



# Electronics

OPTION - ELECTRONICS	Content
Year 10 HT 1	Operational Amplifiers: Theory lessons will involve students in investigating the function and use of operational amplifiers - inverting, non-inverting and summing amplifiers. Gain calculations, determining the amplifier bandwidth, and how to avoid signal clipping of AC signals at the output. Modelling will involve both software (Circuit Wizard) and hardware techniques. Students will take measurements comparing practical results against the circuit calculations.
Year 10 HT 2	Resistive Components in Circuits: Students will be investigating the use photosensitive devices, ntc thermistors, pressure, moisture and sound sensors, switches, potentiometers and pulse generators in circuits. Designing and testing sensing circuits using these components by incorporating them into voltage dividers - calculating the volt drop across resistors and sensors using the voltage divider equation. Investigate the use of switches and pullup or pull-down resistors to provide correct logic level/edge-triggered signals for logic gates and timing circuits Determine the value of a current limiting resistor for LEDs in DC circuits.
Year 10 HT 3	Switching Circuits: Students will describe and analyse the operation and use of n-channel enhancement mode MOSFETs and npn transistors in switching circuits, including those which interface to outputs. Students will investigate the operation and use of voltage comparator ICs. Use component data sheets to design switching circuits using MOSFETs, npn transistors and comparators.
Year 10 HT 4	Applications of Diodes: Students will plot the I-V characteristics of a silicon diode on a graph. Use of diodes for component protection in DC circuits and half-wave rectification of AC circuits to prevent microelectronic circuits from the reverse polarity of power supplies. Practical investigation using breadboard of the use of zener diodes in voltage regulation circuits.
Year 10 HT 5	Students will develop the interpretation of electronic circuit diagrams into a working circuit using their choice of breadboard or stripboard. Circuit calculations and predictions compared against circuit measurements. Theory unit will cover digital logic gates including the designing logic gate circuits from a truth table, Boolean algebra, and simplifying circuits through NAND gate redundancy. Use of pull-up or pull down resistors to provide the correct voltage/logic level at the input to logic gates. Function of logic gate circuits will be investigated through use of simulation software.
Year 10 HT 6	Students will be constructing and comparing the performance of combinational logic circuits using NOT/AND/OR/NOR/NAND, designing through hole PCBs using simulation software. Application of the semiconductor diode in power supplies including half and full wave rectification from an AC signal to a DC signal for use with domestic and handheld electronic devices.
Year 11 HT 1	NEA Practical Assignment: Students will be designing the electronic system commencing with a block diagram then progressing to designing and testing the function of each block comprising the system. Modelling will involve both software (Circuit Wizard) and hardware techniques. Theory lessons will involve students in investigating the function and use of operational amplifiers - inverting, non-inverting and summing amplifiers.
Year 11 HT 2	NEA Practical Assignment: Students will be continuing with the designing, and simulation testing of the Input / Process / Output modules of the electronic system. This will lead to the conversion of the complete circuit into a layout for the manufacture of the Printed Circuit Board. Theory lessons will involve students investigating the Schmitt inverter and its use in debouncing signals produced by mechanical switches and analogue sensors.
Year 11 HT 3	NEA Practical Assignment: Students will be developing the layout of the PCB for economic manufacture i.e. eliminating unnecessary space. Describing the development process and producing a costing for the electronic system. Manufacture of a through hole PCB using chemical etching method. Theory lessons focus on the comparison of the properties of transistors, comparators and Schmitt inverters as interfaces between analogue and digital systems.
Year 11 HT 4	NEA Practical Assignment: Students soft soldering the on board and off board components on the PCB including flying wires and shrink wrapping. Measuring and evaluating the performance of the electronic system against the design specification and suggest improvements to the electronic system. Theory lessons focus on control circuits and the use of microcontrollers as a programmable integrated circuit, integrating sensing circuits and output devices. Designing and analysing flowchart programs to enable microcontrollers to perform tasks.
Year 11 HT 5	Revision and Preparation for the external examinations: Component 1 - Discovery of Electronics Component 2 - Application of Electronics