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STMicroelectronics PFE Book 2025

STMicroelectronics Tunis

We are creators and makers of technology

One of the world's largest semiconductor companies

Over **50,000** employees of which **9,500+** in R&D

$17.3 billion revenues in 2023

Over **80** sales & marketing offices serving over **200,000** customers across the globe

14 main manufacturing sites

Signatory of the United Nations Global Compact (UNGC)
Member of the Responsible Business Alliance (RBA)

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As of December 31, 2023

Global presence

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Our vision

ST stands for

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Everywhere microelectronics
makes a positive contribution to people's lives,
ST is there.

Our value proposition for all stakeholders

For our **shareholders**

Return value in line with our objective

Sustainable and profitable growth

For our **customers**

Provide differentiating enablers

Independent, reliable & secure supply chain

For all **stakeholders**

Committed to sustainability

Our values: Integrity – People – Excellence

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Our technology starts with you

At ST, we create
technology that starts with

You

- Our employees
- Our customers
- Our partners

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Where you find us

Making **driving** safer, greener, and more connected

Enabling the evolution of **industry** towards smarter, safer, and more efficient factories & workplaces

Making **homes & cities** smarter, for better living, higher security, and to get more from available resources

Making everyday **things** smarter, connected, and more aware of their surroundings

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2025 – PFE Graduation Project Subjects

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- From February to August 2025
- 6 months

List of projects per department

Our Departments	Numbers of projects
STM32 Embedded Software Development (Job Req 3391)	**11**
STM32 applications & support (Job Req 3405)	**2**
Digital Characterization (Job Req 3406)	**1**
Tools Department (Job Req 3395)	**5**
Hardware Department (Job Req 3367&3366)	**2**
STM32 Support Solution (Job Req 3527)	**2**
Sales & Marketing (Job Req 4277)	**1**

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STM32 Embedded Software Development
Job Req 3391

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Project_ID01 : Applicative use cases development for Embedded Software validation

Work To be done

- Define complex uses cases for EmbSW deliverable validation purpose
- Design and develop one or more applications with complex use cases that test the whole EmbSW sub- system (Ips/MW/Parts…) and its integration in the overall Cube Ecosystem
- Enhance the validation activity and increase the number of use cases tested

01

Purpose

This internship project aims to study and develop advanced applicative use cases for Embedded software validation purpose

This application will test the integration of several SW components in the overall Cube ecosystem.

02

Keys Words

Embedded C, IAR, STM32CubeMX2,HAL drivers, Middleware, Parts, DFP

03

Number of trainee(s)

1

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Project_ID02 : Validation Framework for EmbSW validation in a multi-series context

Work To be done

- Analyze and make a proposal for applicative projects automatic migration across series based on a generic keyword-based mechanism
- Implement the proof of concept
- Ensure the genericity of the developed framework and validate it is functional for all supported series

01

Purpose

This internship project aims to study and implement a solution for applicative use cases porting between STM32 series.

This will reduce the manual intervention of users and ensure the flexibility to migrate all developed applications to new STM32 products

02

Keys Words

Python, Shell Scripting, Git, STM32Cube, Embedded C, CLI

03

Number of trainee(s)

1

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Project_ID03 : System IPs Modeling into Model 2 Structure

Work To be done

- Develop a reference branch for the IP(s) system
- Develop resource files for each device
- Develop a script to generate a resource code for each device from the reference branch

01

Purpose

This internship project aims to develop a transversal System IP driver model allowing to reduce development time for new and derivative series.

02

Keys Words

STM32, Embedded C, XML, Git, bash, IAR, ACI.

03

Number of trainee(s)

1

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Project_ID04 : FreeRTOS Advanced applications and Test Suite

Work To be done

- Analyze complex use cases
- Define applications and test suite architecture
- Develop demo applications and the tests allowing to show performance
- Develop test suite covering basic and complex use cases
- Integrate the solution over different versions of FreeRTOS

01

Purpose

This internship project aims to develop advanced applications based on FreeRTOS for STM32 allowing to show complex usage and integrate a complete test suite allowing automated validation of each version.

