

Learning Resources



Featured Material



Google

- [Searching is Your Super Power!](#)



Courses and YouTube Contents

- [Fastbit Embedded Brain Academy](#)
- [Quantum Leaps, LLC \(YouTube Channel\)](#)
- [DigiKey \(YouTube Channel\)](#)
- [element14 presents \(YouTube Channel\)](#)
- [Ben Eater \(YouTube Channel\)](#)
- [Phil's Lab \(YouTube Channel\)](#)
- [Electronic Basics - GreatScott! \(YouTube Playlist\)](#)
- [Embedded Systems - Jacob Sorber \(YouTube Playlist\)](#)



Books

- [Embedded System Design with ARM Cortex-M Microcontrollers: Applications with C, C++ and MicroPython - Cem Ünsalan, Hüseyin Deniz Gürhan, Mehmet Erkin Yücel](#)
- [A Hands-On Guide to Designing Embedded Systems - Adam Taylor, Dan Binnun, Saket Srivastava](#)



Simulation

- [Wokwi - Online ESP32, STM32, Arduino Simulator](#)
- [QEMU - open-source freeware for emulating hardware and devices](#)



Arduino

If you do not have any background in programming embedded systems, Arduino boards and libraries are the best choice for you to start and learn the basics. Just keep in mind that most of the Arduino libraries are developed only for learning purposes and are not optimized to be used in industry. Additionally, the Arduino takes care of most of the low-level operations and manipulation of registers that you, as an embedded engineer, should be able to handle yourself. If you want to become a professional embedded developer, you must be able to effectively use industry-standard APIs and frameworks provided and approved by microcontroller vendors. For example, CMSIS for ARM Cortex, STM32Cube for STM32, ESP-IDF for Espressif microcontrollers, etc.

- [Getting Started with Arduino](#)
- [New Arduino Tutorials](#)
- [Arduino in a commercial product?](#)

- [Arduino Project to Product](#)

PlatformIO

PlatformIO is a cross-platform, cross-architecture, multiple framework, professional tool for embedded systems engineers and for software developers who write applications for embedded products.

- [PlatformIO - A professional collaborative platform for embedded development](#)

Educational Websites

- [DeepBlueMbedded](#)
- [Interrupt Blog by Memfault](#)
- [Microchip University](#)
- [SparkFun Learn: Learn at SparkFun Electronics](#)
- [Adafruit Learning System](#)
- [Random Nerd Tutorials | Learn ESP32, ESP8266, Arduino, and Raspberry Pi](#)
- [ControllersTech](#)

Other Useful Roadmaps

- [Embedded Systems Skill Tree](#)
- [PCB Design Skill Tree](#)

Projects

- [STM32 Firmware](#)
- [Udemy – STM32 : Internet Of Things with 4G LTE Modem - Hardware](#)

Hardware Hacking

- [Hardware Hacking Tutorial](#)
- [The Hardware Hacking Handbook: Breaking Embedded Security with Hardware Attacks - Jasper van Woudenberg, Colin O'Flynn](#)

Note: It is not necessary to read or watch all of the following materials, but it is important to study enough to have a basic understanding of each topic. Of course, the more you study and practice, the greater your knowledge will become, ultimately enhancing your abilities as an engineer.

Some of the resources mentioned here will just be used as references. Refer to them only when you need them.

Soft Skills

- [Soft Skills For Embedded Systems Software Developers](#)
- [10 Skills Every Embedded Engineer Should Have](#)

Electronics Fundamentals

Basic Math & Calculus

- [Khan Academy - Calculus 1](#)
- [Calculus - Robert T Smith, Roland Minton](#)

Electrical Circuits Basics

- [Lessons in Electric Circuits](#)
- [Fundamentals of Electric Circuits - Charles K. Alexander, Matthew Sadiku](#)
- [Grob's Basic Electronics - Mitchel E. Schultz](#)
- [Make: Electronics: Learning by Discovery - Charles Platt](#)
- [The Art of Electronics - Paul Horowitz, Winfield Hill](#)

Electronic Components

- [Here's a Quick Way to Know about Major Electronic Components](#)
- [Encyclopedia of Electronic Components - Charles Platt](#)

Digital Circuits & Logic Design

- [Digital Design - Morris Mano](#)

Computer Architecture

- [Build an 8-bit computer from scratch](#)
- [Computer Organization and Design: ARM Edition - David A. Patterson, John L. Hennessy](#)
- [Digital Design and Computer Architecture: ARM Edition - Sarah Harris, David Harris](#)
- [Embedded Systems Architecture - Tammy Noergaard](#)

