

# EE3220 System-on-Chip Design

## Tutorial 1: Get Started with ARM Mbed Platform

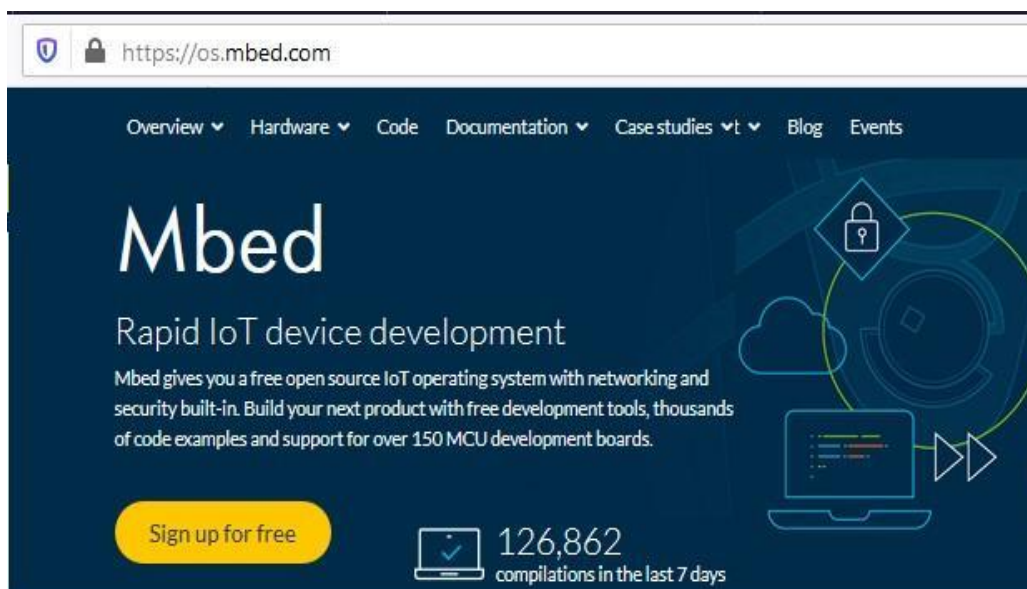
### Objective:

- To gain Hands-on experience and get familiar with the ARM Mbed tools.
- To register your own ARM Mbed account on.
- To get familiar with the function and development cycle of ARM.

In this tutorial, we are going to explore and learn about the ARM Mbed, an online development platform for ARM microcontrollers. You need to register your account and get familiar with the procedure for using the ARM development tools.

### Introducing the ARM Mbed Platform

Arm® Mbed is a free online ARM compiler that can be used over an Internet link. It is an IDE platform and operating system based on 32-bit ARM Cortex-M microcontrollers. It is collaboratively developed by ARM® and its technical partners. Mbed is currently supported by over 60 partners and a community of 200,000 developers. It also provides the operating system, cloud services, tools, and developer ecosystem to make the creation and deployment of IoT solutions possible. Using Mbed we can write a program in C/C++, then compile the program, and upload the executable code to the target ARM processor. The advantage of using Mbed is that it is easy to learn and use and is supported by very large number of library functions. One of the major features of the Arm® Mbed™ systems is its web-based development environment. Just plug the device into computer using a USB cable, which will appear on your computer as a USB memory stick. Write and compile your software code using the Arm® Mbed™ Online Compiler, download the compiled code into the device, and press the onboard reset button to run!



What is Mbed?

Mbed makes device development quicker


## 1. Supported boards

Mbed platform was initially created for mbed NXP LPC1768 microcontroller board. With its vast open source community and partnership and technical support, many vendors now create Mbed enabled microcontroller boards. Such boards are configured and programmed on the Mbed platform besides their proprietary platforms and other IDEs. Currently, Mbed platform supports about 176 boards including four of the STM32 Nucleo boards.