02

Keys Words

STM32 MCUs, Embedded C, FreeRTOS, Scheduling, Python.

03

Number of trainee(s)

1

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Project_ID05 : USB Host DFU and FTDI classes development

Work To be done

- Analyze use case scenarios
- Define applications architecture and user interface
- Develop demo applications for Host DFU and FTDI
- Develop tests allowing the automated validation of the Host DFU and FTDI applications
- Integrate the solution in the framework of STM32 CubeFW and its automated test suite environment

01

Purpose

This internship project aims to develop advanced applications based on STM32 and USB covering Firmware upgrade on a USB Host and support of FTDI devices. The objective is to show the real usage of these applications in demos with graphical user interface

02

Keys Words

STM32 MCUs, Embedded C, USB, Host, DFU, FTDI, Graphic, UI, ACI.

03

Number of trainee(s)

1

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Project_ID06 : USB Advanced Testing Device (USBCV)

Work To be done

- Analyze USBCV test suite
- Define the device architecture
- Develop test suite implementation on STM32
- Develop the Graphical User Interface for the Testing Device
- Integrate the solution in the framework of STM32Cube and its automated test suite environment

01

Purpose

This internship project aims to develop an advanced testing device (based on STM32) allowing to perform USBCV tests without the need for a PC host to run it.

Design a graphical user interface allowing control and monitoring of the USBCV tests.

02

Keys Words

STM32 MCUs, Embedded C, USB, Host, Device, USBCV, Graphic, UI, ACI.
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03

Number of trainee(s)

1

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Project_ID07 : Integrate STM32L4 series into CRYP & SDMMC reference git branches

Work To be done

- Analyze the available code for L4 CRYP/SDMMC IPs on the reference git branch.
- Adapt the reference Git branch to meet the specific requirements of the L4 product Git branch and regenerate the drivers for all series.
- Evaluate the differences between the generated code and the existing code on the product branch.
- Integrate L4 HAL and LL validation tests into the reference branches.

01

Purpose

This internship project aims to integrate the L4 series into CRYP and SDMMC reference branches to establish common reference HAL/LL drivers for all supported STM32 series.

The reference code will facilitate the maintenance of HAL/LL drivers for all STM32 series, saving time and effort..

02

Keys Words

STM32 MCUs, Embedded C, Git, Reference Branch, generator script , HAL/LL validation tests, CRYP, SDMMC

03

Number of trainee(s)

1

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Project_ID08 : Support new revisions of Nucleo-64 boards within STM32Cube packages

Work To be done

- Analyze the existing Introduction package offer for the available Nucleo-64 boards.
- Validate the existing STM32Cube projects on the new Nucleo-64 boards.
- Develop new projects to introduce the newly supported features of the Nucleo-64 boards, such as the USB Type-C connector.
- Ensure the porting and validation on all supported toolchains.

01

Purpose

This internship project aims to update STM32Cube legacy firmware packages to support the new generation of Nucleo-64 boards, which introduce an evolution of these boards with the support of USB Type-C connector.

This will generate more interest in this new Nucleo-64 boards thanks to their extended features.

02

Keys Words

Embedded C, IAR, USB, HAL drivers, Middleware, BSP, Nucleo-64

03

Number of trainee(s)

1

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Project_ID09 : SDM Automatic validation platform development

Work To be done

- Analyze the list of requirements of the SDM developers.
- Study the global architecture of Debug Authentication to allow developer test the SDM releases automatically.
- Prepare a detailed specifications document
- Implement the solution
- Validate the final solution with end-to-end tests.

01

Purpose

This internship project aims to develop an automation platform to ensure the automatic validation of SDM for each new device support, with results recorded into log output file.

02

Keys Words

Python,C,C++,XML,STM32.

03

Number of trainee(s)

1

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Project_ID10 : Bootloader validation platform enhancement

Work To be done

- Analyze the list of requirements with different stakeholders.
- Study the global architecture to allow understand how to add support for USBx and new FD-CAN STLink Api support.
- Implement the solution
- Validate the final solution and provide validation reports.