Using Test Equipment

Multimeter

- [Learn How to Use a Multimeter!](#)
- [How to Use a Multimeter](#)

Logic Analyzer

- [Instrument Basics: Logic Analyzer](#)

Oscilloscope

- [What's an OSCILLOSCOPE?](#)
- [How to Use an Oscilloscope](#)
- [How to use an oscilloscope / What is an oscilloscope / Oscilloscope tutorial](#)
- [Understanding EMI Debugging with Oscilloscopes](#)

Prototyping Skills

Using Breadboards

- [Everything You Need to Know about Breadboards](#)
- [How to Use a Breadboard](#)

Hardware Design Basics

- [Electronic Circuit Design - IFE - TU Graz](#)
- [Hardware Design - Phil's Lab](#)
- [Microcontroller-Based Hardware Design With Altium Designer](#)

PCB Design

- [Create PCBs for Rapid Prototyping](#)
- [How to Make a Raspberry Pi Compute Module 4 Carrier Board](#)
- [How To Learn PCB Design \(My Thoughts, Journey, and Resources\) - Phil's Lab #87](#)
- [KiCad 6 STM32 PCB Design Full Tutorial - Phil's Lab #65](#)
- [Intro to KiCad](#)
- [Altium Academy YouTube Channel](#)
- [Robert Feranec YouTube Channel](#)
- [PCB Design for EMI & SI - Phil's Lab #64](#)
- [PCB Design for Advanced Users](#)

Soldering

- [How To Solder - Electronics with Becky Stern | Digi-Key Electronics](#)
- [HOW TO SOLDER! \(Beginner's Guide\)](#)
- [Soldering Crash Course: Basic Techniques, Tips and Advice!](#)
- [How to Solder Through-Hole Components - Another Teaching Moment | DigiKey Electronics](#)

- [How to Solder QFN MLF Package by Hand \(Using a Hot Air Rework Station\) | Digi-Key Electronics](#)
- [From Solderless Breadboard to Soldered Circuit - Electronics with Becky Stern | Digi-Key Electronics](#)

FPGA Design

- [FPGA vs. Microcontroller: How to choose the right one for your project](#)
- [Introduction to FPGA](#)
- [FPGA Fundamentals](#)
- [Udemy – FPGA Embedded Design, Part 1 - Verilog](#)
- [Udemy – FPGA Embedded Design, Part 2 - Basic FPGA Training](#)
- [Udemy – FPGA Embedded Design, Part 3 - EDA Tools](#)
- [Udemy – FPGA Embedded Design, Part 4 - Microprocessor Design](#)

Software Development Life Cycle (SDLC) Models

- [What is the software development life cycle?](#)
- [Embedded Product Development Life Cycle: Four Main Steps](#)
- [Does agile work with embedded software?](#)
- [Scrum for embedded software: Good – but for reasons other than what your manager thinks](#)
- [What Is Scrum: A Guide to the Most Popular Agile Framework](#)
- [What Is the V-Model in Software Development?](#)

Programming Fundamentals

Algorithms & Data Structures

- [Grokking Algorithms - Aditya Y. Bhargava](#)
- [Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein](#)
- [Collection of various algorithms in mathematics, machine learning, computer science, physics, etc implemented in C for educational purposes](#)
- [Udemy – Embedded Systems State Machines & Data Structures](#)
- [Data Structures in C](#)
- [Data Structures - Full Course Using C and C++](#)

Design Patterns

- [Design Patterns for Embedded Systems in C - Bruce Powel Douglass](#)

State Machines / UML

- [State Machines](#)
- [Event-Driven Programming](#)
- [Embedded System Design using UML State Machines](#)

Memory Management

- [Understanding the C runtime memory model](#)
- [Dynamic Memory Allocation | C Programming Tutorial](#)
- [What is Memory Leak in C/C++? How can we avoid?](#)

Programming Languages

C

- [W3Schools C Tutorial](#)
- [C Programming for Beginners | Full Course](#)
- [C Programming Tutorials](#)
- [The C Programming Language - Brian W. Kernighan, Dennis M. Ritchie](#)
- [C How to Program - Paul Deitel, Harvey Deitel](#)
- [Effective C - An Introduction to Professional C Programming - Robert C. Seacord](#)

