2014 Course Catalog

MICROCHIP

Technical Training

Course Catalog

www.microchip.com/training

Curriculum Overview

Looking for a Business Partner, Not Just Another Vendor?

Our mission is to deliver the freedom to innovate by providing the right training, at the right time, in the right place. With a worldwide network of Technical Training Engineers and certified third-party providers, Microchip will work with you to craft an appropriate program to enhance your technical skills, in a location that fits your needs: live instruction in our training centers, in virtual classrooms, over the internet, or at your facility.

Microchip Technical Training Live

These courses are conducted by Microchip or Microchip Certified Technical Training Engineers live at various sites throughout the world, and usually in the local language. These sites can be at Microchip locations or through our extensive network of design, distribution, and training partners. In addition to having a Technical Training Engineer on location teaching the course, Microchip Technical Training Live Courses include ALL tools and materials required to complete the course, as well as snacks and meals.

Microchip Technical Training Live Online

The majority of our classes are also offered as Live Online courses that can be attended from the convenience of your home or office. Microchip Technical Training Live Online Classes are taught over the internet by Technical Training Engineers using the same material as Microchip Technical Training Live Courses. In most cases, these classes have been adapted to be taught with the Microchip MPLAB Simulator or Proteus VSM simulator. Free evaluation versions of all tools, including C compilers and the Proteus VSM engine are provided for you to install in advance once you have registered. We even provide a special class, “TLS0000 Getting Started with Microchip Technical Training Live Online”, to ensure your tools are up and running before you come to your Live Online class. All you need is a computer running Microsoft Windows, a high speed internet connection, a microphone, and speakers.

Microchip Technical Training Live Onsite

For those organizations who desire to have a number of employees attend a course at the same time, Microchip can customize any curriculum to meet your specific needs. Our instructors arrive at your location with all presentation materials and equipment, making it easy for your whole team to benefit from a specific course topic in one setting.

Microchip Technical Training Live Conference

If your organization is unable to attend the MASTERs, we can bring the MASTERs to you through this program. Some of the most popular classes taught at the MASTERs conference can be delivered through a combination of internet and live classes. They can be scheduled over the course of several weeks at your convenience.

Microchip Technical Training Self Paced

Like the name implies, these courses allow the student to learn at their own pace. These classes are delivered via internet and can be accessed at the student’s convenience. The number of classes available through this program is constantly increasing.

Registration and details for these programs can be found at www.microchip.com/rtc
For customized programs please contact your local sales engineer.

Class units
A class unit is approximately a half a day depending upon the region and the venue in which it is delivered.

Application-Based Classes

Product and tool classes provide knowledge on how Microchip's products and development tools operate. This knowledge provides the foundation upon which all application instruction is based. Attendance to one of these classes can provide significant value through the reduction in time associated with instructional manuals, data sheet review, or trial and error attempts to learn individually.

Market forces constantly press companies to add functionality and features to their products often outside their areas of core competence. As a result, engineers must continually broaden their knowledge base. Microchip's technology classes are intended to help engineers gain an understanding of a new field.

Implementation classes combine elements of product and technology instruction to teach engineers how to design a real world application. Classes at this level provide how-to instruction rather than what or why instruction.

Analog Signal Processing

Course Title **Course Number (Units)**	**Op Amp Fundamentals** **ASP0107 (2 class units)**
Abstract	This class reviews basic Operational Amplifier (Op Amp) concepts and terminology. The key DC and AC characteristics found in an op amp data sheet are defined and discussed so the system designer can choose the right op amp for the application. Examples and analysis of op amp application circuits are presented. Written exercises are provided throughout the course to enhance understanding.
Recommended Prior Knowledge	Knowledge of basic electronics

Course Title **Course Number (Units)**	**Analog Sensor Conditioning in Embedded Systems** **ASP2201 (1 class unit)**
Abstract	This class provides background information on the many types of sensors and sensor conditioning circuits, including active filters. Three common sensors and their conditioning circuits are covered in detail. Hands-on experiments help illustrate these sensor circuits and the filter design theory. The three sensors covered are: thermistor (temperature), photodiode (light) and capacitance (humidity).
Recommended Prior Knowledge	Knowledge of basic electronics