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01

Purpose

This internship project aims to Improve Bootloader auto-validation platform by adding support of USBx protocol, auto generation of validation reports, new STLink V3 FD-CAN API and develop a GUI that facilitates the configuration of the Bootloader Test framework

02

Keys Words

QT, C++, Excel, HTML, CSS, JavaScript, TypeScript, JSON.

03

Number of trainee(s)

1

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Project_ID11 : STM32 Device pack validation platform enhancement

Work To be done

- Analyze existing platform
- Define missing tests for different pack components
- Develop the defined tests and integrate them to the existing platform
- Validate the final solution and provide validation reports.

01

Purpose

This internship project aims to Improve Device pack auto-validation platform and increase test coverage by adding Flashloader and IDEs related tests.

Generate corresponding validation reports.
.

02

Keys Words

STM32, IAR, KEIL, JavaScript, TypeScript, JSON.

03

Number of trainee(s)

1

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STM32 applications & support
Job Req 3405

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Project_ID12: Getting started with STM32 USB peripheral

Work To be done

- Review the existing USB OTG examples
- Implement an example based on the USB and it associated middleware
- Develop the Getting started article to initiate users to implement their applications
- Benchmark access to different memories in USB High Speed and Full Speed
- Deliver project on GitHub

01

Purpose

This internship project aims to develop a knowledge base article to guide developers getting started with STM32 USB peripheral as well as OTG dual role application based on the USB peripheral.

02

Keys Words

STM32 MCUs, Embedded C, ST USB Library, HAL, OTG, HS/FS, Knowledge article, GitHub

03

Number of trainee(s)

1

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Project_ID13: Automatic Testing of GenAI - Based use case on STM32 MCUs

Work To be done

- Define tests: Functional tests, Performance Tests and accuracy tests
- Setup a Software tools that automate the execution of test cases, capture results, and generate reports.
- Measure the accuracy and completeness of the AI's responses.
- Assess user feedback and satisfaction with the AI's support.
- Track the frequency and types of errors made by the AI.

01

Purpose

Automatic testing of a Generative AI-based use case for STM32 microcontrollers involves validating the capabilities and performance of the AI in providing accurate, relevant, and timely support to users. This process ensures that the AI can effectively assist with technical queries, troubleshooting, and guidance related to STM32 microcontrollers.

02

Keys Words

Generative AI, STM32 MCUs, Embedded C, Python

03

Number of trainee(s)

1

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Digital Characterization
Job Req 3406

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Project_ID14: Digital Characterization - New Test Bench Development

Work To be done

- Documentation to hand gain technical knowledge on the ecosystem (Hardware and software) of the new equipment Teradyne J750
- PCB Design of the characterization board
- Software architecture and development of the new testing methodology
- Perform measurements and correlate results with available data in the database

01

Purpose

To maintain a competitive advantage in the market, STM32 microcontrollers are engaged in a race to achieve the highest possible speeds and performance. In light of this, we are upgrading our characterization equipment and methodology to ensure that we remain at the forefront of this evolution in our Laboratory.

02

Keys Words

Altium Designer, Hyperlynx,STM32,Teradyne J750, Microsoft Visual Basic, Embedded C, Oscilloscope, Hardware & Software debugging

03

Number of trainee(s)