C++

- [C++ Tutorial for Beginners - Full Course](#)
- [C++ YouTube Playlist by The Cherno](#)

Assembly

- [Udemy – ARM GNU Assembly Programming From Ground Up](#)
- [Assembly Language Programming with ARM – Full Tutorial for Beginners](#)

Python

- [Real Python: Python Tutorials](#)
- [Python Crash Course - Eric Matthes](#)
- [MicroPython - Python for microcontrollers](#)
- [CircuitPython](#)

Rust

- [The Embedded Rust Book](#)

- [The Future of Programming: Rust](#)
- [Community Rust support projects for STM32 microcontrollers](#)
- [Rust on ESP Community](#)

Build System

GCC & Make

- [GCC and Make - Compiling, Linking and Building C/C++ Applications](#)

CMake

- [How to CMake Good](#)

Bash Scripting

- [Bash scripting cheatsheet](#)
- [Bash Scripting Tutorial for Beginners](#)

Docker

- [Introduction to Docker for the Embedded Developer](#)

Version Control

Git

- [Git Tutorial for Beginners: Learn Git in 1 Hour](#)
- [Git for Professionals Tutorial - Tools & Concepts for Mastering Version Control with Git](#)

SVN (Subversion)

- [Apache® Subversion®](#)

Microcontrollers

- [Make: AVR Programming - Elliot Williams](#)
- [Mastering STM32 - Carmine Noviello](#)
- [Getting Started with STM32 and Nucleo](#)
- [Bare Metal Embedded Programming: Theory and Practice Using STM32](#)
- [Beginning STM32: Developing with FreeRTOS, libopenm3 and GCC - Warren Gay](#)
- [Intro to Raspberry Pi Pico and RP2040](#)

- [Udemy – Microcontroller Embedded C Programming: Absolute Beginners](#)
- [Udemy – Embedded Systems STM32 Low-Layer APIs\(LL\) Driver Development](#)
- [Udemy – Embedded Systems STM32 HAL APIs Driver Development](#)

GPIO

- [Tutorial 5: Peripheral 1 - General purpose Input Output \(GPIO\) Configuration in STM32](#)

ADC

- [How Do ADCs Work? - The Learning Circuit](#)
- [Tutorial 13: ADC in STM32F4](#)
- [Tutorial 14: ADC by Polling](#)

DAC

- [How Do DACs Work? - The Learning Circuit](#)
- [DAC in STM32 || Sine wave || HAL || CubeIDE](#)

Timers

- [STM32 TIMERS](#)

PWM

- [What is PWM?](#)
- [STM32 Guide #3: PWM + Timers](#)

Interrupts

- [Polling/Interrupt/DMA differences explained easily](#)
- [Level Up Your Arduino Code: External Interrupts](#)
- [Tutorial 10: Peripheral 2 - Nested Vector Interrupt controller \(NVIC\) in STM32](#)
- [Tutorial 11: LAB - External Interrupt \(EXTI \) Interfacing in STM32 using STM32CUBEMX](#)
- [Tutorial 12: Interrupt Priorities in STM32](#)

Watchdog

- [The Watchdog Timer on Arduino](#)
- [WATCHDOGS in STM32 || IWDG and WWDG || CubeIDE](#)

DMA

- [STM32 DMA PT 1](#)
- [STM32 DMA PT 2](#)

- [Getting Started With STM32 & Nucleo Part 4: Working with ADC and DMA - Maker.io](#)
- [STM32 UART DMA and IDLE LINE || Receive unknown length DATA](#)

Bootloader

- [How to Create a Super Simple Bootloader](#)
- [Udemy – STM32Fx Microcontroller Custom Bootloader Development](#)

Power Management

- [SLEEP Mode in STM32F103 || CubeIDE || Low Power Mode || Current Consumption](#)
- [STOP MODE in STM32 || CubeIDE || Low Power Mode](#)

GUI Design

- [U8glib library for monochrome displays, version 2](#)
- [LVGL](#)
- [TouchGFX](#)

Functional Safety

- [Udemy – Functional Safety According to ISO 26262 - Crash Course](#)
- [A Guide to MISRA C Coding Standards - MISRA C and MISRA C++](#)

Interfaces, Protocols & Communication Technologies

Common

- [Understanding Serial Protocols](#)
- [PROTOCOLS: UART - I2C - SPI - Serial communications #001](#)

