Technical Training Conference for
Embedded Control Engineers

MASTERs 24

EMPOWERING INNOVATION

India MASTERs 2024
December 10-13

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Contents

What is the MASTERs Conference?

The MASTERs Conference is a premier event for the exchange of technical expertise between the technical teams at Microchip and embedded control design engineers. Now in its 17th year, the Annual India MASTERs Conference offers comprehensive, hands-on technical training designed to meet the evolving needs of today's embedded control design community, helping to shorten the learning curve and speed up product development.

This year, we are offering 51 classes covering a diverse array of topics, including 22 hands-on workshops. These sessions, led by Microchip's expert application and design engineers, will introduce the latest Microchip products, and cover key areas such as Ethernet switch connectivity, USB Type-C™ fundamentals, power delivery, CAN FD/LIN, and various wireless solutions including Wi-Fi® and Bluetooth®. We will also provide in-depth classes on IoT applications (including secure communications with AWS IoT core), motor control, touch and gesture sensing, power management for battery-powered devices, and graphics solutions.

Workshops will focus on practical skills such as firmware development, designing simple Linux®-based IoT edge nodes, creating efficient FreeRTOS™ applications with MPLAB® Harmony v3, using MPLAB Code Configurator (MCC), and working with AVR® MCU, Cortex® M0+, and Arm® Cortex-A5-based MPUs. Additionally, this year's conference will feature new classes on Microchip's PolarFire® FPGAs, Power over Ethernet (PoE) solutions, SiC technology, 64-bit quad-core RISC-V processor, 32-bit dsPIC with double precision FPU, and Artificial Intelligence on Microchip MPU. We will also explore new trends in Electric Vehicles, Solar Power, and Power Conversion.

Join us and learn directly from the engineers who developed the products you use every day. Our classes are crafted to provide you with the knowledge and skills necessary for your next product or application design.

	Date	Venue	Cost
Bangalore	Dec 10–13, 2024	**Sheraton Grand Bangalore Hotel at Brigade Gateway** 26/1 Dr. Rajkumar Road, Malleswaram-Rajajinagar, Bengaluru 560055 India	Rs12000

Dynamic Certificate Management With keySTREAM and ECC608 TrustMANAGER

Maintaining IoT Security Over Your Products Lifecycle

With the innovative integration of Kudelski IoT keySTREAM technology and the ECC608 TrustMANAGER, customers gain unprecedented control over their IoT device security. They can effortlessly create, update, and maintain their custom Public Key Infrastructures (PKIs) with full autonomy. This groundbreaking approach enables seamless device claiming upon online connection, eliminating the challenging process of customizing cryptographic keys for each device through a manufacturing facility. Moreover, customers only pay for connected devices in use, optimizing cost efficiency as unconnected devices incur no activation fees. Throughout the product lifecycle, users can create root certificate authorities, manage associated certificates, revoke and refurbish compromised chains and schedule certificate expiration date renewals with unparalleled ease. Experience smooth security management for your IoT fleet with our dynamic solution.

Key Features

- Self-serve PKI including Root CA creation
- Cost-effective and user-friendly security SaaS
- In-field provisioning
- Guaranteeing up to 99.99% availability of your PKI through keySTREAM quality assurance (SLA)
- Scale across any IaaS/PaaS

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microchip.com/TrustMANAGER

Who Should Attend?

Those who are looking for solutions to embedded control challenges or in-depth education on Microchip's products. Design engineers and engineering managers will benefit from the Conference by learning about solutions and interfacing with the Microchip personnel.

Attendees graduating from the MASTERs program will be equipped to go out and use Microchip products to full advantage. Certificates will be awarded upon completion of the Conference

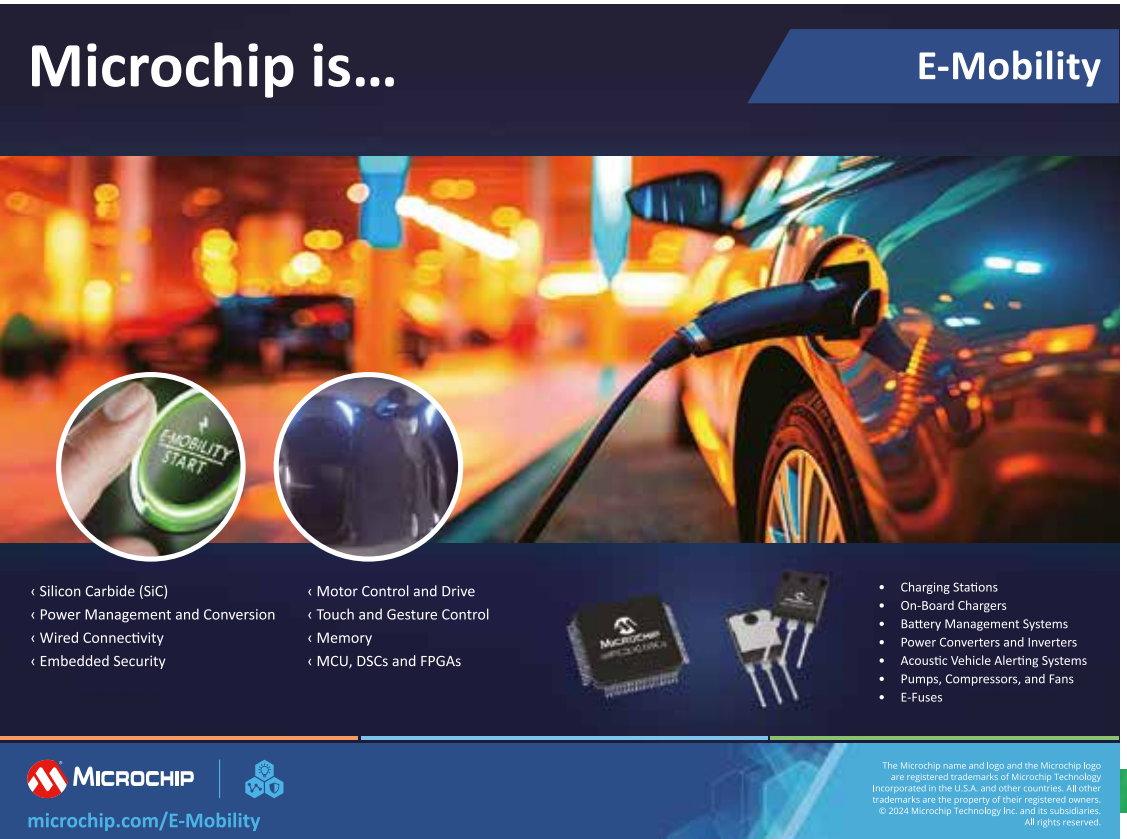
*Microchip reserves the right to refuse registration or entry to anyone for any reason.
#Image is for reference only

Conference Fee

Conference Fee
(Tax included)

Rs.12,000

- Conference classes and meals
- Complete set of class materials
- Microchip backpack



	Conference fee	Deadline
Normal Fee	Rs.12,000	26 Nov

*Depends on seat availability

Registration

All attendees should register via the website at https://www.microchip.com/im

Registration Confirmation

A registration confirmation will be generated upon web registration. When full payment of the attendee fee is received, a further confirmation from Microchip will be issued via e-mail/fax. If you do not receive any confirmation,

please email indiamasters@microchip.com as soon as possible.