Bus Communications and Networking

Course Title **Course Number (Units)**	**Principles of I²C™ Design** **COM2109 (2 class units)**
Abstract	This class breaks down the hardware and software components needed to use the Inter-Integrated Circuit (I²C™) bus at all levels. All aspects of I²C™ from address and data formatting to command syntax and handshaking are covered. In order to give a complete grounding in the use of I²C™, the PICDEM™ System Management board is used to communicate with four I²C™ devices: a real time clock, serial EEPROM, analog-to-digital converter and thermal fan controller. Each of the four labs uses the MPLAB®X Serial Device Analyzer to view bus transactions.
Recommended Prior Knowledge	TLS0101, MCU1101

Course Title **Course Number (Units)**	**Introduction to High-Speed USB** **COM3101 (2 class units)**
Abstract	This class introduces the USB protocol and its features. Fundamental USB electrical, mechanical and protocol specifications are presented to help students fully understand the USB capability of Microchip's dedicated USB microcontrollers. This class provides an idea of what kind of tasks are performed, and what factors have to be considered when designing a USB peripheral application. Concepts are enforced through hands-on exercises which show the attendee how to use the CDC class RS-232 Emulation framework to enable basic USB connectivity with a PC using a PIC®18/24/32 USB MCU.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and at least one PIC architecture

Course Title **Course Number (Units)**	**Designing a USB Peripheral Application with the Microchip PIC®** **COM3201 (2 class units)**
Abstract	This class demonstrates how to transfer generic data between a PC host and a device using the HID class, as well as the Custom (or Vendor) class using Microsoft's WinUSB driver. The class examines the advantages and disadvantages of each method. USB PC Host Program design considerations, techniques, and tips are presented and discussed through examples and demonstrations. Class exercises are based on Microsoft Visual C++.NET and Microchip's USB MCU development boards and USB framework.
Recommended Prior Knowledge	COM3101

Course Title **Course Number (Units)**	**Designing a USB Embedded Host Application with the Microchip PIC®** **COM3202 (2 class units)**
Abstract	The USB On-The-Go (OTG) Supplement was designed to allow embedded devices with substantially less resources than a PC to become hosts to other USB devices. This class investigates the different USB hosting options and how these decisions affect designs electrically and mechanically. This class introduces the FAT file system library and how to manipulate files on a thumb drive, enabling data-logging and field firmware updates via thumb drive. It also covers the process for developing a generic driver and application that acts as a host to a simple USB device.
Recommended Prior Knowledge	COM3101

Course Title Course Number (Units)	**Designing TCP/IP Monitor and Control Applications with the Microchip PIC®** **COM4201 (2 class units)**
Abstract	This class delivers a complete design example of a TCP/IP control and status monitoring application. The information presented can be applied to designs using Microchip's MAC/PHY transceiver devices and Microchip's PIC18 microcontrollers with a built-in transceiver. Communication concepts are introduced from the interfaces of the foundation (ARP, IP, DHCP, DNS, etc.) and application layers (SMTP, SNMP, etc.). PHY layer fundamental characteristics are also discussed. Details of the API commands for TCP, HTTP and file system protocols are explained. This class highlights the cross-platform compatibility of Microchip's TCP/IP stack by allowing attendees to implement the application during class on the platform of their choice: PIC18, PIC24 or PIC32 MCUs.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and at least one PIC architecture

Course Title Course Number (Units)	**Advanced TCP/IP HTTP Applications with the Microchip PIC®** **COM4301 (1 class unit)**
Abstract	This class teaches the techniques required to extend a basic MCU based web-server monitor/control system including Authentication and the HTTP-POST methodology for updated pages via HTML forms. The basic foundation layers of TCP/IP are reviewed up through the requirements needed to complete an HTTP-GET based monitor and control system. Both the basic and extended features are taught via study of the required APIs within the ANSI-C based Microchip TCP/IP firmware stack. Debugging techniques utilizing the Wireshark protocol analyzer are also taught. This class highlights the cross-platform compatibility of Microchip's TCP/IP stack by allowing attendees to implement the application during class on the platform of their choice: PIC18, PIC24 or PIC32. PHY interface options in the class include Microchip's 10/100 wire-line Ethernet interface or 2Mbps wireless WiFi interface.
Recommended Prior Knowledge	COM4201

Course Title Course Number (Units)	**Rapid LIN Design Using a Pre-Certified Configurator with the Microchip PIC®** **COM5610 (1 class unit)**
Abstract	LIN (Local Interconnect Network) is a low cost serial communication system intended to be used for distributed electronic systems. This class presents an introduction to the basics of the LIN bus. It covers definition of the protocol and the physical layer, as well as definition of interfaces for development tools and application software. It introduces a third party development tool that simplifies the configuration of a LIN network. Several hands on labs create and configure a LIN bus with the evaluation version of the "LIN Driver Configuration Tool for PIC® Microcontrollers"
Recommended Prior Knowledge	Knowledge of C programming