1

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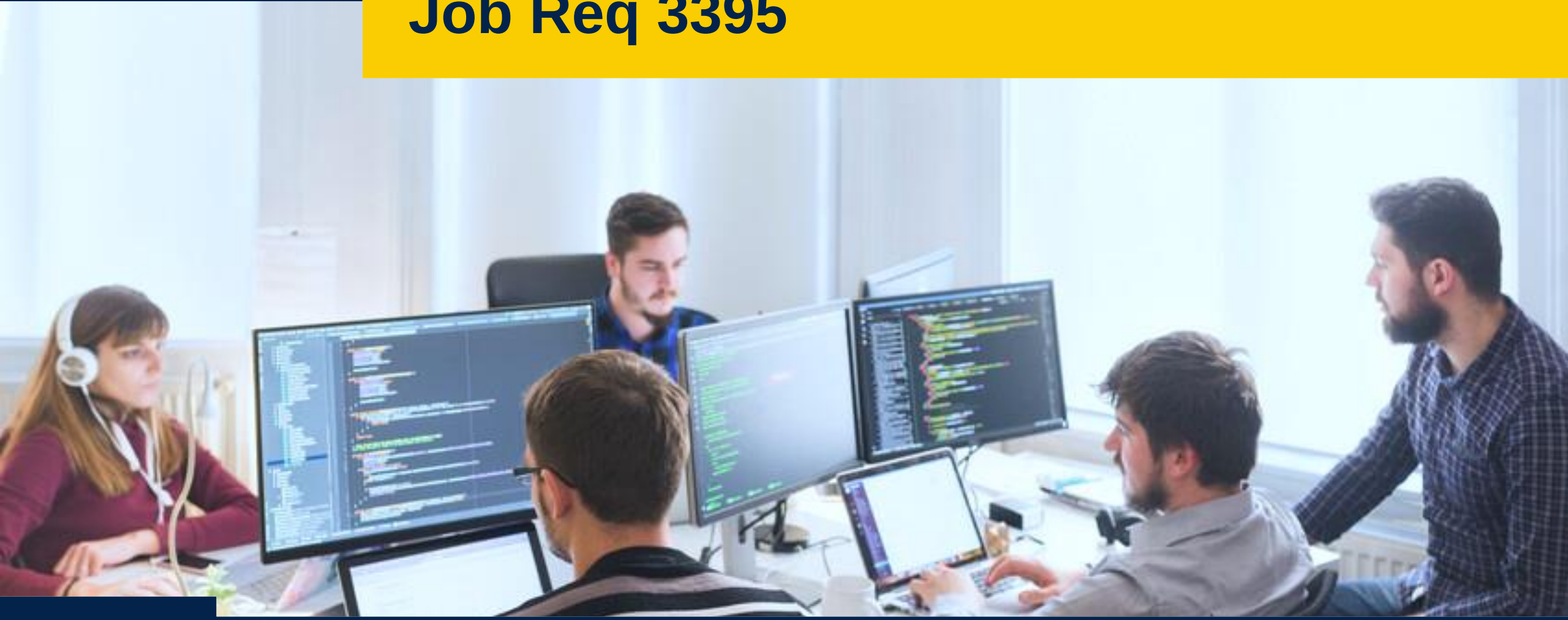
Tools Department
Job Req 3395



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Project_ID15 :Design and implementation of STM32CubeProgrammer automatic validation tests: basic memory programming features

Work To be done

- Review and Evaluate the existing automatic validation environment related to basic memory programming scope
- Design and Implement the automatic validation test(s) for OptionByte programming, and Checksum features
- Deploy the implemented automatic test(s) in the whole Automatic Platform (covering All OSs, and supported boards)

01

Purpose

This internship project aims to design and implement new automatic validation tests for the STM32CubeProgrammer Tool.
These tests are focused on basic programming features.

02

Keys Words

STM32 MCUs, Embedded C, Flash memories, Option Bytes, Checksum, Git, Python, UFT.

03

Number of trainee(s)

1

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Project_ID16 :Conception and implementation of STM32CubeProgrammer Validation automatic tests: Specific secured programming features

Work To be done

- ❑ Ramp-up on Specific security features, based on STM32WL Sigfox feature, and advanced memory programming with TrustZone enabled, using BootLoader interfaces (USB/UART/I2C/SPI)
- ❑ Define the validation use cases to be automatized
- ❑ Propose an architecture of the New automatic tests defined
- ❑ Implement New automatic validation test(s)
- ❑ Deploy the implemented automatic test(s) in the whole Automatic Platform: considering the HW solution to be aligned with the Automatic platform existing setup.