Payment

1. Please arrange payment by following the instructions outlined below to confirm your attendance:

Option 1: Online Electronic Payment:

Online payment may be made through below QR with corresponding eWallets such as Paytm, BHIM, UPI, etc

Option 2: Online Electronic Payment:

Payment may be made through online wire transfer to Microchip per the following account information:

DBS BANK INDIA LTD.,
Beneficiary: Microchip Technology (India) Pvt Ltd,
FSC Code: DBSS0IN0811
Branch Code: IN0811
Account: 100947801356
SWIFT Code: DBSSINBB (Head Office) SWIFT Code of Development Bank of Singapore (DBS)
Address: 3RD FLOOR, FORT HOUSE, 221 DR D N ROAD, FORT, MUMBAI 400001M

2. Please mark the "Registration Number" & "GST number" in the payment proof and email to indiamasters@microchip.com.

3. All attendees MUST register and pay the conference fee by 26 November, 2024 (Bangalore). Full payment is required prior to attending the Conference.

- For general enquiries, please email indiamasters@microchip.com.
- For design partner, training partner, academic partner and group booking discounts, contact Sriharsha Sadaralahalli at Sriharsha.Sadaralahalli@microchip.com.

Accommodation

This is a non-residential program and no accommodation will be provided. Attendees may contact the host hotel directly regarding information on room prices and availability with the reference “Microchip MASTERs”.

Note: Attendees may contact the corresponding hotel if necessary.
Contact details can be found at www.microchip.com/im.

Meals

For India MASTERs - five meals are included.

	Day 1		Day 2		Day 3		Day 4	
Bangalore	Lunch	Dinner	Lunch	Dinner	Lunch	Dinner	Lunch	Dinner
	√		√	√	√		√	

Location and Local Transport

Bangalore - Sheraton Grand Bangalore Hotel at Brigade Gateway

Address: 26/1 Dr. Rajkumar Road, Malleswaram-Rajajinagar, Bengaluru 560055 India

Phone: +91 80 4252 1000

Website:
https://www.marriott.com/hotels/travel/blrgs-sheraton-grand-bangalore-hotel-at-brigade-gateway/

Sheraton Grand Hotel is conveniently connected through the Namma Metro Green Line. Participants can alight at ‘Sandal Soap Factory’ Metro Station and the venue is located 5 minutes away.

Attire

Proper attire for all classes and events is business casual.

Cancellation

Cancellations received less than 14 days before the start of the India MASTERs Conference are subject to the entire conference fee. In fairness to all participants and Conference organizers, once Microchip confirms your seat and if you do not notify Microchip regarding your cancellation or fail to attend, you are still required to make the full payment.

Ask The Experts Program

Here’s your chance to ask our engineers design and development questions with regards to Microchip products. Experts from all Microchip departments will be available at the ‘Ask The Experts’ area to help answer your questions. Look for ‘Ask The Experts’ schedules at the beginning of the Conference in order to grab hold of this opportunity

Technology Showcase

Technology Showcase development tools which helps decrease development time when using Microchip products. Be sure to visit the Bazzar to discuss your needs with selected partners who will have demos, literature, and technical experts on site. The exhibit will be available during Conference check-in, lunch breaks as well as after class sessions, allowing plenty of time for you to review their products.

Conference Agenda

Day 1

Time	Agenda
8:30 AM – 9:00 AM	Registration
9:00 AM – 10:00 AM	Session 1
10:00 AM – 10:15 AM	Break
10:15 AM – 11:15 AM	Session 2
11:15 AM – 11:30 AM	Break
11:30 AM – 12:30 PM	Session 3
12:30 PM – 13:30 PM	Lunch
13:30 PM – 14:30 PM	Session 4
14:30 PM – 14:45 PM	Break
14:45 PM – 15:45 PM	Session 5
15:45 PM – 16:00 PM	Break
16:00 PM – 17:00 PM	Session 6
17:30 PM – 20:00 PM	• Ask the Experts • Technology Showcase

Day 2

Time	Agenda
9:00 AM – 10:00 AM	Session 7
10:00 AM – 10:15 AM	Break
10:15 AM – 11:15 AM	Session 8
11:15 AM – 11:30 AM	Break
11:30 AM – 12:30 PM	Session 9
12:30 PM – 13:30 PM	Lunch
13:30 PM – 14:30 PM	Session 10
14:30 PM – 14:45 PM	Break
14:45 PM – 15:45 PM	Session 11
15:45 PM – 16:00 PM	Break
16:00 PM – 17:00 PM	Session 12
17:30 PM – 20:00 PM	• Microchip Keynote • Cocktail & Dinner

Day 3

Time	Agenda
9:00 AM – 10:00 AM	Session 13
10:00 AM – 10:15 AM	Break
10:15 AM – 11:15 AM	Session 14
11:15 AM – 11:30 AM	Break
11:30 AM – 12:30 PM	Session 15
12:30 PM – 13:30 PM	Lunch
13:30 PM – 14:30 PM	Session 16
14:30 PM – 14:45 PM	Break
14:45 PM – 15:45 PM	Session 17
15:45 PM – 16:00 PM	Break
16:00 PM – 17:00 PM	Session 18
17:00 PM – 20:00 PM	• Ask the Experts • Technology Showcase

Day 4

Time	Agenda
9:00 AM – 10:00 AM	Session 19
10:00 AM – 10:15 AM	Break
10:15 AM – 11:15 AM	Session 20
11:15 AM – 11:30 AM	Break
11:30 AM – 12:30 PM	Session 21
12:30 PM – 13:30 PM	Lunch
13:30 PM – 14:30 PM	Session 22
14:30 PM – 14:45 PM	Break
14:45 PM – 15:45 PM	Session 23
15:45 PM – 16:00 PM	Break
16:00 PM – 17:00 PM	Session 24
17:00 PM – 20:00 PM	• Ask the Experts • Technology Showcase