Course Title Course Number (Units)	**Adding IEEE 802.11 Wi-Fi™ to an Embedded Application** **IRF2101 (2 class units)**
Abstract	802.11/Wi-Fi extends the Ethernet network using familiar protocols and programming layers. This class focuses on the key design considerations to be aware of when adding Wi-Fi connectivity to internet applications. Lab exercises use Microchip's 16/32 bit MCUs, agency certified 802.11/Wi-Fi™ module and TCP/IP Framework.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and either 16-bit or 32-bit PIC architecture

Course Title Course Number (Units)	**Wireless Networking with the MiWi™ Development Environment** **IRF2102 (2 class units)**
Abstract	This hands-on class introduces the MiWi Development studio as the framework for developing low cost, low power wireless networks based on MiWi protocol, as a simpler alternative to ZigBee. This hands on class builds a network based on the MRF24J240 2.4GHz radio modules.
Recommended Prior Knowledge	IRF 2101

Digital Signal Processing

Course Title Course Number (Units)	**DSP Features of the Microchip dsPIC® Architecture** **DSP0201 (1 class unit)**
Abstract	This class covers the DSP specific features of the dsPIC® Digital Signal Controller architecture in detail. These features include the DSP engine, DSP instructions, zero overhead loop features, dual memory access, modulo and bit-reversed addressing, MAC architecture, barrel shifter and multipliers. The exercises combine both C and assembly language programming in a series of signal acquisition and processing applications that reinforce the concepts introduced in the lecture. It is recommended to have a basic understanding of the 16-bit architecture as a prerequisite.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and the 16-bit PIC architecture

Course Title Course Number (Units)	**Designing with Microchip's DSP Libraries and Tools** **DSP0202 (1 class unit)**
Abstract	This class brings the concepts learned in *DSP0201 DSP Features of the dsPIC® DSC Architecture* class into the practical domain by utilizing software tools available for the dsPIC® DSC architecture. This class teaches how to use the free dsPICworks™ tool to generate and analyze data, including observing the frequency spectrum of a sensor output. It also shows how to utilize the dsPIC® DSC Filter Design tool to design FIR and IIR filters based on specified characteristics. Finally, functions from the DSP Library, along with the on-chip ADC peripheral, are used to perform signal processing tasks.
Recommended Prior Knowledge	DSP0201

Human Interface

Course Title **Course Number (Units)**	**Designing with Microchip's Graphics Library** **HIF2131 (2 class units)**
Abstract	This class introduces students to the power of the graphics library included with Microchip's Library of Applications (MLA). Understanding the capabilities of the MLA can significantly decrease the development time of sophisticated graphical LCD based displays as well as various input options. Exercises step through the process of creating applications and testing them with the Microchip Graphics Display Designer X.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and at least one PIC architecture

Motor Control

Course Title **Course Number (Units)**	**Overview of Intelligent Motor Control Solutions** **MCT0101 (1 class unit)**
Abstract	This class describes what electric motors are, and how they operate. It is designed to help the student select the best motor for their application based on the characteristics and features of the most common electric motor types, understand various motor control techniques, and choose between different controls for the application.
Recommended Prior Knowledge	Knowledge of basic electronics

Course Title **Course Number (Units)**	**BLDC Control Techniques with Microchip dsPIC® DSCs** **MCT3101 (2 class units)**
Abstract	This class presents an in-depth analysis of Microchip's Brushless DC Motor (BLDC) Control algorithms. An essential part of the class is an overview of the dsPIC DSC's specialized motor control peripherals. Exercises make use of the Data Monitor and Control Interface (DMCI) plug-in to explore the effects of algorithm parameters on motor start up and run behavior.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and the 16-bit PIC architecture

Course Title **Course Number (Units)**	**AC Induction Motor Control with the Microchip MCHV Development Board** **MCT4201 (1 class unit)**
Abstract	This class is intended for engineers with a solid C programming background and little or no background with controlling an ACIM motor. A background in motor theory is highly desirable since minimal time is devoted to the concepts of motor design and operation.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and the 16-bit PIC architecture

Course Title **Course Number (Units)**	**Sensorless Field Oriented Control for PMSMs** **MCT7101 (2 class units)**
Abstract	This class guides the attendee through Permanent Magnet Synchronous Motor (PMSM) construction and its control. By the use of practical exercises, attendees are familiarized with Microchip tools and Sensorless FOC, an advanced algorithm for PMSM.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and the 16-bit PIC architecture

