

# 物聯網應用 Internet of Things (IoT) Application



- 含豐富的軟硬件資源  
Rich in hardware and software resources
- 採用Blynk + mBlock + Arduino實作的方式  
Practical implementation of Blynk, mBlock & Arduino
- 深入淺出地學習各項硬件原理和編程技巧的實際應用  
To learn hardware principles and practical programming skills easily
- 教學材料採用開放源碼軟硬件  
Teaching materials are developed using open-source hardware and software
- 可配合校本課程修訂教學內容及STEM學習活動  
The teaching content and STEM learning activities can be customized to cater for the school-based curriculum



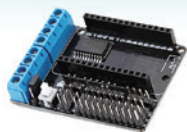
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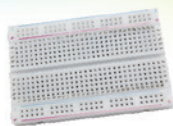
# 主要零件 Key Parts



NodeMCU開發板 (連USB線)  
NodeMCU Development Board (with USB Cable)



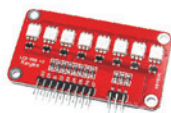
ESP-12E電動機驅動擴展板  
ESP-12E Motor Shield Board



麪包板  
Breadboard



SG-90伺服電動機 (180度轉動)  
SG-90 Servo Motor (180-degree Rotation)



8路5050 RGB LED流水燈模組  
8 RGB LED Line Module 5050



15cm杜邦線 (公對公、母對母)  
15cm Jumper Wires (M/M, F/F)



DHT11溫濕度感應器模組  
DHT11 Humidity & Temperature Sensor Module



GY-30 BH1750光強度模組  
GY-30 B1750 Light Intensity Module



MQ-3 氣體感應器模組 /  
MQ-3 Gas Sensor Module



5V直流散熱風扇  
5V DC Cooling Fan



5V 5050 RGB LED燈帶 (15cm)  
5V 5050 RGB LED Light Strip (15cm)



電阻 (220歐姆/1000歐姆)  
Resistors (220Ω/1000Ω)



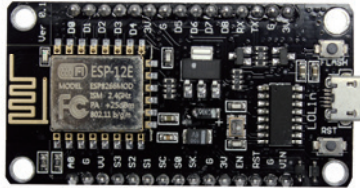
4節AA電池盒 (連開關)\*  
4-AA Battery Holder (with switch)

\* 4粒AA電池不包括在套件內

## 重要零件介紹 Introduction to Major Parts

### NodeMCU 開發板

#### NodeMCU Development Board

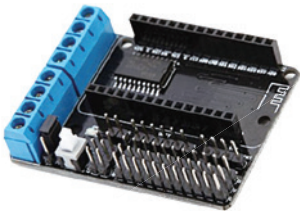


NodeMCU（一個開放源碼韌體）開發板包含 ESP8266 Wi-Fi 晶片，該晶片適合於開發 IoT（物聯網）應用。我們可在 Arduino 的開發環境 (IDE) 開發 NodeMCU 的應用。

NodeMCU (an open source firmware) Development Board includes an ESP8266 Wi-Fi enabled chip that helps to develop IoT (Internet of Things) applications. We can develop applications on NodeMCU using Arduino IDE.

### ESP-12E 電動機驅動擴展板

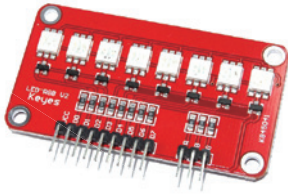
#### ESP-12E Motor Shield Board



這個擴展板模組採用大功率驅動晶片 L293DD，可直接驅動 2 個直流電動機或者 1 個步進電動機。驅動電流最大可以達到 1.2A，適用於推動電壓及電流需求較高的設備。

This shield adopts a high-power chip L293DD which can directly drive two DC motors or one stepper motor. The maximum driven current is 1.2A. It is suitable for driving devices of higher voltage and current requirements.

## 8 路 5050 RGB LED 流水燈模組 8 RGB LED Line Module 5050



「R」、「G」和「B」分別代表紅、綠和藍 3 種顏色。模組可直接連接到 Arduino 開發板上使用，而且不需額外接駁電阻。LED 亮着的顏色會跟據模組的 3 個針腳所接駁的數位腳位的 PWM 訊號變化。8 顆 LED 各有 1 個針腳獨立 (D0-D7) 控制開關，配合不同的程式碼即可控制燈塊顯示各種的燈光效果。

“R”, “G” and “B” represent red, green and blue respectively. This module can be directly used with an Arduino development board without additional resistors. The colour of each LED depends on the PWM signal variation of the digital pins connected to the module’s 3 pins. Each of the 8 LEDs has an independent pin (D0-D7) for on-off control and lighting effects can be controlled by different programs.