Class List

Class Code		Title	Hours	Tech Level
24001 PNP1		Microchip Is... Microcontroller, Microprocessor, Memory and FPGA products	1	1
24002 PNP2		Microchip Is… Analog, Power, Silicon Carbide, Discrete, Timing and Power over Ethernet Products	1	1
24003 PNP3		Microchip Is… Security, Wireless, Wired and Touch Products	1	1
24004 PNP4		Introduction to dsPIC33A Architecture	2	1
24005 PNP5		Signal Acquisition and Processing using the new dsPIC33A Floating Point Digital Signal Controller (DSC)		
24006 PNP6		Unlocking the Power of the SAM M0+, M23, and M4 ARM Microcontroller Architecture and Peripherals	3	2
24008 PNP8		Meet the Configurable Logic Block - Microcontroller With Programmable Logic Combining the Best of Both Worlds	3	2
24009 PNP9		Introducing PolarFire® SoC FPGAs - the First System-on-Chip FPGA With a Deterministic, Coherent RISC-V CPU Cluster	2	2
24010 PNP10		Understand the Importance of Clock Precision and Stability, and How to Achieve It Using a Mems-Based Clock Generator	2	2
24011 DEV1		Next Generation MPLAB® IDE	2	2
24012 DEV2		Run Time debugging, verification and application tuning using the MPLAB Data Visualizer Run Time (DVRT)	2	1
24014 DEV4		Automated Build and Test System with MPLAB® X IDE and MPLAB XC Compilers	3	1
24017 FRM3		Build better prototypes in less time with MCC Melody	3	2
24018 FRM4		Creating Bare Metal and RTOS based Applications for 32-bit MCUs/MPUs with few easy steps using MPLAB® Harmony	3	2
24022 LNX2		Introduction to Embedded Linux distribution creation using Yocto	3	1
24023 LNX3		Fusing intelligence into your Microchip Graphics Suite for Linux application using AI	3	3
24024 LNX4		Securing Over the Air Updates in Linux	3	2
24025 APD1		Low Power Microcontroller Design Techniques / Application Example	2	2
24026 APD2		Analog MCU cookbook: Design Examples exploiting Advanced Integrated Analog MCU features	3	2
24027 APD3		Microchip Graphics Suite Remastered	3	3
24028 APD4		Shining a light on Artificial Intelligence/Machine Learning (AIML)	3	2
24029 APD5		Smart Embedded Vision AI, with real-time object detection using Microchip's FPGAs VectorBlox Accelerator SDK	2	2
24030 APD6		Intelligent embedded video capturing, processing and streaming using H.264 Video Compression pipeline on PolarFire SoC FPGA	1	2
24031 APD7		Implementing Multiple Embedded Applications on a Single CPU Cluster using PolarFire SoC FPGA in Asymmetric Multi Processing (AMP) Mode	1	2
24032 APD8		From concept to prototype design expansion using mikroBUS click boards with Microchip FPGAs as base	2	2
24033 FS1		Functional Safety Introduction and Architecture	3	1
24035 HIF1		Innovations in Capacitive Touch: Buttons, Sliders, Touchpads, Touch Screens and Proximity Sensing.	1	1

Class List

Class Code		Title	Hours	Tech Level
24036 HIF2		Creating and Tuning a Capacitive Touch Project for Reliable Operation Using Data Visualizer	3	2
24037 NET1		Unlocking the Potential of 10BASE-T1S: A Comprehensive Guide to Understanding, Developing and Evaluating Single Pair Ethernet with MCC Harmony for Automotive and Industrial Networking	3	2
24038 NET2		Developing your first managed Ethernet switch. A hands-on introduction to Linux Switchdev and an overview of switch operating systems.	3	1
24039 NET3		Harnessing the Power of PCIe in Embedded Systems	2	1
24040 SEC1		Crypto Primer: Everything you ever wanted to know about Cryptography; the Why and How.	2	1
24041 SEC2		Hacking the Badge: Researching Vulnerabilities in Embedded Systems	3	3
24042 SEC3		Enhancing Device Security: Leveraging TrustMANAGER / keySTREAM solution to comply with security legislation and standards as TEC 31318 and AIS-140	3	2
24043 SEC4		Authenticate and securely start your application (Secure Boot) on Microchip's 32-bit MCUs	3	2
24045 IoT1		Multi-Protocol Sensor Network using Bluetooth® Low Energy and 802.15.4	3	1
24046 IoT2		WiFi IOT made simple with new RNWF	3	1
24047 IoT3		Rapid Prototyping of IoT Solutions using MicroPython	3	1
24048 AMS1		Mitigate signal noise and improve analog system precision using simulation techniques	3	2
24050 AMS3		High accuracy sensors for linear and rotary position measurement	3	1
24051 MC1		3-phase Sinusoidal Motor Control with AVRs	3	2
24052 MC2		Brushless Motor Control Workshop from forced commutation to sensorless field oriented control including Microchips dedicated tools.	3	2
24054 MC4		Predictive Maintenance in Motor Control Applications	3	2
24055 MC5		Introduction to Zero Speed Maximum Torque (ZSMT) algorithm using Microchips dedicated tools motorBench or QSpin.	2	5
24056 PC1		Power Design with the Microchip Analog Tools Ecosystem	3	1
24057 PC2		Analog Control of DC-DC Converters	3	2
24060 PC5		Enabling the Green Revolution with Bidirectional High-Efficiency Digital Power Factor Correction	3	2
24061 PC6		Phy SiC, Why Now?	2	2
24062 SIG1		Noise Reduction and Robust Hardware Design	2	2
24063 SIG2		What really is EMI and How do I Tackle it?	3	2
24070 SDR9		Low-Power Software-Defined Radio Platform for Tactical Radio, Space Communications and Beamforming	3	2

Hands On

Tech Levels
1: No prior knowledge on the topic necessary.
2: Basic knowledge of the topic is necessary.
3: Previous hands-on working experience with the topic is necessary.
4 Thorough knowledge and working experience with the topic is necessary.
5 Advanced – attendees should already have expertise in the topic before attending

Class Description

24001 PNP1 Microchip Is... Microcontroller, Microprocessor, Memory and FPGA products

Hours	Hands On	Tech level
1	False	1

Abstract:

Curious about the advanced features and applications of our latest MCUs and MPUs? Interested in a brief overview of our cutting-edge memory products and their role in various applications? Eager to gain insight into the flexibility and scalability offered by our FPGA innovations? This session will provide a high-level understanding of our latest and upcoming products. We'll cover everything from advanced PIC and AVR MCUs to sophisticated dsPIC DSCs, SAM MCUs, and MPUs and also delve into Memory Products and FPGAs. Attendees will receive a broad understanding of our latest products across multiple technology domains and a high-level insight into potential integration opportunities and applications in their projects. It's an opportunity to broaden your understanding and explore the possibilities these innovations bring.

24002 PNP2 Microchip Is… Analog, Power, Silicon Carbide, Discrete, Timing and Power over Ethernet Products

Hours	Hands On	Tech level
1	False	1

Abstract:

This class provides an overview of Microchip's latest Analog, Power, Silicon Carbide, Discrete, Timing and Power over Ethernet products. Attendees will receive a broad understanding of our latest products across multiple technology domains and a high-level insight into potential integration opportunities and applications in their projects.

24003 PNP3 Microchip Is… Security, Wireless, Wired and Touch Products

Hours	Hands On	Tech level
1	False	1

Abstract:

This class provides an overview of Microchip's latest security, touch and connectivity products, both wireless and wired. Attendees will receive an introduction to new features, new technologies and new products from Microchip.

Class Description

24004 PNP4 Introduction to dsPIC33A Architecture

Hours	Hands On	Tech level
2	False	1

Abstract:

This class introduces the features and architecture of the dsPIC33A family of devices. Content includes core features and use of select peripherals including 40 MPSP ADC, floating point unit, and high resolution PWM. Differences and advantages from earlier dsPIC33 devices are presented along with application examples. Attendees will gain understanding of the dsPIC33A family of devices and their capabilities.

24005 PNP5 Signal Acquisition and Processing using the new dsPIC33A Floating Point Digital Signal Controller (DSC)

Hours	Hands On	Tech level
2	False	2

Abstract:

In this class you will see and experience the latest innovations in a new 200 MHz DSC including doubleprecision floating point unit, 32-bit instruction and datapaths with dual 72-bit accumulators together with a suite of fast peripherals designed to accelerate your real-time applications. This class will explore fast signal acquisition and related signal processing in a new and robust manner with Microchip's latest dsPIC® DSC family of devices. Material included will utilize this device for a rudimentary digital storage oscilloscope and then process these input into the frequency domain using FFTs using this processor core.

