<table>
<thead>
<tr>
<th>Session</th>
<th>Track 1</th>
<th>Track 2</th>
<th>Track 3</th>
<th>Track 4</th>
<th>Track 5</th>
<th>Track 6</th>
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</thead>
<tbody>
<tr>
<td>8 to 9 a.m.</td>
<td>Registration / Continental Breakfast</td>
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<td>9 to 10 a.m.</td>
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<td>1</td>
<td>Analog Sensing AFEs for Environmental Sensing and Their Wireless connectivity</td>
<td>Industrial DAC Essentials</td>
<td>Power Supply Noise Challenges in Precision Analog, Radios, and Communication Systems</td>
<td>Range Considerations for RF Networks</td>
<td>Getting Started with Stellaris® EK-LM4F120XL LaunchPad (session 1 of 2)</td>
<td>Sitara™ Based Android Introduction</td>
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<td>10 to 10:30 a.m.</td>
<td>Break/Exhibits</td>
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<td>10:30 to 11:30 a.m.</td>
<td>Temperature Sensor Measurement Techniques Using Delta Sigma Converters</td>
<td>Ten Little Analog Lessons</td>
<td>What's New in Power for 2013</td>
<td>RF Basics, Tools, Design Overview and Demo</td>
<td>Getting Started with Stellaris® EK-LM4F120XL LaunchPad (session 2 of 2)</td>
<td>Ti Sitara-Based Android Out of Box Experience and Roadmap</td>
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<td>11:30 a.m. to 1 p.m.</td>
<td>Lunch/Exhibits</td>
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<td>2 to 2:15 p.m.</td>
<td>Break/Exhibits</td>
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<td>2:15 to 3:15 p.m.</td>
<td>RS485: The Industrial Workhorse’s Design Guide</td>
<td>Parasitics in Precision PCB Layouts</td>
<td>Fly-Buck™ Solution: Adding Well Regulated Isolated Outputs to a Buck Without Opto</td>
<td>Using SimpleLink WiFi CC3000 for Home Automation and Cloud Connected Sensors</td>
<td>InstaSPIN: Your own Personal Motor Control Expert (session 1 of 2)</td>
<td>AM335x Starter Kit Overview</td>
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<td>3:15 to 3:30 p.m.</td>
<td>Break/Exhibits</td>
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<td>3:30 to 4:30 p.m.</td>
<td>Sensor Signal Conditioning Basics and Technology Trends</td>
<td>Analog to Digital Converters: To Calibrate or Not to Calibrate? – That is the Question…</td>
<td>Battery Management Technology Overview: Charging, Protection, and Gauging</td>
<td>Overview of Dynamic Near Field Communications (NFC) Tag Type 4B…Using NFC to enable Alternative Radio Connection Handovers (Bluetooth, WiFi, etc.)</td>
<td>InstaSPIN: Your own Personal Motor Control Expert (session 2 of 2)</td>
<td>Introduction to BeagleBone Black</td>
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Cleveland Tech Day 2013 Session Titles and Abstracts

Track 1 - Industrial and Sensing

Analog Sensing AFEs for Environmental Sensing and Their Wireless connectivity

This session will discuss how Texas Instruments is addressing the growing demand for affordable, small-scale sensor solutions including wireless networks that provide the smallest size, lowest cost, lowest power and most flexible solutions for the industrial, consumer and medical markets. A focal area for this session will be on environment sensing. This segment is growing exponentially with increasing pull from markets that are demanding greener, smarter and safer infrastructure. To alleviate the energy crisis and government regulations about safety, the building automation and air quality markets are demanding more and more sensing and control expertise. A hands-on demo will be shown demonstrating a Breath analyzer module featuring TI’s Sensor AFE with a Low power BLE solution that is available now as a free mobile app.

Temperature Sensor Measurement Techniques Using Delta Sigma Converters

Today’s Delta-Sigma Converters are highly integrated devices often used with RTD’s, thermocouples and Thermistors to perform precision temperature measurements in Industrial Applications. A Delta-Sigma converter such as the ADS1248 and ADS1220 incorporate a digital filter, voltage reference, internal amplifier and programmable excitation sources to configure the device in different configurations. However, the circuit designer working in the application environment faces many questions: What are the optimal circuits and configuration settings to perform the measurement? What are the considerations when choosing the external circuit components and necessary anti-aliasing filters? This presentation will explore circuit design considerations and trade-offs, calibration techniques, sensor linearization methods, and measurement error analysis. The presentation will provide a detailed look at RTD ratiometric measurements and anti-alias filter design considerations. The presentation will include circuits with experimental results using the ADS1248 and ADS1220.