Power Management and Power Supplies

Course Title **Course Number (Units)**	**Battery Technology and Power Management** **PWR1101 (1 class unit)**
Abstract	This class provides an overview and comparison of practical primary and secondary battery chemistries and other portable power sources such as Solar Cell and Fuel Cell. Battery voltage regulation (Linear, Buck, Boost, Buck/Boost), charging algorithms, protection, safety and maintenance are discussed and demonstrated.
Recommended Prior Knowledge	Knowledge of basic electronics

Course Title **Course Number (Units)**	**Digital Power Converter Basics dsPIC33 DSCs** **PWR3101 (1 class unit)**
Abstract	This class builds the information background that power converter analog designers need to start approaching digital design. Transition from analog to digital is demonstrated based on a simple buck converter topology. Evolution of analog blocks to digital blocks is considered, with comparisons between the performances of the two different approaches. PWM, ADC and comparator are described in their implementation as dsPIC® peripherals. Differences, advantages and cautions in using the digital version compared to the analog version are presented.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and the 16-bit PIC architecture

Course Title **Course Number (Units)**	**Digital Control Techniques for Power Converters Using the dsPIC® SMPS Family** **PWR3201 (2 class units)**
Abstract	This class investigates common control techniques used in converter designs. A review of the basic theory of PID (Proportional Integral Derivative Controllers) precedes its implementation into a dsPIC®. The buck converter on the PICtail™ Buck Boost Board is used to implement voltage mode, average current mode and peak current mode control loops. The code and execution flow for each of these modes is analyzed. The availability of two buck converters on the board enables investigation of a multiphase converter and how to efficiently control it. Finally, soft start and sequencing are implemented and used to manage the switching transients of the converter outputs.
Recommended Prior Knowledge	PWR3101

Extreme Low Power and Battery Management

Course Title **Course Number (Units)**	**Low Power Design with the Microchip nanoWatt XLP** **XLP0110 (1 class unit)**
Abstract	This hands-on class investigates low power system design and innovative features of the Microchip 8 & 16-bit product families optimized for deep low power. The overall low power problem is introduced. System design techniques are presented including management of internal peripherals, low power integration of external peripherals, external signal acquisition problems, power profile and clock management. Details of Microchip's nanoWatt and nanoWatt XLP microprocessors are introduced and examined as an integral part of a low power system design. Exercises reinforce the concepts introduced in the lectures.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and at least one PIC architecture

Course Title **Course Number (Units)**	**Battery Selection for Low Power Embedded Solutions** **XLP1101 (1class unit)**
Abstract	This class investigates battery technologies and how they relate to embedded applications. In addition to discussing the various chemistries and their characteristics, the class finishes with an application case study.
Recommended Prior Knowledge	Knowledge of basic electronics

Development Tools and Programming Languages

Course Title **Course Number (Units)**	**Getting Started with Microchip Technical Training Live Online** **TLS0000 (1 hour)**
Abstract	Having trouble preparing Microchip development tools for an upcoming Live Online or Self Paced class? This workshop provides a basic introduction to the tools, then proceeds with step by step installation and testing of MPLAB® X IDE, MPLAB® XC C compilers, and Proteus VSM simulator. Instructors are available to help with individual installation problems and advice. A link for all necessary tools is provided upon registration.
Recommended Prior Knowledge	Workstation running Microsoft Windows, Apple MAC OS®, or Linux. High speed internet connection.

Course Title **Course Number (Units)**	**Getting Started with Microchip Tools** **TLS0101 (1 class unit)**
Abstract	This class introduces the foundational tools and techniques required to develop applications for any Microchip PIC or dsPIC DSC. Following an introduction to the most common Microchip tools, exercises are presented with the MPLAB® X Integrated Development Environment (IDE) using techniques that are applicable to MPLAB® X's built in simulator as well as to hardware debugging tools such as the MPLAB® REAL ICE™, MPLAB® ICD3 or MPLAB® PICkit™ 3. Exercises include step-by-step creation of a project, code editing and compilation, debugging and running a program.
Recommended Prior Knowledge	Workstation running Microsoft Windows, Apple MAC OS®, or Linux. High speed internet connection.