Prerequisites:

Introduction to the dsPCI33A recommended

Class Description

24006 PNP6 Unlocking the Power of the SAM M0+, M23, and M4 ARM Microcontroller Architecture and Peripherals

Hours	Hands On	Tech level
3	True	2

Abstract:

Do you want to be able to quickly write code for an ARM 32-bit microcontroller to get your proof-of-concept designs running in less than one day, even if you have not previously used an ARM device? This course offers a quick-start guide to coding for Microchip ARM® Cortex® 32-bit microcontrollers, including M0+, M23, and M4 microcontrollers. It is designed to expedite the development process of embedded ARM projects, even for those unfamiliar with ARM devices. The course covers a wide range of topics, including SAM system architecture, communication buses, clock synchronization, compiler register access, port and pin control, and interrupts. Practical application is provided through hands-on labs using the Microchip MCC/Harmony Configurator, ATSAME54 M4 microcontroller, and MPLABX Integrated Development Environment. Attendees should have some experience with C programming for embedded microcontrollers. This is not a detailed course on Cortex® hardware architecture, but it does cover the basics.

Prerequisites:

The clients should have a basic understanding of MCC/Harmony. They should also have a working knowledge of C programming.

Class Description

24008 PNP8 Meet the Configurable Logic Block - Microcontroller With Programmable Logic Combining the Best of Both Worlds

Hours	Hands On	Tech level
3	True	2

Abstract:

Do you want to implement a logic circuit in your application without adding extra parts? Are you curious about the flexibility provided by the Configurable Logic Block (CLB) on creating custom peripherals and protocols? This class will teach how to enhance applications with complex logic designs using the new PIC® peripheral – Configurable Logic Block. This will include a quick run through the advantages of the CLB environment by deep-diving into some typical use-cases. Hands on labs will provide opportunities to practice:

- Interfacing the CLB with internal and external signals
- Using the graphical configuration tool (CLB Synthesizer) in MCC Melody to sketch your logic circuit design
- Uncovering the main advantages and limitations when designing combinational and sequential logic inside the microcontroller

Prerequisites:

Basic knowledge of combinational and sequential logic

Basic knowledge of C programming language

Familiarity with MPLAB® X IDE and MPLAB® Code Configurator (MCC) Melody

24009 PNP9 Introducing PolarFire® SoC FPGAs - the First System-on-Chip FPGA With a Deterministic, Coherent RISC-V CPU Cluster

Hours	Hands On	Tech level
2	False	2

Abstract:

This class will introduce the low power, robust security and thermal efficient PolarFire SoC FPGAs with integrated coherent and deterministic 64-bit RISC-V CPU cluster, peripherals and deterministic L2 memory subsystem for creating Linux and real-time (RTOS) applications.

The instructor led demo will demonstrate the FPGA Libero SoC tools design flow, PolarFire SoC features, and running applications on the PolarFire SoC Icicle kit.

Prerequisites:

Attendees registering for this course should be familiar with Microchip's PolarFire® FPGA family or review the Microchip University "Hello FPGA" or "Using Microchip PolarFire FPGAs in Low Power Applications" courses on the Microchip University site.

Class Description

24010 PNP10 Understand the Importance of Clock Precision and Stability, and How to Achieve It Using a Mems-Based Clock Generator

Hours	Hands On	Tech level
2	False	2

Abstract:

The importance of clock precision and stability in various applications is emphasized, with a focus on the use of Starlite (DSC50x), a MEMS-based clock generator, as a replacement for multiple crystal oscillators. The benefits of using Starlite, which can output multiple clock signals, are highlighted through a side-by-side comparison with six different crystal oscillators. The discussion also covers the use of the multi-output, multi-format, and multi-frequency MEMS-based generator in a subsystem. The concept of clock stability is introduced, with an understanding of phase noise and ADEV. The use of Microchip Technology's 53100A Phase Noise Analyzer to measure and interpret these metrics is discussed, along with their relevance to various applications like radar and communications. The session concludes with a comparison of the stability metrics of various DSC50x outputs.

24011 DEV1 Next Generation MPLAB® IDE

Hours	Hands On	Tech level
2	False	2

Abstract:

The next generation MPLAB IDE is based on Visual Studio Code and Eclipse Theia, providing existing VS Code users with a familiar development environment. This class will provide a hands-on experience on how to use the MPLAB Extensions for VS Code to create, build and debug embedded applications.

Prerequisites:

Attendees registering for this class should have basic embedded application development skills. C programming skills are necessary, as we will be using C code projects.

Class Description

24012 DEV2 Run Time debugging, verification and application tuning using the MPLAB Data Visualizer Run Time (DVRT)

Hours	Hands On	Tech level
2	False	1

Abstract:

Does your application seem to work, when debugging with breakpoints, but something is just not quite right when it runs? Wouldn't you like the ability to look at, plot or update application variables at run time? The Data Visualizer Run Time (DVRT) solves this problem and is a highly effective tool for application debugging, verification and tuning. In this class you will:- Examine various practical use cases where the DVRT is particularly effective. - Compare functionality between Data Streamer protocol and the DVRT protocol.- Learn how to view, visualize and update variables and MCU special function registers at run-time, including tips and tricks when using different MCU architectures.- Explore support for both MCC Melody and Harmony, and take a deep dive into using DVRT with MCC Melody.

Prerequisites:

The Visual Debugging with MPLAB® Data Visualizer course on MU will give attendees an overview of the Data Visualizer and its capabilities, which would beneficial.

24014 DEV4 Automated Build and Test System with MPLAB® X IDE and MPLAB XC Compilers

Hours	Hands On	Tech level
3	False	1

Abstract:

How to set up an automated build and test system using MPLAB® X IDE and MPLAB XC Compilers and Git source repository. The CICD wizard in MPLAB X will be used to generate tailored scripts for automation. This will help you improve your code quality by continuously validating code changes to get fast feedback and catch bugs earlier. In this course we will create a Jenkins build and test pipeline setup. We will use Docker containers to get consistency, scalability and portability in the build and test setup. We will show how HW-in-the-loop testing can be done when using Docker containers.

Class Description

24017 FRM3 Build better prototypes in less time with MCC Melody

Hours	Hands On	Tech level
3	True	2

Abstract:

Have you struggled to use example snippets to build up application functionality, but can't find an easy way to make them work together? Do you just want a simple blocking implementation to show that something works, but all the examples are too integrated and complex? Or the opposite, you have a basic structure of your application in place, so can't use any blocking code.

This class covers how to quickly build up application functionality, using MCC Melody example building blocks. An overview is given of the MCC Melody Design Patterns for Control Flow. Then an example application is put together, showing how various example building blocks, of a given implementation, can be used together, to build up more interesting functionality.

Prerequisites:

Recommend going through (at least part of) either one of the following MU classes:

- MCC Melody API Reference for AVR® MCUs
- MCC Melody API Reference for PIC® MCUs

24018 FRM4 Creating Bare Metal and RTOS based Applications for 32-bit MCUs/MPUs with few easy steps using MPLAB® Harmony

Hours	Hands On	Tech level
3	True	2

Abstract:

MPLAB® Harmony v3 provides graphical tools and easy to understand peripheral libraries that simplify the use of Microchip's 32-bit microcontrollers and microprocessors. In this hands-on class, you will learn to navigate and manage project settings with MPLAB® Code Configurator (MCC), set up and configure peripherals, and generate optimized code tailored to your requirements, which is automatically integrated into new or existing embedded projects. MPLAB® Harmony is a modular framework that provides inter-operable firmware libraries for 32-bit microcontroller and microprocessor application development. This class shows how you can develop RTOS based applications using the MPLAB® Harmony drivers, system services and middleware in a few easy steps.Learn how to leverage the MPLAB® Harmony power to quickly develop an embedded application and get your project off the ground in minimal time!