Distributed Power Monitoring: Temperature, Voltage and Current

Today’s board and system design engineers face many challenges that can threaten to delay their new product development. Achieving optimal system performance on the first pass is key to a successful product development and go-to-market strategy. This session will discuss how Texas Instruments is addressing the rapidly emerging market for distributed power monitoring with an emphasis on improving monitoring accuracy, improving system performance while at the same time reducing system costs. The session will be broken into two halves. The first half will focus on accurately sensing current, voltage and power with an emphasis on identifying and understanding sources of errors with a goal to reduce and/or eliminate these sources of errors. The second half will focus on temperature sensing with an emphasis in theory of operation of local and remote junction temperature sensors, challenges affecting measurement accuracy and sensing and communications in noisy environments.

RS485: The Industrial Workhorse’s Design Guide

RS485 is the most successful industrial interface technology worldwide and enjoys a dramatic growth rate in China and other parts of the world. Most fieldbus systems use RS485 as their physical layer. This comprehensive session explains the standard basics, shows the favoured bus structures, derives the maximum stub length, calculates external failsafe resistors, introduces the single-ground reference design, determines the minimum distance between network nodes, demonstrates how to isolate bus nodes, introduces IEC’s ESD, Burst, and Surge test, and presents solutions for EMI transient protection. A final product overview concludes the session.

Sensor Signal Conditioning Basics and Technology Trends

Sensors are used to convert a physical quantity (such as pressure) to an electrical signal. Example sensors used in Industrial and Automotive applications include pressure sensors, temperature sensors, and humidity sensors. A sensor signal conditioner is used to process the output of the sensor element and to generate a signal that can be interfaced with the control system. In this presentation, we will introduce three specific sensor signal conditioning solutions offered by TI: (1) die solutions, (2) high temperature (>125C) solutions, and (3) integrated solutions. We will then discuss in detail the PGA400, which is an integrated solution, for pressure sensor signal conditioning. Specifically, the block diagram of the device and pressure sensor calibration using the PGA400 will be explained. The presentation will then conclude with roadmap overview for integrated signal conditioning solutions from TI.

Track 2 - Signal Chain Design

Industrial DAC Essentials

This seminar will kick off with an exploration into the three primary precision DAC architectures. We will define the DAC architectures, explain how they work, and trade-offs from one architecture to the next. The seminar will conclude by reviewing datasheet specifications common across the TI precision DAC portfolio and explain how the specifications are measured and why they may be important in your application. The presentation will conclude with discussion of industrial DAC applications, TI solutions for these applications, and a few neat circuits that any engineer will want in their “bag of tricks”. If time permits, we will also draw attention to TI DAC evaluation tools & software.

Ten Little Analog Lessons

This collection of mainstream op amp topics addresses questions that frequently appear in our forums. It covers common mistakes, misconceptions and misunderstandings—and the type of errors that are frequently made. All topics take a practical, intuitive, approach but are thoroughly grounded in theory. A sampling of some of the topics are 1) can op amps be used as comparators, 2) are input bias cancellation resistors really needed, 3) why op amps oscillate, and more. You will leave with a clearer understanding of op amp circuits and behaviors and better prepared to not make those same mistakes in your own designs.

How to Design for the Best Performance out of Your SAR ADCs Using SPICE Models

This presentation highlights the fundamentals of Successive Approximation converters as well as a detailed explanation of the key specifications and parameters of the SAR converter that are needed to optimize the input drive and reference circuitry for best performance. Finally, using these key parameters will yield a systematic process to design and leverage SPICE to optimize your final circuit for power, stability, and settling time without having to rely on laborious hand calculations.

Parasitics in Precision PCB Layouts

Ideally, a printed circuit board (PCB) would have no impact on the performance of the circuit which was installed on it. In reality, however, improper PCB layout techniques can create parasitic capacitances, inductances, thermocouples, and other elements which can interact with circuits in undesirable ways. This presentation will provide examples of how these parasitics are formed as well as recommended layout techniques for avoiding them. A hands-on workshop will allow the participants to measure the effects of PCB parasitics and compare the behavior of identical circuits on both “good” and “bad” PCB layouts.

Analog to Digital Converters: To Calibrate or Not to Calibrate? That is the Question...

Some analog-to-digital converters have built in calibration routines while others do not. Within the conversion process external circuitry can create offset and gain errors, but what about the ADC? Many delta-sigma precision data converters have a built in mux or gain stage that can affect the result. Even the conversion process may induce error. So what can be done, or is it even necessary to do anything? This presentation will discuss both offset and gain error and how it can be calibrated out of the measurement for systems that do not have built in calibration routines and registers. The topic will center around the precision delta-sigma ADS1220, and software functions utilizing a MSP430 for calibrating error via software. The same techniques can be used by other ADCs and processors as well.