Filters


- ☐ Mbed Enabled
  - ☐ Advanced (46)
  - ☐ Baseline (163)
  - ☐ Pelion Device Ready (23)
- ☐ Mbed OS support
  - ☐ Mbed OS 2 (99)
  - ☐ Mbed OS 5.4 (49)
  - ☐ Mbed OS 5.5 (51)
  - ☐ Mbed OS 5.6 (57)
  - ☐ Mbed OS 5.7 (55)
  - ☐ Mbed OS 5.8 (61)
  - ☐ Mbed OS 5.9 (64)
  - ☐ Mbed OS 5.10 (96)
  - ☐ Mbed OS 5.11 (109)
  - ☐ Mbed OS 5.12 (110)
  - ☐ Mbed OS 5.13 (109)
  - ☐ Mbed OS 5.14 (114)
  - ☐ Mbed OS 5.15 (117)
  - ☐ Mbed OS 6.0 (89)
  - ☐ Mbed OS 6.1 (89)
  - ☐ Mbed OS 6.2 (91)
  - ☐ Mbed OS 6.3 (94)
  - ☐ Mbed OS 6.4 (94)
  - ☐ Mbed OS 6.5 (95)
  - ☐ Mbed OS 6.6 (95)
  - ☐ Mbed OS 6.7 (96)
  - ☐ Mbed OS 6.8 (97)
  - ☐ Mbed OS 6.9 (97)
  - ☐ Mbed OS 6.10 (99)
  - ☐ Mbed OS 6.11 (100)
  - ☐ Mbed OS 6.12 (103)
  - ☐ Mbed OS 6.13 (103)
  - ☐ Mbed OS 6.14 (103)
  - ☐ Mbed OS 6.15 (105)
- ☐ Mbed OS 6
  - ☐ Bare metal (49)
  - ☐ RTOS (30)
- ☐ Communication
  - ☐ BLE (31)
  - ☐ CAN (6)
  - ☐ Cellular (10)

176 results




**MAX32660EVSYS**

- Cortex M4F 96MHz
- 256KB Flash, 96KB SRAM




**SIDK S1SBP6A Bio-processor dev kit**

- Cortex-M4 100 MHz
- 2MB Flash, 256KB RAM
- BLE, TRNG, Bio-sensors




**DISCO-L4S5I (B-L4S5I-IOT01A)**

- Cortex-M4, 120 MHz
- 2MB Flash, 640KB SRAM
- BLE, NFC, WIFI, USB




**NUMAKER-M2354**

- Cortex-M23, 96MHz
- 1MB Flash, 256KB SRAM
- v8-M TrustZone, WIFI, SD S...



**DISCO-WB5MMG**

- Cortex-M4, BLE
- 1MB Flash, 256KB SRAM



**NUCLEO-WB15CC**

- Cortex-M4, BLE
- 320KB Flash, 48KB SRAM

## 2. Registration for using the Mbed platform

Now you need to register and create a login account for the Mbed platform.

- Go to the Mbed platform website <https://os.mbed.com/account/login>
- Fill in the short form and click sign up.

**arm MBED**

### Sign up

Already have an Mbed account? [Log in](#)

Create a free Mbed account to access Mbed tools and services and contribute to the developer community.

Email address \*

Username \*

Password \*

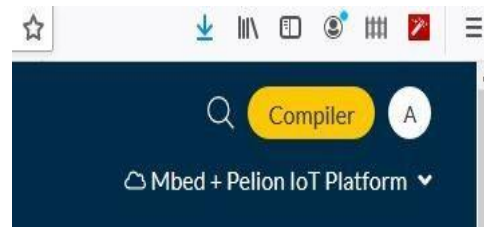
First name \*

- Go to your email and confirm the registration

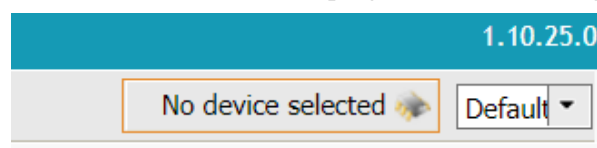
### 3. Getting familiar with Mbed platform

Now you need to log in to your account and choose a board.

- Go to the Mbed platform website <https://os.mbed.com/account/login>
- Click **Compiler** button at the top right hand side of the page.



- Click “No device selected” button at the top right hand side of the page.



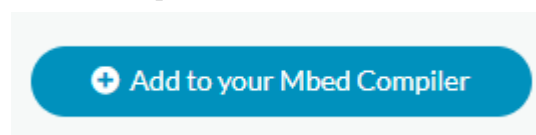
- click **Add Board** button, a new page will open on your browser.



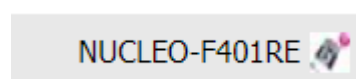
- Search for the board **F401** and click finish.
- Click the board.



- Click Add to your Mbed Compiler.

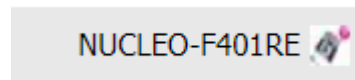


- Find the board is selected on your compiler page.



Now we will see how to add or remove a platform (a board).

- At the top right-hand corner of the environment, click the current board (NUCLEO-F401RE).



- Click Description then Pinout tabs to learn about the current board

- To add new board, click **Add Board** button, a new page will open on your browser.
- Search for your new board. Now search Nucleo-F11RE board and click on the board.