Prerequisites:

Attendees registering for this class should have a basic understanding of C language programming for SAM/PIC32 systems using Microchip's MPLAB® X IDE, debugger, and GCC language tools.

Class Description

24022 LNX2 Introduction to Embedded Linux distribution creation using Yocto

Hours	Hands On	Tech level
3	True	1

Abstract:

The Yocto Project is an open source collaboration project that helps developers create custom Linux-based systems regardless of the hardware architecture. The project provides a flexible set of tools and a space where embedded developers worldwide can share technologies, software stacks, configurations, and best practices that can be used to create tailored Linux images for embedded and IOT devices, or anywhere a customized Linux OS is needed. This class will explain how Yocto is organized, and how you can create a custom distribution for a multitude of embedded systems.

Prerequisites:

Attending students should come to the class with an ability to use common Linux command line utilities like sh, ls, vi, nano, etc.

24023 LNX3 Fusing intelligence into your Microchip Graphics Suite for Linux application using AI

Hours	Hands On	Tech level
3	True	3

Abstract:

This class empowers participants to design and implement gesture-driven GUI and running AI on Microchip MPUs. Attendees will gain hands-on experience in using MGC and EGT on Linux, crafting custom GUIs and implement UI features using the Ensemble Graphics Toolkit framework to run on our MPU's. The class also delves into integrating AI functionalities like object detection and face recognition, helps user to develop interactive applications like UI selection on face recognition. In addition, attendees will explore gesture control of the GUI using MGC3130 sensor, enabling hands-free interaction with the LCD.

Prerequisites:

Attendees registering for this class should have some basic working knowledge of Linux and comfortable working in command-line environment.

Class Description

24024 LNX4 Securing Over the Air Updates in Linux

Hours	Hands On	Tech level
3	False	2

Abstract:

Are you concerned about regulations requiring deploying updates safely and securely? Do you feel like you don't know where to start? In this class you will learn the concepts of how OTA updates with SWUpdate work from both a client and server perspective. You will see how important security is to the OTA update ecosystem and learn how to implement a solution using secure TLS authentication with a secure element protected key. You will deploy a full image OTA update and a delta update to an embedded Linux target running on a Microchip development board using the Eclipse Hawkbit™ management console.

Prerequisites:

Working knowledge of Linux

24025 APD1 Low Power Microcontroller Design Techniques / Application Example

Hours	Hands On	Tech level
2	False	2

Abstract:

Low power microcontrollers offer a number of operating modes, power management systems, and techniques for reducing system power consumption including:

- Microcontroller sleep modes
- Automatic clock request systems
- Power domains / regulator selection
- Core independent peripheral operation
- Inter peripheral communication / triggering

The class starts with an active mode light sensor application example (no low power techniques utilized) and progressively applies microcontroller sleep modes, power management systems, and peripheral automation of tasks to reduce the power consumption. Attendees will observe the reduction in power consumption obtained from utilizing low power techniques in the instructor led labs.

Class Description

24026 APD2 Analog MCU cookbook: Design Examples exploiting Advanced Integrated Analog MCU features

Hours	Hands On	Tech level
3	True	2

Abstract:

A series of small demos demonstrating integrated analog on recent PIC and AVR MCUs solving various common problems. Examples will demonstrate easy setup in MCC Melody, interconnectivity of analog peripherals to digital peripherals and integrated logic to automate response. Also demonstrated will be the ability to reconfigure integrated analog at runtime on the fly.

24027 APD3 Microchip Graphics Suite Remastered

Hours	Hands On	Tech level
3	True	3

Abstract:

This two-hour course covers the Microchip Graphics Suite (MGS), focusing on the MGS Composer, Desktop Emulator, and Web Simulator tools. The first part provides a hands-on guide to the MGS Composer, exploring its redesigned interface and features for creating professional embedded GUIs. Students will learn to create widgets like images, text, and buttons. The second part introduces the MGS Desktop Emulator and Web Simulator tools, detailing their use in graphics creation and their role in enhancing the GUI development process. By the end, attendees will understand how to use the MGS tools to create industry-standard embedded GUIs.

Prerequisites:

Attendees registering for this class show have viewed Getting Started with a New Harmony Graphics Application (https://mu.microchip.com/getting-started-with-a-new-harmony-graphics-application) and should have familiarized themselves with the MPLAB Harmony Graphics Suite (https://www.microchip.com/en-us/tools-resources/configure/mplab-harmony/graphics-suite).

Class Description

24028 APD4 Shining a light on Artificial Intelligence/Machine Learning (AIML)

Hours	Hands On	Tech level
3	True	2

Abstract:

Are you intrigued or concerned by the possibilities of artificial intelligence? Whilst we are not going to attempt to build the next Terminator, this class will take a journey through artificial intelligence and machine learning and how you can use it in a simple classification application. We will begin by looking at the perceived benefits of AIML and apply it to a simple case study where we teach the microcontroller to detect what sort of light is shining on a sensor. We will cover techniques for capturing and processing the sampled signals on a typical microcontroller and the factors that you should consider in your design. Having captured the data, attendees will have the opportunity to use the Microchip ML Dev Suite to process it and build a ML model able to discriminate between the various modes of a light source. You will then get the opportunity to test your model on hardware and evaluate its performance under real conditions. Once completed, attendees will be able to add artificial intelligence to their own designs, “I’ll be back”……..

24029 APD5 Smart Embedded Vision AI, with real-time object detection using Microchip’s FPGAs VectorBlox Accelerator SDK

Hours	Hands On	Tech level
2	False	2

Abstract:

Are you interested in higher performance and low power inference of Artificial Intelligence (AI) models such as classification, object detection, pose estimation, or multiple model tasks such as facial recognition, and license plate recognition?

The class will show the fundamentals of the VectorBlox Accelerator Software Development Kit (SDK) that targets the most power-efficient FPGA-based Convolutional Neural Network (CNN)-based Artificial Intelligence/Machine Learning inference accelerator with PolarFire and PolarFire SoC FPGAs. Instructor led demos demonstrating:

- The fundamentals of the VectorBlox Accelerator SDK and solution.
- Show download, configure, and steps to use the SDK.
- Show the import of models, optimize, compile, and run networks runtime objects generated in the SDK on a PolarFire SoC Video Kit

Prerequisites:

Basic Knowledge of Artificial Intelligence/Machine learning is recommended

Class Description

24030 APD6 Intelligent embedded video capturing, processing and streaming using H.264 Video Compression pipeline on PolarFire SoC FPGA

Hours	Hands On	Tech level
1	False	2

Abstract:

This class will explain the basics of MIPI CSI-2 image sensor interface, image processing, H.264 compression, and streaming encoded video over Ethernet. An intelligent Ethernet camera implementation with H.264 compression will be demonstrated using embedded vision application. An instructor-led demo along with a live video streaming demo that will show:

- A typical video pipeline is implemented on FPGA,
- Demonstration of a real-world implementation of H.264 compression,
- Explanation of the H.264 Software Stack showing WebUI flow utilizing Linux Software on PolarFire SoC FPGA

Prerequisites:

The attendees can attend the webcast “Intro to Smart Embedded Vision (SEV) Using a PolarFire® FPGA” available at https://event.on24.com/wcc/r/3141845/D55A83000B5EA33F743379D2B9AA847C for prior knowledge

24031 APD7 Implementing Multiple Embedded Applications on a Single CPU Cluster using PolarFire SoC FPGA in Asymmetric Multi Processing (AMP) Mode

Hours	Hands On	Tech level
1	False	2

Abstract:

This class will explain and demonstrate the set up and implementation of independent embedded applications on Microchip PolarFire SoC FPGA’s 64-bit RISC-V CPU cluster. One deterministic bare metal / Real Time Operating System (RTOS) running as one context and the Linux operating system running as the second context. Both systems run on the same CPU cluster but are completely independent. This class will also show the advantages of using Asymmetric Multi Processing (AMP) and how it can be used to potentially improve system performance, reliability, safety and security.

