPXA-F300 Undergraduate Physics (BSc)
  - Year 1 of F300 Physics
  - Year 1 of F300 Physics
  - Year 1 of F300 Physics
- UPXA-F303 Undergraduate Physics (MPhys)

- Year 1 of F300 Physics
- Year 1 of F303 Physics (MPhys)
- Year 1 of UPXA-F3N1 Undergraduate Physics and Business Studies
- Year 1 of UPXA-F3N2 Undergraduate Physics with Business Studies