## GY-30 BH1750 光強度模組 GY-30 BH1750 Light Intensity Module



GY-30 模組的主要部份包括 BH1750 晶片、可連接至 NodeMCU 和改變 GY-30 模組的 I<sup>2</sup>C 地址的腳位。當中的 BH1750 晶片的靈敏度高，在指定範圍內可檢測到 0 - 65535 Lux (或 lx) 的光線，而解象度可準確至 1lx。

GY-30 module consists of a BH1750 chip and pins that can be connected to NodeMCU and change the I<sup>2</sup>C address of the module itself. The BH1750 chip has high sensitivity which allows it to sense light within 0-65535 Lux (or lx) within a particular scope and provide us with a high resolution, 1 lx.



## 5V 5050 RGB LED 燈帶 5V 5050 RGB LED Light Strip



此燈帶附有多顆 5.0mm x 5.0mm 的 LED 晶片並以 5V 電壓運作。它的開關功能可由腳位控制，而輸出的光度則可由 PWM 訊號控制，能調較出適合不同環境的光強度。

This light strip contains several 5.0mm x 5.0mm LED chips and operates in 5V. It can be turned on/off through pins while its luminosity is controlled by the PWM signal. This light strip is suitable for different light intensity environments.

## MQ-3 氣體感應器模組 MQ-3 Gas Sensor Module



MQ-3 氣體感應器模組只對乙醇蒸氣敏感，檢測範圍在 0.1 至 10mg/L 之間。模組一般會應用於測試酒精濃度而不適合用作檢測易燃氣體之用。它的電導率隨乙醇蒸氣濃度的改變作出的變化。故此，我們可以透過由電導率轉換成與乙醇蒸氣濃度相對應的輸出訊號來得知乙醇的濃度。

MQ-3 Gas Sensor Module is only sensitive to ethanol vapour within a detection range of 0.1 to 10mg/L. In general, this module is used for measuring alcohol concentration and unsuitable for detecting inflammable gases. Its electrical conductivity varies with the concentration of ethanol. The concentration reading is converted from the signal of electrical conductivity.

## 直流散熱風扇 DC Cooling Fan



直流散熱風扇是一件耗電量低的電器。它主要由直流電動機、電磁鐵線圈和扇葉組成。它的運作原理是透過電流使磁鐵相吸相斥和磁極轉換，令電動機轉動，從而帶動扇葉運轉。它的其中一個優點是電磁干擾量低，能減少為其他對電磁敏感的電器造成干擾。

A DC cooling fan is an electrical appliance with a low power consumption. It contains a DC motor, electromagnetic coils and blades. It works by the principle that the current in the coil causes magnetic attraction and repulsion and changes magnetic poles, so that the motor rotates and the blades spin. One of the advantages of using a DC cooling fan is a minimal electromagnetic interference, which prevent disruption to other sensitive electronic appliances.

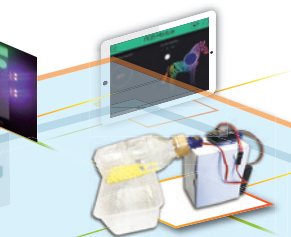
## 程式語言 Programming Language

Scratch 程式語言是由 MIT 開發的免費教學用程式語言，特別為中小學生而設計。Scratch 使用圖形化的積木編程界面，簡單易用。

參考書目：① PA01 Scratch 初階；② PA02 Scratch 進階

Scratch is a free educational programming language that was developed by MIT and geared towards kids ages 8-16. Scratch's drag-and-drop programming blocks can fit into each other like jigsaw puzzle pieces.

Reference Books: ① PA01 Scratch: Basic Skills ; ② PA02 Scratch: Advance Skills



# 產品特色 Product Features

## 1. 詳盡自學教程 Detailed Self-Learning Tutorial

- 資料詳盡，鼓勵自主學習。  
Detailed information is provided to encourage self-directed learning.
- 涵蓋多個學科的知識和技能，實踐跨學科學習。  
Covers knowledge and skills of various subjects and practises interdisciplinary learning.
- 教程支援電腦、平板及智能手機，方便易用。  
Tutorial supports different devices including computers, tablets and smartphones.
- 教程另備Word格式，教師可配合校本課程修訂教學內容。  
Tutorials are prepared in Word format. Teachers can adjust the teaching content according to school-based curriculum.

## 2. Scratch 語言教學 Scratch Programming Language

- 採用流行、簡易並免費的 Scratch 程式語言來進行教學，學與教更簡便。  
Scratch, a popular, simple and free programming language, is used, which makes learning and teaching easy.
- 特別加入與硬件相關的編程技巧。  
Hardware-related programming skills are covered.

## 3. 開放源碼的軟硬件 Open-Source Software & Hardware

- Arduino 和 mBlock 都是開放源碼的，教師可以按校本需要調整內容。  
Arduino and mBlock are open-source, teachers can adjust the teaching content according to school needs.



# 教材和學材 Teaching and Learning Materials

## 1. 基礎知識 Basic Knowledge

- 附多個基礎知識教程，即使完全不懂 mBlock 和電路，也能輕鬆學習。教師可根據學生的水平，靈活調適教程。

Basic knowledge tutorials of mBlock and electric circuit are provided for beginners. Teachers can adjust the curriculum according to needs.