Class Description

24032 APD8 From concept to prototype design expansion using mikroBUS click boards with Microchip FPGAs as base

Hours	Hands On	Tech level
2	False	2

Abstract:

Want to find out how easy it is to expand your design and create a development environment to take your idea from concept to prototype using MicroBUS click boards with a Microchip FPGA base board? This class will show Microchip based MicroBUS click or Add-On boards along with a Microchip FPGA base board to utilize and expand your design. You will learn the basics of enabling / adding a peripheral controller to an FPGA fabric, connecting I/Os and writing embedded software to access registers on a device.

24033 FS1 Functional Safety Introduction and Architecture

Hours	Hands On	Tech level
3	True	1

Abstract:

Functional safety standards have been developed and adopted in many markets. From automotive to nuclear power, functional safety is changing the way we develop systems. This class provide a brief introduction to functional safety and focus on developing a system architecture that can meet functional safety requirements. Through hands-on safety analysis we will show that the architecture we develop can meet the required safety integrity level and provide a launch to the next level of hardware and software development.

Class Description

24035 HIF1 Innovations in Capacitive Touch: Buttons, Sliders, Touchpads, Touch Screens and Proximity Sensing.

Hours	Hands On	Tech level
1	False	1

Abstract:

What is possible with capacitive touch these days? Will I be able to sense a full keypad with low power? How speedy can my small touch pads become? What are my options for integrating a touchscreen into my system? Can I easily accommodate safety certification requirements? Can I easily add a capacitive touch interface into my existing system design? Which tools will I need and where do I find guidance/help to use them? Microchip's portfolio of touch solutions can address more challenging applications than ever before. In this lecture and live demo class, we will provide answers to all these questions and more as we guide you through creating a stellar user experience with Microchip Capacitive Touch solutions.

Prerequisites:

While no prerequisites are technically required, it would be helpful to have a working knowledge of capacitive touch interfaces.

24036 HIF2 Creating and Tuning a Capacitive Touch Project for Reliable Operation Using Data Visualizer

Hours	Hands On	Tech level
3	True	2

Abstract:

Today's electronic gadgets are expected to provide users with the same touch experience they have with the average cell phone. To this end, Microchip has developed highly functional MCUs with integrated peripherals that provide that experience. The Microchip Touch Library demonstrates the highest configurability, sensitivity, and noise immunity required for these applications. In this laboratory class, the student will create a touch project using MPLAB X IDE and MPLAB Harmony Code Configurator. The student will then experience the touch tuning process using Microchip Data Visualizer and its two-way communication capabilities, the student will learn how to interactively characterize and tune the touch system for sensitivity and application tuning. Additionally, the student will use a noise generator to see the impact of noise countermeasure tuning in real-time on the Data Visualizer. Join me in learning how easy it really is.

Prerequisites:

Guide to Tuning Touch Sensors - Developer Help (microchipdeveloper.com) https://microchipdeveloper.com/xwiki/bin/view/applications/touch-gesture/start-qtouch-capacitive-sensing-library/design-guides/sensor-tuning-guide/

Class Description

24037 NET1 Unlocking the Potential of 10BASE-T1S: A Comprehensive Guide to Understanding, Developing and Evaluating Single Pair Ethernet with MCC Harmony for Automotive and Industrial Networking

Hours	Hands On	Tech level
3	True	2

Abstract:

Time to put your Hands-On the new 10BASE-T1S Technology!Do you need to add 10BASE-T1S connectivity to your industrial or automotive application?Do you want to learn more about 10BASE-T1S and the brand-new media access method PLCA (physical layer collision avoidance) offering maximum bandwidth utilization ?After attending this class you will understand the important features of the 10Base-T1S standard and how it compares to other legacy and wired Ethernet interfaces, as well as the key design considerations for replacing legacy field bus solutions in order to realize the benefits of migrating legacy Information and Operation Technology buses to 10BASE-T1S. Learn that the 10Base-T1S standard offers support for Precision Time Protocol, Time Sensitive Networks, Wake and Sleep, Network Discovery… and in the future Remote Control and Layer-2 Security that are still being standardized.This class will teach you how to configure PLCA network parameters, and how to setup a physical 10BASE-T1S network using MPLAB® X , Harmony, microcontroller boards, and the latest LAN867x/5x PHYs and MAC-PHYs for 10BASE-T1S. Examine and explain the effects of different network configurations on the available bandwidth and communication.

Class Description

24038 NET2 Developing your first managed Ethernet switch. A hands-on introduction to Linux Switchdev and an overview of switch operating systems.

Hours	Hands On	Tech level
3	False	1

Abstract:

Developing a managed Ethernet switch can be achieved either by bare metal programming, using Linux Switchdev or a commercial off-the-shelf operating system.

Switchdev is a suite of Linux tools which allows offloading the task of data forwarding from the host CPU to the switch ASIC itself. This class will introduce the concepts of adding IP addresses to devices, bridging and an introduction to VLANs and implementing them with Switchdev. This part of the class will be hands-on using the LAN9662 evaluation tools.

The class will also demonstrate the implementation of the PTP4L Precision Time Protocol stack on the LAN9662 and introduce bringing up a device as an IEEE1588 synchronized device and demonstrate timing accuracy between networked devices. Additional freely available software libraries will also be introduced to further expand the use of Switchdev, time and Linux to build the feature set of a switch.

Finally the class will give an overview of a switch operating system (iStax) and a pragmatic overview of where each of the solutions may offer the most technically and commercially viable solution based on the requirements of the switch design.

24039 NET3 Harnessing the Power of PCIe in Embedded Systems

Hours	Hands On	Tech level
3	False	1

Abstract:

Within embedded systems there is a growing trend to streamline processors by reducing the different I/O available. Throughout this, PCIe, a high-speed, adaptable, and scalable interface for linking peripheral devices, remains a constant. This interface can extend an embedded host's I/O capabilities. This course will guide you on the fundamentals of PCIe and then dive into more detail on adjusting the runtime parameters of a connected PCIe device, such as link speed/width and power management, hot-swapping PCIe devices in an embedded system, and utilizing PCIe bridges to expand the I/O capabilities of an embedded system.