01

Purpose

This internship project aims to concept and implement a new Validation automatic tests for the STM32CubeProgrammer Tool.
These tests are focused on specific secured programming features, based on STM32WL Sigfox feature, and advanced memory programming with TrustZone enabled, using BootLoader interfaces (USB/UART/I2C/SPI)

02

Keys Words

STM32 MCUs, Embedded C, Flash memories, Option Bytes, STM32U5xx, STM32WLxx, TrustZone memory, BootLoader interfaces (USB/UART/I2C/SPI), Git, Python, UFT.

03

Number of trainee(s)

1

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Project_ID17 : Design and implement an automatic solution to validate the full user flow from code generation to project build based on provided configuration

Work To be done

- ❑ Analyze the list of requirements
- ❑ Study the global architecture and identify the list of dependencies and interfaces
- ❑ Prepare a detailed specification and architecture document
- ❑ Implement the solution
- ❑ Test and Integrate the solution
- ❑ Archive the solution

01

Purpose

The main goal of this project is to ensure the integrity and correctness of code content based on predefined configurations and to verify the build of generated code with supported toolchains. The project is divided into three main tasks:

- **Validation of Code generation for a Precompiled Project:** Review and validate the code generation content of precompiled projects to ensure they adhere to the provided configurations.
- **Validation of Code generation for .cube Configuration**: Use .cube configuration files to cross-check the code generation content for consistency and correctness.
- **Build Verification using Toolchain Parameters:** Verify the build result by using various toolchain parameters to ensure that the build working correctly.

02

Keys Words

STM32, EWARM, MDK-ARM, GCC Toolchain, Robot framework, Python, Techno web, Selenium, JIRA, XRAY, Jenkins.

03

Number of trainee(s)

1

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Project_ID18 : Design an implement an automatic solution to manipulate and validate STM32 Boards data using AI

Work To be done

- ❑ Analyze the list of requirements
- ❑ Study the global architecture and identify the list of dependencies and interfaces
- ❑ Prepare a detailed specification and architecture document
- ❑ Implement the solution
- ❑ Test and Integrate the solution
- ❑ Archive the solution

01

Purpose

The main goal of this project is to develop an automated system to extract structured data from PDF files (Datasheet, Reference Manual, Boards User Manual, etc.) using AI, converting them into structured formats such as JSON and finally compare extracted Data w/ Boards Data outputs:

- **Conduct a comprehensive review of existing methods and technologies for PDF data extraction**.
- **Design an architecture for the data extraction system, including the integration of AI solution.**
- **Develop the system, focusing on the following components:**
  - PDF parsing and text extraction
  - Data interpretation using AI solution
  - Output formatting into structured data formats.
- **Compare extracted Data w/ Dataset Boards outputs.**

02

Keys Words

PyMuPDF, PDFMiner, OpenAI API, AI, SQLite, JSON, Python, JIRA, Jenkins, STM32, STM32 Boards.

03

Number of trainee(s)

1

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Project_ID19 : AI-Powered Clock Graph Generator for STM32 Microcontrollers

Work To be done

- Data Extraction: Develop an AI model to read and understand STM32 datasheets, user manuals, and architectural guides.
- Information Synthesis: Extract and synthesize clock-related data from these documents.
- Graph Construction: Build a detailed clock graph for various STM32 microcontroller models.
- User Interface: Create a user-friendly interface using Node.js and TypeScript, integrated with Theia and GLSP for visualization.
- Testing and Validation: Test the AI program with different STM32 models and documents to ensure accuracy and reliability.
- Documentation: Prepare comprehensive documentation and user manuals for the AI program.

01

Purpose

Develop an AI program that can read and analyze multiple technical documents related to STM32 microcontrollers. The AI will focus on extracting clock-related data to build a comprehensive clock graph, aiding engineers and developers in understanding and configuring clock settings efficiently.

02

Keys Words

AI, STM32 Microcontrollers, Clock Configuration Data Extraction, Node.js, TypeScript, Theia GLSP (Graphical Language Server Platform)

03

Number of trainee(s)

1

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Hardware Department
Job Req 3367&3366

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Project_ID20 : Automated management and compliance verification tool of electronic component documentation

Work To be done

- Automate the verification of certifications for components, ensuring compliance with regulations and validate the correct input.
- Archive the component related documents within a subversion repository with proper classification and versioning, the tool must ensure correct file placement based on the type of component and its certification details.
- Implement a module to monitor and correct folder names that deviate from the company's predefined naming conventions, maintaining structured data organization for electronic components..