Course Title **Course Number (Units)**	**Microchip MPLAB® X Debugging Techniques** **TLS0102 (1 class unit)**
Abstract	This hands-on class picks up where TLS0101 leaves off and covers practical debugging techniques using MPLAB® X and hardware and software development tools. The class investigates the use of watch windows, HW and SW breakpoints, debugging control, stack management and debugging exceptions are investigated.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Fundamentals of MPLAB® X IDE** **TLS0104 (1 class unit)**
Abstract	This class explores the fundamentals and debugging features of MPLAB® X IDE. A detailed explanation of the new project creation and legacy project conversion processes is provided. Some of the most exciting new productivity enhancing features are highlighted that are sure to be a welcome addition to your embedded development toolbox.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Subversion Version Control System and Microchip MPLAB® X** **TLS 0901 (1 class unit)**
Abstract	This class introduces the Subversion Version Control System (VCS) and how it interfaces with MPLAB® X IDE. The theory behind the Subversion VCS is presented followed by an exploration of how to use the Subversion plug-in for MPLAB® X.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming

Course Title **Course Number (Units)**	**Transitioning to MPLAB® X IDE for users of MPLAB®-IDE v8** **TLS0999 (1 class unit)**
Abstract	This class introduces MPLAB® X IDE from the perspective of an experienced MPLAB® 8 user. The two IDEs are compared with a special emphasis on differences and new ways of accomplishing everyday tasks. A detailed explanation of the new project creation and legacy project conversion processes is provided. Some of the most exciting new productivity enhancing features are highlighted that are sure to be a welcome addition to your embedded development toolbox.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming, and at least one PIC architecture

Course Title **Course Number (Units)**	**Introduction to the C Programming Language for Embedded Control Engineers** **TLS2101 (4 class units)**
Abstract	This class provides an introduction to the C programming language in the context of embedded systems. The class covers the C language from the ground up from a non-hardware specific point of view in order to focus on the various elements of the C language itself. While not required, previous experience with any programming language or experience with microcontrollers would be helpful. The presentation is accompanied by a series of exercises designed to reinforce the fundamentals, all of which are conducted within the MPLAB® X simulator. Skills learned in this class are applicable to any ANSI C compiler.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Getting Started with the Microchip MPLAB® XC8 C Compiler** **TLS2108 (2 class units)**
Abstract	This class provides an introduction to the Microchip MPLAB® XC8 C compiler for 8-bit processors including the PIC10, PIC12, PIC16, and PIC18 families. Topics include project management, variable allocation, code allocation, interrupt service routines, creation and use of libraries, mixing C and assembly, memory models, optimization and an overview of Microchip specific extensions for embedded systems programming. Concepts are reinforced through a series of exercises.
Recommended Prior Knowledge	TLS0101, Knowledge of the 8-bit PIC architecture

Course Title Course Number (Units)	**Getting Started with the Microchip MPLAB® XC16 C Compiler** **TLS2116 (2 class units)**
Abstract	This class provides an introduction to the Microchip MPLAB® XC16 C compiler for 16-bit processors including the PIC24, dsPIC30 and dsPIC33 families. Topics include project management, variable allocation, code allocation, interrupt service routines, creation and use of libraries, mixing C and assembly, memory models, optimization and an overview of Microchip specific extensions for embedded systems programming. Concepts are reinforced through a series of exercises.
Recommended Prior Knowledge	TLS0101, Knowledge of the 16-bit PIC architecture

Product Family Classes

Engineers looking to gain in-depth knowledge of a particular Microchip microcontroller family are encouraged to take one or more of the following class sequences. These sequences provide the foundational tool and product knowledge to quickly begin designs. The classes help speed time to market by efficiently providing engineers with knowledge that takes much longer to learn in a trial and error setting.

Baseline Microcontroller Family (PIC10, PIC12X5, PIC16X5X)

Course Title **Course Number (Units)**	**Getting Started with Microchip Baseline PIC® MCU Architecture and Peripherals** **MCU0101 (2 class units)**
Abstract	This class teaches how to write programs using the architecture and peripherals of Microchip's Baseline PIC® microcontroller family. The course covers the architecture, the peripherals and programming for Baseline PIC microcontrollers in assembly language. The course also covers the tools needed to fully develop and download applications into Baseline microcontrollers.
Recommended Prior Knowledge	TLS0101

Mid-Range Microcontroller Family (PIC12X6, PIC16X6/7/8)