Class Description

24040 SEC1 Crypto Primer: Everything you ever wanted to know about Cryptography; the Why and How.

Hours	Hands On	Tech level
2	False	1

Abstract:

Curious about the secrets of cryptographic security in the digital realm? Our "Crypto Primer" class is just the adventure you need. Imagine delving into the world of digital security, starting with the crucial role of security and the significance of microchips in protecting our digital treasures. Picture yourself uncovering the mysteries of private keys and navigating through the labyrinth of cryptographic principles, algorithms, and technologies. Demos will bring to life the concepts of data integrity, confidentiality, and authentication, along with a certificate-based TLS connection. This journey concludes with advanced explorations and demos in secure boot processes and firmware upgrades, equipping you to safeguard your digital realm. So, are you ready to unlock the secrets of cryptography?

Prerequisites:

SEC1, SEC2 is highly recommended.

24041 SEC2 Hacking the Badge: Researching Vulnerabilities in Embedded Systems

Hours	Hands On	Tech level
3	True	3

Abstract:

In this class the you will dive into the role of a white hat security researcher. As recommended pre-work you will receive code and schematics for a security badge that will actually be used at the conference. You will review carefully using your current knowledge to try to find any vulnerabilities ranging from default passwords to advanced fault injection attacks. During the class you may volunteer to present your findings to everyone. In the class you, individually, or in groups of 2-3, will walk through discovering and exploiting all vulnerabilities in the badge using a lab manual to guide you. You will use side-channel analysis and fault injection tools and even a soldering iron. After completing this lab you will have a new perspective on what attacks you should be concerned about when designing an embedded system

Class Description

24042 SEC3 Enhancing Device Security: Leveraging TrustMANAGER / keySTREAM solution to comply with security legislation and standards as TEC 31318 and AIS-140

Hours	Hands On	Tech level
3	True	2

Abstract:

Embark on a journey into IoT security with our class on in-field provisioning and dynamic remote management using keySTREAM SaaS and ECC608. This course tackles the challenges of setting up and managing a cost-effective, production-grade PKI, and updating cryptographic credentials in a vast IoT fleet. Learn to effortlessly establish robust PKI policies and integrate keystream key management into embedded systems. The class splits into two parts: theoretical concepts with transaction diagrams between keySTREAM SaaS and ECC608, followed by a hands-on session utilizing keySTREAM SaaS for PKI

provisioning, certificate management, and key lifecycle events using the latest IoT tools. This course is your guide to mastering scalable and secure IoT device management.

Prerequisites:

https://mu.microchip.com/cryptography-primer

https://mu.microchip.com/trust-platform-design-suite-v2-introduction

https://mu.microchip.com/securely-connecting-to-aws-iot-core-with-the-atecc608b-course-in-development

24043 SEC4 Authenticate and securely start your application (Secure Boot) on Microchip's 32-bit MCUs

Hours	Hands On	Tech level
3	True	2

Abstract:

By the end of this hands-on class the attendee will understand the process of creating a Public/Private key pair using Microchip's security tools, Provisioning the public key to the device and using the Private key to sign an application and enable the secure boot functionality of the device.This class will demonstrate how to perform secure boot on different 32-bit architectures.

Prerequisites:

Attendees registering for this class should have basic knowledge of how to use MPLAB Tools (IDE, Compiler and Debugger)

Class Description

24045 IoT1 Multi-Protocol Sensor Network using Bluetooth® Low Energy and 802.15.4

Hours	Hands On	Tech level
3	True	1

Abstract:

Ever wonder how to connect a wireless sensor to your phone via BLE? How about multiple sensor nodes in a wireless network? In this class we will build a complete plant health sensor monitoring system that interfaces with a smart phone over BLE and to a wireless data gateway.The class will make use of Microchips multiprotocol wireless solutions to create a data link from the sensors to the connected smartphone app and a data gateway. Students will have opportunities to practice:

- Developing an application using wireless building blocks in code
- Reading and transmitting key sensor values
- Adding a second protocol to the wireless system
- Reading and transmitting key sensor values to a wireless gateway over a separate protocol.Further DevelopmentIf you also are interested in extending this functionality using a cloud service, consider coming by the wireless booth at ask the experts to see more demos

24046 IoT2 WiFi IOT made simple with new RNWF

Hours	Hands On	Tech level
3	True	1

Abstract:

Are you overwhelmed at the complexity required to connect a sensor to your cloud application? Simplify the task by eliminating the complicated stack development process. Connect your application to a Microchip network controller and accelerate your design using our AT command solution.In this class we will use the new RNWF modules and their cloud-friendly AT command set. Using just five simple AT+CMD to connect to a Secure Access Point (AP), six AT+CMD to securely connect over TLS to an MQTT Cloud broker (AWS IoT, Azure, or Mosquitto), and just a couple more commands to exchange data with MQTT brokers.The beginning of the class will show easy techniques to explore the features of RNWF modules. After we cover the basics, we will show how to connect an 8-bit embedded device to AWS IoT and exchange data using MQTT.

Class Description

24047 IoT3 Rapid Prototyping of IoT Solutions using MicroPython

Hours	Hands On	Tech level
3	False	1

Abstract:

Have you considered MicroPython for your next wireless design? In this class we demonstrate how to integrate the Micro Python Harmony middleware component in a Microchip 32 bit MCU. A full wireless IOT cloud application will be developed using MicroPython. By the end of the class you will be able to build and see your data on a cloud system. The hands on labs will provide opportunities to practice setting up the micro python, hardware and software development environment, reading and transmitting a simple sensor value to a cloud as well as receiving control commands via the cloud. If you are interested in extending this functionality, come by the wireless table in the Ask-the-Experts area to see some more advanced demos.

24048 AMS1 Mitigate signal noise and improve analog system precision using simulation techniques

Hours	Hands On	Tech level
3	True	2

Abstract:

Got Noise in your signal? Having a hard time choosing the correct signal conditioning topology? Do you want to increase the accuracy & precision in your system? Then this hands-on class is for you. Together, we will use the Mindi Analog Simulator as a tool for making design decisions.

Prerequisites:

Working knowledge of Mindi Simulator (or similar tools) and familiarity with its analysis toolsThe following Microchip MU Classes are extremely helpful in preparing for this class 1. Mindi Analog Simulator Applications 2. Mastering Analog Simulations Using the MPLAB Mindi Analog Simulator

Class Description

24050 AMS3 High accuracy sensors for linear and rotary position measurement

Hours	Hands On	Tech level
3	True	1

Abstract:

Accurate, safe, robust linear or rotary position measurement technologies are vital to industrial, electric vehicles, appliance and factory automation products. Leading edge sensors are critical to first class products. However, it is time consuming and expensive for product design engineers to learn the intricacies of a new position sensing technology.Get a hands on experience with a linear sensor that you can calibrate with in person guidance and support, that only requires a metal target and a printed circuit board. This experience will give an application space overview, sensor technology comparisons, and demonstrate how easy it really is to jump start your next position sensor design with inductive position sensors.

Prerequisites:

Microchip.com Account.

- If they are using thier own computer they will need the latest IPCE software downloaded
- Suggested Prerequisite- “Designing Your First Inductive Position Sensor” MU class at https://mu.microchip.com/sensors-i-designing-your-first-inductive-position-sensor

24051 MC1 3-phase Sinusoidal Motor Control with AVRs

Hours	Hands On	Tech level
3	True	2

Abstract:

Interactive hands-on class presenting a novel Motor Control solution with AVR® MCUs for low-cost and low-noise motor solutions. Configure the new hardware peripherals of the AVR EB using MCC in 4 modes of operation: Trapezoidal or Sinusoidal drive, both with sensored or sensorless feedback.