UART

- [Understanding UART](#)
- [how does UART work??? \(explained clearly\)](#)
- [Basics of UART Communication | UART Frame Structure | RS 232 Basics | Part1](#)
- [Understanding UART Communication Programming | UART Peripherals | Part 2](#)
- [The RS-232 protocol](#)

I2C

- [Understanding I2C](#)
- [STM32 I2C SLAVE](#)

SPI

- [Understanding SPI](#)
- [SPI: The serial peripheral interface](#)
- [Getting Started with STM32 and Nucleo Part 5: How to Use SPI | Digi-Key Electronics](#)

1-Wire

- [1-Wire® Technology Overview](#)

I2S

- [Building a Digital Music Player with I2S?! What is I2S! EB#45](#)

Wireless

- [Bluetooth Low Energy Fundamentals - Nordic Semiconductor](#)
- [What is Thread? Low-power IoT Networking for Smart Home Devices | Digi-Key Electronics](#)
- [What is Matter? Unifying IoT Devices for the Smart Home | Digi-Key Electronics](#)

Industrial

Modbus

- [What is Modbus and How does it Work?](#)
- [How does Modbus Communication Protocol Work?](#)
- [MODBUS STM32](#)

RS485

- [What is RS485 and How it's used in Industrial Control Systems?](#)
- [What is RS-485?](#)

CoAP & MQTT

- [#144 Internet Protocols: CoAP vs MQTT, Network Sniffing, and preparation for IKEA Tradfri Hacking](#)
- [MQTT vs. CoAP | Comparison of IoT Protocols](#)
- [Simple ESP32 IoT Sensor Node Tutorial: WiFi Enabled MQTT Sensor Data Node](#)
- [Cellular IoT Fundamentals - Nordic Semiconductor](#)

High-Speed

Ethernet

- [How the Ethernet Protocol Works – A Complete Guide](#)
- [What is an Ethernet PHY?](#)

- [The Data Link Layer, MAC Addressing, and the Ethernet Frame](#)

USB

- [Training - USB 101 - Introduction to USB](#)
- [How does a USB keyboard work?](#)
- [How does USB device discovery work?](#)
- [MOOC - STM32 USB training](#)

Automotive

CAN

- [CAN Bus: Serial Communication - How It Works?](#)
- [CAN Bus: A Beginners Guide Part 1](#)
- [CAN Bus: A Beginners Guide Part 2](#)
- [CAN Bus, OBD2 & J1939 Explained](#)
- [J1939 Explained - A Simple Intro \[v2.0 | 2021\]](#)
- [Unified Diagnostic Services \(UDS\) Explained - A Simple Intro \[2022\]](#)

Network

- [Networking Fundamentals](#)
- [TCP vs UDP - Explaining Facts and Debunking Myths - TCP Masterclass](#)
- [TCP - 12 simple ideas to explain the Transmission Control Protocol](#)
- [UDP doesn't suck! It's the BEST L4 protocol for THESE types of applications...](#)
- [Networking tutorial](#)
- [Hands-On Network Programming with C - Lewis Van Winkle](#)

Cellular

GSM / LTE

- [STM32 : Internet Of Things With 4G LTE Modem](#)

LTE-M & NB-IoT

- [Cellular IoT Fundamentals - Nordic Semiconductor](#)

Memories

- [Memory Options for Embedded Systems: How to Select the Right Memory Configuration](#)

NOR / NAND Flash

- [QSPI in STM32 || Write and Read || N25Q](#)
- [QSPI in STM32 || Boot from EXT Memory || XIP || N25Q](#)
- [Flash Memory in Embedded Linux Systems](#)

eMMC

- [What is a eMMC? Intro, Comparing to Other Storage, and Upgrading. SSD, M.2](#)

EEPROM

- [Using EEPROM with Arduino - Internal & External](#)

SRAM / DRAM

- [SRAM vs DRAM: Difference Between SRAM & DRAM Explained](#)
- [What is SRAM?](#)
- [SDRAM Hardware & Firmware Tutorial \(STM32\) - Phil's Lab #80](#)
- [SDRAM in STM32 || MT48LC4](#)

Sensors & Actuators

- [Getting Started With STM32 and Nucleo Part 2: How to Use I2C to Read Temperature Sensor TMP102](#)
- [GPS Module and STM32 || NEO 6M || Get coordinates, Date, Time, Speed, etc.](#)
- [Interface MPU6050/GY-521 with STM32 || LCD 20x4 || CubeMx || HAL || SW4STM](#)
- [DC Motor Speed Controller PWM With Potentiometer Using STM32](#)