## 2. 自學教材 Self-Learning Guide

- 每個專案都有詳盡的自學教材，鼓勵自主學習。

Each project contains detailed self-study materials in order to encourage self-study.

## 3. 資源檔案及建議答案 Resource Files & Suggested Answers

- 全部與編程有關的作業均配備相關的資源檔案及建議答案。

All assignments related to programming are provided with relevant resource files and suggested answers.

## 4. DIY 內容 DIY Materials

- 為專案提供設計圖檔，讓學生發揮創意，自行美化作業。

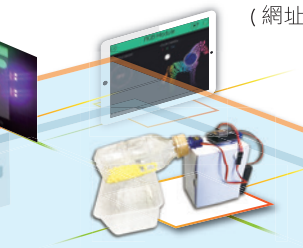
Layout files are provided for the projects, so that students can touch up their assignments.

## 5. 互動光碟及專用網站 Interactive CD-ROM & Companion Website

- 光碟和網站均提供完整的教材和學材，方便備課、教學或自學。

A CD-ROM and a website with full teaching and learning materials are provided.

(網址 Website : <http://www.apricot.com.hk/stemkit/>)



## 專案一：物聯網應用（上） Project 1: IoT Application (1)

同學會學習使用 Blynk 應用程式以無線網絡遙控寵物餵食器和 RGB 流水燈模組。

Students will learn how to use the Blynk app to remotely control a pet feeder and a RGB LED line module.

## 專案資源 Project Resources

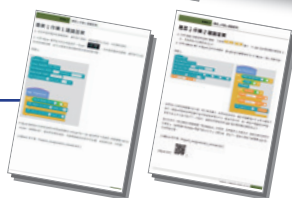
自學教材  
Self-Learning Guide



資源檔案  
Resource files



建議答案  
Suggested Answers



DIY 內容  
DIY Materials



## 專案一：物聯網應用 (下)

### Project 2: IoT Application (2)

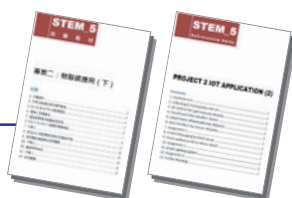
此專案會利用雲端小型氣象監測站、智能家居易燃氣體偵測助理和智能照明系統為例子，向同學說明利用物聯網收集及儲存數據的方法。

In this project, a cloud-based mini weather station, a smart home inflammable gas detector and a smart lighting system will be used as examples to illustrate how IoT collects and store data.

## 專案資源 Project Resources

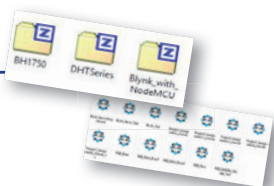
自學教材

Self-Learning Guide



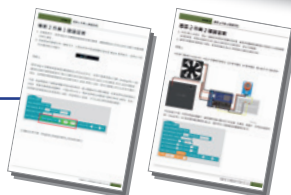
資源檔案

Resource files



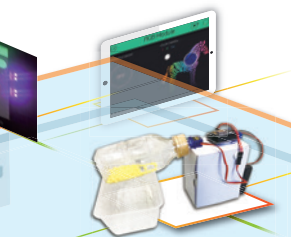
建議答案

Suggested Answers



DIY 內容

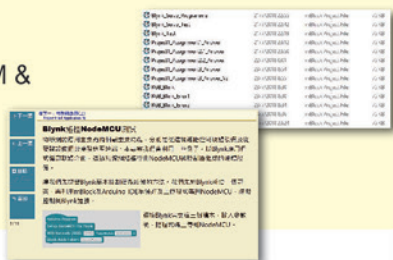
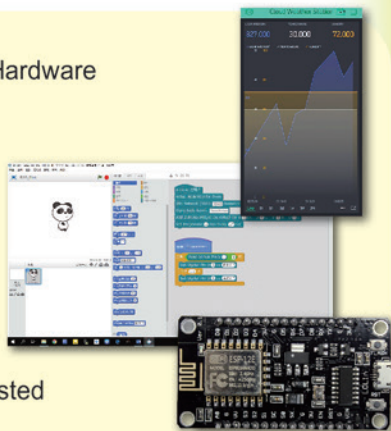
DIY Materials



本教學套件為配合教育局推行的STEM教學而設計，適合中小學生使用，學與教材料齊備，方便作課堂教學、專題研習或自主學習之用。

## 產品特色 Product Features

- 開放源碼的軟硬件 Open-Source Software & Hardware
- 詳盡自學教程 Detailed Self-Learning Tutorial
- 採用Scratch語言教學 Scratch Programming Language for Teaching
- 提供活動相關的基礎知識 Related Basic Knowledge Provided
- 資源檔案及建議答案 Resource Files & Suggested Answers
- DIY內容 DIY Materials
- 互動光碟及專用網站 Interactive CD-ROM & Companion Website



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