## Filters

106 results

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  - ☐ Mbed OS 5.15 (72)
  - ☐ Mbed OS 6.0 (57)
  - ☐ Mbed OS 6.1 (57)

NUCLEO-F411RE	NUCLEO-F401RE	NUCLEO-F103RB
<ul style="list-style-type: none"> <li>Cortex-M4 + FPU, 100MHz</li> <li>512KB Flash, 128KB SRAM</li> <li>USB_OTG_FS SDIO</li> </ul>	<ul style="list-style-type: none"> <li>Cortex-M4 + FPU, 84MHz</li> <li>512KB Flash, 96KB SRAM</li> <li>USB_OTG_FS SDIO</li> </ul>	<ul style="list-style-type: none"> <li>Cortex-M3, 72MHz</li> <li>128KB Flash, 20KB SRAM</li> <li>CAN USB</li> </ul>

- Click **Add to your Mbed compiler**, the board will be added to your account.

# NUCLEO-F411RE

Affordable and flexible platform to ease prototyping using a STM32F411RET6 microcontroller.



To compile a program for this board using Mbed CLI, use `nucleo_f411re` as the target name.

## Board Partner



ST

A world leader in providing the semiconductor solutions that make a positive contribution to people's lives, both today and in the future.

+ Add to your Mbed Compiler

## Overview

The STM32 Nucleo board provides an affordable and flexible way for users to try out new ideas and build prototypes with any STM32 microcontroller line, choosing from the various combinations of performance, power consumption and features.

The Arduino™ connectivity support and ST Morpho headers make it easy to expand the functionality of the STM32 Nucleo open development platform with a wide choice of specialized shields.


The STM32 Nucleo board does not require any separate probe as it integrates the ST-LINK/V2-1 debugger/programmer.

### Table of Contents


1. Overview
2. Microcontroller features
3. Nucleo features
4. Board pinout
5. Supported shields
6. Getting started
7. Technical references
8. Known limitations
9. Tips and Tricks

- Now we will delete the board added. From the Compiler environment click at the current board (**NUCLEO-F401RE**) to open the boards interface.
- Select NUCLEO-F11RE and click More info.

Select a Platform

**NUCLEO-F411RE**

Click the 'Select' button to compile for the "NUCLEO-F411RE" platform.



Description

Pinout

Affordable and flexible platform to ease prototyping using a STM32F411RET6 microcontroller.

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{(https://www.youtube.com/watch?v=g3p6iX\_RpEc&index=1&list=PLgyFKd2HIZlbhKhvngDGmsJxx0uLscnvV)}


More Info


Select Platform

Your registered platforms

  
NUCLEO-F401RE

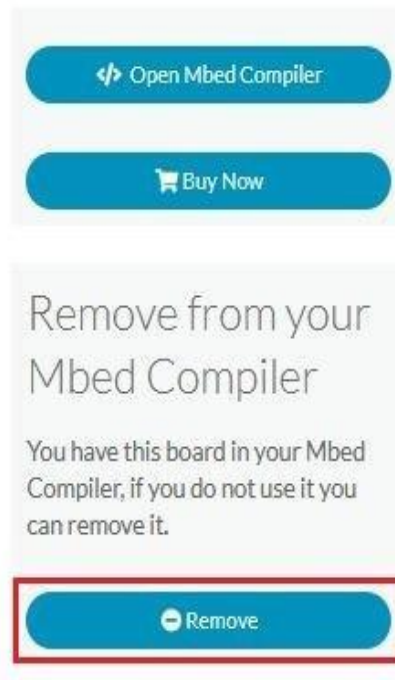
  
NUCLEO-F411RE

  
Add Board

  
Add Module

- From the board's info page now select **Remove**.





- Now the board will be removed from your Mbed account. Follow the same procedure outlined above to add or remove the same or another board to your account. Read and learn more information about different ARM boards.

#### 4. Using the Mbed platform

Mbed is a free online IDE consisting of an online code editor, a compiler, and a program upload tool. Only a web browser is required to access Mbed and develop ARM-based programs. Programs are compiled on the Cloud using the ARM C/C++ compiler. Developing a project using Mbed is very easy since all the user needs is to pick an Mbed supported development board, write the application program, and then upload the program to the board. To use the Mbed IDE platform, follow the steps below:

- (a) Go to the Mbed platform website and log in to your account.  
<https://os.mbed.com/account/login>
- (b) Create a new program, choose a platform board and import the library.
- (c) Write your own program and compile.
- (d) Download the generated file and run on board.

**We will cover more details in the next tutorial and lectures!**



**PSoC 64 Secure Boot,  
Wi-Fi / BLE Pioneer Kit**



**NuMaker-IoT-M487**



**NuMaker-LoRaD-M252**



**MultiTech Dragonfly  
Nano**



**Future Electronics  
Sequana**

**END**