

# ***GCSE Electronics - Volume One - Foundations for Electronics***

## **Course Summary Sheet**

### **General Overview**

Comprehensive delivery of the course material is achieved through dividing the content into five sections. The student is encouraged to work through each section, rather than rapidly move from one to another, thus maintaining cognitive flow. The text is fully narrated and supported by high quality graphics and 3D animations.

Virtually immediate feedback is given by means of regular tests with questions chosen at random from a computer-stored list. Worked solutions are available when required. Mock examinations consist of 6 short papers each of 5 questions. Following computer assessment, model solutions may be viewed. Unlimited attempts at each paper are possible.

The Construction Laboratory takes students through a construction project step by step, allowing interactivity in testing the circuit. The working of the circuit is thoroughly explained in a stimulating manner supported by high quality graphics.

### **Course Material Overview**

#### ***Section 1: Electricity and Electronics***

##### **Material Covered**

- Implications of Electronics
- Electricity as the movement of free electrons
- The atom
- Conductors and Insulators
- Batteries
- Conventional and electron current flow
- Voltage
- DC and AC
- Simple electric circuits
- Switches
- Ohm's Law:  $V=IR$

##### **Interactive Exercises**

- Virtual Ohm's Law experiment
- Manipulate switching circuits
- Multiple choice test
- Numerical questions with worked solutions provided when required

#### ***Section 2: Networks of Resistors***

##### **Material Covered**

- Series and parallel connections
- Voltage in a series circuit
- Current in a parallel circuit
- Product over sum rule
- Resistors of the same value in parallel
- Combined series parallel circuits
- Effect of length and csa on resistance
- Resistivity of materials
- Variable resistors
- Electrical Power:  $P=VI=I^2R$
- Power rating of components
- Resistor colour code

##### **Interactive Exercises**

- Numerical calculations with worked answers provided if required.
- Multiple choice questions
- Placing a meter at points in a circuit

## **Course material Overview (cont'd)**

### **Section 3: *Semiconductors***

#### **Material Covered**

- Diodes: Forward and reverse bias
- Zener diodes
- Light emitting diodes
- Light dependent resistors
- Thermistor
- Transistors: the bipolar junction transistor; the transistor as a switch; Currents through transistors
- Thyristors

#### **Interactive Exercises**

- Numerical calculations with worked answers.
- Virtual diode characteristics experiment
- Virtual thermistor characteristics experiment
- Drag and drop labelling of transistor

### **Section 4: *Capacitors, Inductors and Relays***

#### **Material Covered**

- Construction of capacitors
- Units of capacitance
- Electrolytic capacitors
- Charging a capacitor
- Energy storage
- The time constant
- Construction of Inductors
- Reactance of capacitors and inductors
- Variation of reactance with frequency
- The relay and its uses
- Relays in electronic circuits
- Time delay circuits

#### **Interactive Exercises**

- Numerical calculations with worked answers.
- Multiple choice questions

### **Section 5: *Transducers and Systems***

#### **Material Covered**

- Input and output transducers
- Transducers in electronic circuits
- Designing circuits
- Alarm circuits: “too dark”; “too light”; “too hot”; “too cold”;
- More advanced systems as “input-process-output”

#### **Interactive Exercises**

- Multiple choice questions
- Interactive circuit examples

## **Construction Laboratory**

Students are shown the steps involved in producing a working electronic circuit. Component layout on prototype board (breadboard) and stripboard is shown and the use of the necessary tools is explained with the support of numerous detailed photographs. The operation of the circuit (a sensor with transistor-operated relay latch and reset switch) is explained in detail. An interactive exercise allows the student to test the circuit operation.