Operating Systems

Operating System Fundamentals

- [Operating Systems: Three Easy Pieces - Remzi H Arpaci-Dusseau, Andrea C Arpaci-Dusseau](#)

Multitasking and Parallel Processing

- [Multitasking vs Multithreading vs Multiprocessing](#)
- [Programming with POSIX Threads - David Butenhof](#)
- [Parallel Programming and Performance Optimization With OpenMP](#)
- [Introduction to OpenMP - Tim Mattson \(Intel\)](#)
- [C++ Concurrency in Action - Anthony Williams](#)

Embedded Linux

- [FreeRTOS vs Linux for Embedded Systems](#)
- [Introduction to Embedded Linux](#)

Linux Kernel

- [Practical System Programming with C: Pragmatic Example Applications in Linux and Unix-Based Operating Systems](#) - Sri Manikanta Palakollu
- [The Linux Programming Interface](#) - Michael Kerrisk

Linux Device Drivers

- [Linux Device Drivers](#) - Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman
- [Mastering Linux Device Driver Development](#) - John Madieu

U-Boot

- [The U-Boot Documentation](#)

BuildRoot

- [Introduction to Embedded Linux Part 1 - Buildroot | Digi-Key Electronics](#)

Yocto

- [Introduction to Embedded Linux Part 2 - Yocto Project | Digi-Key Electronics](#)
- [Yocto Project Tutorial Series \(Basic to Advance\)](#)
- [Udemy – Embedded Linux using Yocto](#)

Qt

- [Qt Documentation](#)
- [Introduction to Qt / QML](#)
- [Udemy – Multi-Threading and IPC with Qt 5 C++](#)

Real-Time OS

- [FreeRTOS vs Linux for Embedded Systems](#)
- [Real-Time Systems Concepts](#)
- [RTOS](#)
- [Beyond the RTOS](#)

FreeRTOS

- [FreeRTOS - Market leading RTOS](#)
- [Introduction to RTOS](#)
- [Mastering the FreeRTOS Real Time Kernel - a Hands On Tutorial Guide](#)

- [Getting Started With STM32 and Nucleo Part 3: FreeRTOS - How To Run Multiple Threads w/ CMSIS-RTOS](#)
- [Hands-On RTOS with Microcontrollers: Building real-time embedded systems using FreeRTOS, STM32 MCUs, and SEGGER debug tools - Brian Amos](#)
- [Beginning STM32: Developing with FreeRTOS, libopencm3 and GCC - Warren Gay](#)
- [SAFERTOS - Safety Critical Real-Time OS](#)

Zephyr

- [Zephyr® Project](#)
- [Why We Moved from FreeRTOS to Zephyr RTOS](#)
- [nRF Connect SDK](#)
- [ESP32 on Zephyr OS](#)

μC/OS / Micrium OS

- [Micrium OS](#)
- [μC/OS-III Documentation](#)
- [μC/OS-III Books](#)
- [μC/OS-II Documentation](#)

NuttX

- [NuttX - The Apache Software Foundation](#)
- [Getting Started to NuttX](#)

RT-Thread

- [RT-Thread | An Open Source Embedded Real-time Operating System](#)
- [RT-Thread Beginners Guide](#)

Mbed OS

- [Mbed OS](#)

QNX

- [BlackBerry QNX: Embedded OS, Support, and Services](#)

VxWorks

- [VxWorks | Industry Leading RTOS for Embedded Systems](#)

Digital Signal Processing

DSP Fundamentals & Filter Design

- [FIR Filter Design and Software Implementation - Phil's Lab #17](#)
- [IIR Filters - Theory and Implementation \(STM32\) - Phil's Lab #32](#)
- [Digital Signal Processing \(ECSE-4530\) Lectures, Fall 2014](#)
- [Udemy – Digital Signal Processing \(DSP\) From Ground Up in C](#)
- [Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications - Sen M. Kuo, Bob H. Lee, Wenshun Tian](#)
- [Real-Time Digital Signal Processing from MATLAB to C with the TMS320C6x DSPs - Thad B. Welch, Cameron H.G. Wright, Michael G. Morrow](#)
- [Digital Signal Processing - John G. Proakis, Dimitris K. Manolakis](#)
- [Schaum's Outline of Signals and Systems - Hwei P. Hsu](#)