Learn about the new drive and BEMF acquisition method that makes Sinusoidal sensorless commutation on AVR possible without FOC.

Spin a BLDC/PMSM Motor with the help of the new Multi-Phase Power Board and see the limitations and differences between the Trapezoidal and Sinusoidal solutions.

Class Description

24052 MC2 Brushless Motor Control Workshop from forced commutation to sensorless field oriented control including Microchips dedicated tools.

Hours	Hands On	Tech level
3	True	2

Abstract:

Upon completion of this course, you will be proficient in utilizing the specialized Motor Control Peripherals, understanding the basics of a Brushless DC Motor, and implementing various methods to control a Brushless DC Motor. You will also be able to employ the high-speed X2CScope Virtual Oscilloscope interface for real-time debugging and successfully operate a BLDC Motor within your application. Additionally, this course will familiarize you with our QSpin Harmony3-based tool designed for configuring motor control algorithms.

Prerequisites:

Attendees registering for this class should have basic knowledge in using MPLAB and debuggingAttendees registering for this class should have basic knowledge in using interface toolsAttendees registering for this class should have basic knowledge in “C” programming

24054 MC4 Predictive Maintenance in Motor Control Applications

Hours	Hands On	Tech level
3	False	2

Abstract:

Predictive Maintenance solutions can help to detect anomalies in your motor control application. 2 different solutions for field oriented controlled PMSM motors will be presented that don’t required any additional sensor. Statistical or Neural Network models will be created based on captured data and depending on the selected solution ether deployed as a library or instantaneously online.

Prerequisites:

The attendee should have good knowledge of Microchip tools, C programming and field oriented motor control.

Class Description

24055 MC5 Introduction to Zero Speed Maximum Torque (ZSMT) algorithm using Microchips dedicated tools motorBench or QSpin.

Hours	Hands On	Tech level
2	False	5

Abstract:

Introduction to Zero Speed Maximum Torque (ZSMT) algorithm over motorBench/Qspin. This algorithm allows you to start your PMSM motor from zero speed with maximum torque in closed loop. Use cases, requirements and limitations will be discussed. motorBench and QSpin will be used to showcase different demos.

24056 PC1 Power Design with the Microchip Analog Tools Ecosystem

Hours	Hands On	Tech level
3	True	1

Abstract:

This course will demonstrate how the Microchip Analog Tools Ecosystem can make power design, and other analog functions, more efficient and less error prone. The instructor will demonstrate and provide opportunities for hands-on investigation by the attendee for each step of the tool chain:

* Find It, Design It - Use MAD to find a power solution and customize it for their application
* Simulate It - Export/download a schematic from MAD to simulate in the Mindi Simulator
* Build It - Instructor will demonstrate how to find and use CAD/CAE models for the components
* Check It - Instructor will demonstrate how to submit a design to have Microchip engineers review it

Class Description

24057 PC2 Analog Control of DC-DC Converters

Hours	Hands On	Tech level
3	False	2

Abstract:

The Buck DC-DC converter (step-down converter) is a popular solution for today's point-of-load (POL) applications. The main control architectures are Voltage Mode, Current Mode, and Constant On-Time (COT) control modes. This course delves into these converter control schemes through a data-driven lens, focusing on stability, performance, and an analysis of component variations. The primary objective is to empower designers with the knowledge and skills necessary to make informed decisions in selecting the optimal control system for DC-DC converters tailored to specific application needs.

24060 PC5 Enabling the Green Revolution with Bidirectional High-Efficiency Digital Power Factor Correction

Hours	Hands On	Tech level
3	False	2

Abstract:

The need for smart AC/DC and DC/AC power conversion is becoming increasingly vital as we move towards the electrification of everything. Efficient Power Factor Correction (PFC) is a critical part of this story. In this course, we first introduce the fundamentals of power delivery and power quality, before moving onto Power Factor Correction and why it is so important.

We deep-dive into the bridgeless Totem Pole Topology. With its exceptional efficiency and capacity for bi-directional power transfer enabling Vehicle-to-Grid (V2G), Vehicle-to-Load (V2L) and Vehicle-to-Home (V2H), Totem Pole PFC is becoming increasingly popular. This course utilizes Microchip's latest dsPIC33C-based 11kW Totem Pole Demonstration Application as a tool to provide attendees with the necessary knowledge and skills to employ this topology effectively. We will review single phase and three-phase totem pole power factor correction circuits and the advantages of Silicon Carbide switches. Isolation and gate drive circuits will be discussed. Basic waveforms and power calculations will be reviewed. An on-line power simulator will be used to perform detailed analysis of the power dissipation and temperature rise for the discrete power devices in the circuit.

Participants will learn how to implement both AC/DC (PFC) and DC/AC (Inverter) functions using this platform, with an emphasis on the practical hardware and firmware-based techniques required to achieve the highest power factor, lowest distortion, and highest efficiency possible.

Class Description

24061 PC6 Why SiC, Why Now?

Hours	Hands On	Tech level
2	False	2

Abstract:

Are you curious about the sudden prevalence of SiC power devices in trade articles, papers and recent designs? This class will teach you the advantages of using SiC over Si based power devices. Actual high voltage switching loss testing will be performed. The class will give you the opportunity to utilize an online simulation tool to view relevant waveforms and calculate power dissipation and temperature rise of the power devices.

24062 SIG1 Noise Reduction and Robust Hardware Design

Hours	Hands On	Tech level
2	False	2

Abstract:

This class unravels the mystery Noise reduction and its impact on embedded systems design, with particular emphasis on microcontroller based applications. Intuitive relationships, rules of thumb, and a minimum of math are used to guide the participant through the fundamentals of EMC from both an RF emission and immunity perspective. The effects of noise on microcontroller and circuit performance are presented and demonstrated through case studies and live demos. Various hardware and software techniques to help avoid and/or resolve real world EMC problems are discussed. After this class, participants will be able to design new products with noise reduction and robustness in mind. They will also be able to better understand and mitigate EMC and noise immunity problems in existing product designs.

A series of progressively improved board designs will be presented to demonstrate the effects of noise reduction techniques.

Prerequisites:

EMC compatibility class in MU

Class Description

24063 SIG2 What really is EMI and How do I Tackle it?

Hours	Hands On	Tech level
3	False	2

Abstract:

After attending this class, passing EMC testing won't seem impossible! We will explore the fundamental principles of EMI, and understand the impact of it on your final design. Learn the art of designing robust EMI filters by understanding the filter topologies that best fit your product. Finally, we will guide you through the crucial steps of pre-compliance testing, and equip you with the knowledge to evaluate the test results before you go to an accredited test laboratory.

24070 SDR9 Low-Power Software-Defined Radio Platform for Tactical Radio, Space Communications and Beamforming

Hours	Hands On	Tech level
3	False	2

Abstract:

Low power is a key requirement for battery operated devices from handheld devices to communications in space. We will explore various power-efficient solutions to enhance your next FPGA application in communications, radar, and electronic warfare.
We will dive into the advantages of using Microchip's Software-Defined Radio platform on PolarFire® FPGAs and discuss the tools available for rapid application development. We will also introduce a new PIC64HX and PIC64-HPSC families and showcase an example of building large-scale beamforming applications utilizing this product line.

Contact Us

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