Course Title **Course Number (Units)**	**Getting Started with Microchip's Mid-Range Microcontroller Family Architecture** **MCU1101 (1 class unit)**
Abstract	This class covers the fundamentals of the Mid-Range microcontroller family's architecture and instruction set. Topics covered include the programmer's model, data and program memory organization, clocking structures, assembly language and special features of the devices. Basic concepts are reinforced through the writing of two simple assembly language programs. Hands-on labs using MPLAB® X IDE and development tools are used to reinforce the concepts introduced in the lectures.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Getting Started with Microchip's PIC16F1 Enhanced MCU Architecture** **MCU1102 (1 class unit)**
Abstract	This hands-on class covers the fundamentals of the PIC16F1 Enhanced MCU architecture. Topics include enhancements to the data and program memory, clocking schemes, and special features of the MCU.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Microchip Mid-Range PIC® MCU Peripheral Configuration and Usage with C** **MCU1121 (2 class units)**
Abstract	This class covers the configuration and usage of the Mid-Range microcontroller family peripherals including timers, A/D converters, UARTs, comparators, PWMs and more. Interrupt structures and interrupt service routine handling are also covered. Attendees perform hands-on exercises and learn how to program Mid-Range devices in assembly using MPLAB® X IDE and development tools including simulators.
Recommended Prior Knowledge	MCU1101

PIC18 Microcontroller Family

Course Title **Course Number (Units)**	**Getting Started with Microchip's PIC18 MCU Architecture** **MCU2101 (1 class unit)**
Abstract	This class covers the fundamentals of the PIC18 MCU family architecture and instruction set. Topics covered include the programmer's model, data and program memory organization, clocking structures, assembly language and special features of the devices. Attendees learn how to program Mid-Range devices using MPLAB® IDE and development tools including simulators.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Microchip's PIC18F MCU Peripheral Configuration and Usage with C** **MCU2121 (2 class units)**
Abstract	This class covers the configuration and usage of the Mid-Range microcontroller family peripherals including timers, A/D converters, UARTs, comparators, and PWMs . Interrupt structures and interrupt service routine handling are also covered. Attendees learn how to program PIC18 devices in assembly using MPLAB® IDE and development tools including simulators.
Recommended Prior Knowledge	MCU2101

PIC24 Microcontroller Family

Course Title **Course Number (Units)**	**Getting Started with Microchip's 16-bit MCU Architecture** **MCU3101 (1 class unit)**
Abstract	This class covers the microcontroller architecture fundamentals for Microchip's 16-bit families (PIC24F/H and dsPIC30/33). Basic concepts of the 16-bit devices are reinforced through the writing of simple programs. The class covers program and data memory organization, instruction set, addressing modes, clocking sequence and modes and Program Space Visibility (PSV). Attendees leave with a knowledge of fundamentals for the PIC24 and dsPIC30/33 families. This class does NOT cover the DSP architecture or DSP specific instruction set of the dsPIC30/33 families.
Recommended Prior Knowledge	TLS0101

Course Title **Course Number (Units)**	**Microchip 16-bit MCU Peripherals (Unit 1)** **MCU3121 (2 class units)**
Abstract	This class covers the standard peripheral set of Microchip's PIC24 microcontroller and dsPIC digital signal controller families. Using hands-on exercises and the MPLAB® C compiler for the PIC24, students become familiar programming the I/O ports, ADC, timers, PWM, UART and MSSP modules. Although based on the PIC24 microcontrollers, these principles are directly applicable to Microchip's entire 16-bit family including the PIC24F, PIC24H, dsPIC30F and dsPIC33F devices.
Recommended Prior Knowledge	MCU3101

Course Title **Course Number (Units)**	**Microchip 16-bit MCU Peripherals (Unit 2)** **MCU3122 (2 class units)**
Abstract	This class covers the extended peripheral set of Microchip's PIC24 microcontroller and dsPIC® digital signal controller families. Using the MPLAB® C30 compiler, students become familiar programming Peripheral Pin Select (PPS), Parallel Master Port (PMP), Real Time Clock Calendar (RTCC), Cyclic Redundancy Code (CRC) and DMA modules. Although based on the PIC24 microcontrollers, these principles are directly applicable to Microchip's entire 16-bit family including the PIC24F, PIC24H, dsPIC30F and dsPIC33F devices.
Recommended Prior Knowledge	MCU3101

PIC32 Microcontroller Family

Course Title **Course Number (Units)**	**Getting Started with Microchip's 32-Bit MCU Architecture** **MCU4101 (2 class units)**
Abstract	This class introduces the attendee to the basic operation of the PIC32MX microcontroller. Attendees are led through several hands-on exercises to demonstrate key concepts of the PIC32MX architecture. By the end of this class, attendees will have created and debugged several PIC32 MCU projects.
Recommended Prior Knowledge	TLS0101, Knowledge of C programming