Discrete Fourier Transform / FFT

- [Discrete Fourier Transform - Simple Step by Step](#)
- [The Fast Fourier Transform \(FFT\): Most Ingenious Algorithm Ever?](#)
- [The FFT Algorithm - Simple Step by Step](#)
- [STM32 Fast Fourier Transform \(CMSIS DSP FFT\) - Phil's Lab #111](#)

Controls Systems / PID Control

- [Understanding Control Systems](#)
- [PID Controller Explained](#)
- [Understanding PID Control](#)
- [PID Controller Implementation in Software - Phil's Lab #6](#)
- [Control Systems Engineering - Norman S. Nise](#)
- [Modern Control Systems - Richard C. Dorf, Robert H. Bishop](#)

MATLAB / Simulink

- [MATLAB Tutorials: Getting Started with MATLAB](#)
- [Getting Started with Simulink](#)
- [Udemy – MATLAB/SIMULINK Bible|Go From Zero to Hero!](#)

Debugging

JTAG / SWD

- [Guide: Connecting your debugger](#)
- [STM32 + SWD + ST-Link + CubeIDE | Debugging on Custom Hardware Tutorial - Phil's Lab #4](#)

GDB

- everyone needs to stop using print debugging (do THIS instead)
- GDB is REALLY easy! Find Bugs in Your Code with Only A Few Commands

OpenOCD

- This Is 100% How You Should Be Debugging | How to Use OpenOCD to Debug Embedded Software with GDB

Testing

- Test Driven Development for Embedded C - James Grenning
- Intro to CI/CD

Unit Testing

- Unit Testing for C (especially Embedded Software)
- GoogleTest - Google Testing and Mocking Framework
- Embedded C/C++ Unit Testing with Mocks
- Unit Testing Principles, Practices, and Patterns - Vladimir Khorikov

Integration Testing

- Hardware CI Arena
- <https://www.bunniestudios.com/blog/?p=5450>

SIL / HIL Testing

- Embedded CI/CD with HIL Testing

Embedded AI

AI & ML Basics

- A beginner's guide to artificial intelligence and machine learning
- Udemy – Getting Started with Embedded AI | Edge AI
- Intro to Edge AI: Machine Learning + IoT – Maker.io Tutorial | Digi-Key Electronics

TensorFlow

- Getting Started with TensorFlow and Keras – Maker.io | Digi-Key Electronics
- Intro to TensorFlow Lite Part 1: Wake Word Feature Extraction – Maker.io | Digi-Key Electronics

- [Intro to TensorFlow Lite Part 2: Speech Recognition Model Training – Maker.io | Digi-Key Electronics](#)

tinyML

- [Intro to TinyML Part 1: Training a Neural Network for Arduino in TensorFlow | Digi-Key Electronics](#)
- [Intro to TinyML Part 2: Deploying a TensorFlow Lite Model to Arduino | Digi-Key Electronics](#)
- [TinyML: Getting Started with TensorFlow Lite for Microcontrollers | Digi-Key Electronics](#)
- [TinyML: Getting Started with STM32 X-CUBE-AI | Digi-Key Electronics](#)

Embedded Security

Cryptography

- [Hashing, Hashing Algorithms, and Collisions - Cryptography - Practical TLS](#)
- [Data Integrity - How Hashing is used to ensure data isn't modified - HMAC - Cryptography](#)
- [Encryption - Symmetric Encryption vs Asymmetric Encryption - Cryptography - Practical TLS](#)
- [Public and Private Keys - Signatures & Key Exchanges - Cryptography - Practical TLS](#)
- [Understanding AES Encryption Mechanics: BMPS](#)
- [Understanding Cryptography: A Textbook for Students and Practitioners - Christof Paar, Jan Pelzl](#)
- [Cryptography and Network Security: Principles and Practice - William Stallings](#)
- [Serious Cryptography: A Practical Introduction to Modern Encryption - Jean-Philippe Aumasson](#)
- [MOOC - Security Part2: Basics of cryptography](#)
- [MOOC - Security Part3 : STM32 security features](#)

Secure Boot & Secure Firmware Update

- [Blinky To Bootloader: Bare Metal Programming Series](#)
- [MOOC - Security Part4 : STM32 security in practice](#)
- [MOOC - Security Part5 : How to define your security needs](#)
- [MOOC - Security Part6: STM32 security ecosystem, from theory to practice](#)
- [TPM \(Trusted Platform Module\) - Computerphile](#)
- [Securing Embedded Linux Systems with TPM 2.0 - Philip Tricca, Intel](#)
- [TPM: Basic applications to embedded devices](#)