01

Purpose

This project is focused on developing an automation tool for managing electronic components inputs within an established database. The purpose is to automate the verification of components compliance, streamline documents archiving, and ensure proper folder naming.

This combination of tasks will further optimize workflows, reduce manual work and improve the reliability of compliance checks, while relying on detailed expertise in electronic components and regulatory requirements.

02

Keys Words

Python, Document Processing, electronic knowledge

03

Number of trainee(s)

1

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Project_ID21 : Maintenance of a STM32 MCU & MPU Evaluation Tool

Work To be done

- Manage the obsolescence alerts.
- Identify the replacement candidates.
- Re-design of the related promotion boards.
- Generate all manufacturing files and related web packages for publication on st.com.
- Update the production test package.
- Update the corresponding official web documents.
- Publish all documents on the different platforms (Intranet, internet)

01

Purpose

This internship project aims to manage the obsolescence of electronic components mounted on STM32 MCU & MPU evaluation tools (Nucleo boards, Discovery kits, Evaluation boards) to ensure product continuity for customers.

02

Keys Words

STM32 MCUs, Altium designer, Embedded C, Python, VBA, SubVersion (TortoiseSVN client), Microsoft Office tools (Word, Excel, …), Good electronics knowledge

03

Number of trainee(s)

1

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STM32 Support Solution
Job Req 3527

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Project_ID22 : Develop Application of Flexible Data-rate Controller Area Network (FDCAN) on STM32 Microcontrollers

Work To be done

- Study the FDCAN protocol and its specification.
- Study the FDCAN Peripheral integration in the STM32 MCUs
- Configure the FDCAN peripheral using STM32CubeMX and STM32CubeIDE
- Develop an FDCAN application with delay compensation, test mode …
- Prepare a final report summarizing the project, including challenges faced and solutions implemented

01

Purpose

This internship project aims to conduct a study of the FDCAN on STM32 microcontrollers, focusing on calibration, delay compensation, and test mode features. Additionally, it is meant to explore the capabilities, configurations, and applications of FDCAN, and to develop a practical project that could be related to the customer's use case.

02

Keys Words

MCU, BxCAN, FDCAN, Operating modes, Bit timing, Embedded C

03

Number of trainee(s)

1

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Project_ID23 : Develop an application for DC motor control using STM32 Timer

Work To be done

- ❑ Research & literature
  - •**Study** the basics of DC motors and their control methods.
  - •**Review** STM32 documentation and timer functionalities.
  - •**Understand** PWM and its application in motor control.
- ❑ Analyze & define the use case.
- ❑ Configure GPTIM for PWM generation to drive the DC motor.
- ❑ Implement algorithms for speed and position control.
- ❑ Suggest potential improvements and future enhancements for the motor control application.
- ❑ Explore additional features.

01

Purpose

This internship project aims to develop a software application that utilizes the STM32's timer to control the speed and direction of a DC motor. It involves configuring the timer for Pulse Width Modulation (PWM) and implementing motor control algorithms. The project provides practical experience in embedded systems and motor control techniques.

02

Keys Words

STM32, GPTIMER, PWM, Motor Control, Embedded systems

03

Number of trainee(s)

1

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Sales & Marketing
Job Req 4277

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Project_ID24 :Develop User Guide for Graphical Application on High Performance STM32 MCU

Work To be done

- Study Graphical performance of STM32 MCU.
- Provide user guide for customers on how to develop graphical application.
- Develop a graphical application.

01

Purpose

This internship project aims to test and demonstrate the graphical performance of a STM32 Microcontroller and help customer to develop graphical application where also take advantage of security.

02

Keys Words

STM32 MCU, Graphic, Security, LCD
External Memory, High performance, AI

03

Number of trainee(s)

1

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