UK Electronics Skills Foundation

Logic and Arithmetic
Student Guide

A-Level Computer Science
Electronics Kit

www.ecs.soton.ac.uk/kits
AND gate \[ Y = A \cdot B \]

OR gate \[ Y = A + B \]

NOT gate \[ Y = \overline{A} \]

NAND gate \[ Y = \overline{A \cdot B} \]

NOR gate \[ Y = \overline{A + B} \]

XOR gate \[ Y = A \oplus B \]
The Logic and Arithmetic kit allows exploration of Boolean operations, logic gates and base 2 (binary) number systems in the context of electronic engineering. It is split into two sections: ‘Logic’ and ‘Binary Arithmetic’, with Light Emitting Diodes (LEDs) used to indicate logic states throughout.

**Logic Section**

- By connecting logic gates together, and connecting them to inputs and outputs, you can explore their properties and implement simple logic functions and circuits.
- *Logic gates are the building blocks of digital electronics and computers. Did you know that modern CPUs contain hundreds of millions of logic gates, all squeezed into a few square centimetres?*

**Binary Arithmetic Section**

- An 8-bit two’s complement adder/subtractor circuit allows experimentation with both unsigned and signed Boolean arithmetic.
- *Adding and subtracting signed numbers are just two of many functions that processors can perform. How would you design a circuit to multiply two binary numbers?*
Electronic Engineers apply Maths and Science to use components like these to design and build complex systems such as smart phones and computers. Exciting developments in Electronics mean we can develop innovative products and help transform the way we live; from healthcare and energy to entertainment.

**UKESF**

In the UK, the Electronics sector is big, valuable and growing; however, the demand for capable, employable graduates is currently outstripping supply. The UKESF is an educational charity that operates collaboratively with major companies, leading universities and other organisations to tackle the skills shortage.

www.ukesf.org | info@ukesf.org
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**University of Southampton**

- Ranked in the top two for Electrical and Electronic Engineering for nearly a decade (Guardian University Guide).
- Offering a range of degrees in electronic and electrical engineering, including mechatronic, aerospace and biomedical electronics.
- A research led degree including advanced theory underpinned by practical experiments and project work in our £8M+ teaching labs.

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**Find out more**

For more resources, including tutorials on how to use the board, videos related to the concepts and technologies used, visit: www.ecs.soton.ac.uk/kits