Track 3 - Power Supply Considerations

Power Supply Noise Challenges in Precision Analog, Radios, and Communication Systems

One of the challenges system designers face is to create power supplies that provide voltage rails to a system’s radio, high speed data converters, and signal chain device that have low enough noise to realize the full performance of the system. In particular, the power supply’s design is most difficult when the radio is implemented in portable equipment because of the small system size and low power requirements. There are effective techniques to create these power rails using low noise LDOs, filtering, board layout techniques and careful component choice. This session reviews these methodologies and shows the resulting performance on a low power wireless system.
Fly-Buck™ Solution: Adding Well Regulated Isolated Outputs to a Buck Without Opto

The Fly-Buck converter, also known as the isolated buck converter, is a sync buck with a coupled inductor/transformer replacing the inductor and having a flyback-like isolated secondary output. The Fly-Buck can generate multiple outputs and have regulation done on primary side without opto. The LM(2)5017/8/9 family are constant-on-time sync buck regulators with wide Vin (up to 100V). Using it in the Fly-Buck provides a cost effective, minimum component count and easy-to-use solution and makes it exceptionally suitable as a flyback alternative for industrial applications with high input voltage and requiring isolation outputs and have regulation done on primary side without opto. The LM(2)5017/8/9 family are constant-on-time sync buck regulators with wide Vin (up to 100V). Using it in the Fly-Buck provides a cost effective, minimum component count and easy-to-use solution and makes it exceptionally suitable as a flyback alternative for industrial applications with high input voltage and requiring isolation.

Battery Management Technology Overview: Charging, Protection, and Gauging

This presentation will begin with a brief survey of the various battery technologies available to help the user decide which type of cell chemistry is appropriate for their application. The appropriate type of battery management electronics required for different systems will be reviewed. Special considerations for lithium-ion and larger format battery packs will be discussed. Some guidelines for deciding on the architecture of battery protection, capacity monitoring, and efficient charging circuit implementation will be provided along with a roadmap and overview of the TI battery management solutions portfolio.

Track 4 - Wireless Connectivity

Range Considerations for RF Networks

This course will cover the theories behind antennas and RF range and discuss what occurs when line of sight is not an option. Antenna types and sizes with be compared as well as elements in near field (plastic enclosures) and far field (a wall) are introduced into a system. Finally, these considerations will be applied in a Link Budget example.

RF Basics, Tools, Design Overview and Demo

Has your manager asked you to remove the wires from the design? Not sure where to start? This presentation serves as an overview of the parameters and considerations a designer would use to select a low-power wireless (LPW) solution. It also highlights the devices and tools from TI and how they fit in a typical low power RF design. A reference design will be reviewed as an example.

Bluetooth v4: A low energy technology to the Bluetooth Specification

Bluetooth v4.0 introduced a low energy technology to the Bluetooth Specification, enabling new Bluetooth Smart devices that can operate for months or even years on tiny, coin-cell batteries. Markets for these new devices include health care, sports and fitness, security, and home entertainment. This session gives an overview of Bluetooth Low Energy and shows the audience how to get started with Texas Instruments CC2540/1 and Bluetooth Low Energy SW stack.
Track 6 - ARM Processors

Sitara™-Based Android Introduction
In this session we will be talking about why we need Android, Android's migration from phone to embedded applications, and go into detail about the benefits of Android such as attractive licensing and java-based application development.

TI Sitara-Based Android Out of Box Experience and Roadmap
This session focuses on TI's roadmap and experience with Android, content of the development kit package, how to populate the SD card. In addition, we will walk through various performance/benchmark tools and pre-integrated Android applications.

Introduction to BeagleBone Black
In this session Beagle enthusiasts, developers and hobbyists will learn about the recently released lower-cost next generation BeagleBone, BeagleBone Black; that supports AM335x Sitara ARM® Cortex™-A8 Processors. You will learn about new features and how it compares to the original BeagleBone. In addition, you will see how easy it is to get started with the quick out of box experience and how to expand functionality by using the Cape plug-in boards. This low-cost development kit is sure to be something that everyone wants.

AM335x Starter Kit Overview
This introduction to the AM335x Starter Kit outlines the functionality of the $199 development platform while sharing the out of the box support for both Linux and Android. Explore the kit and some of the special demos and features built in to the board. At $199, the AM335x Starter Kit provides a robust development platform without breaking your bank. Learn more today

TI-RTOS: An RTOS Solution for TI MCU Customers
As microcontrollers (MCUs) increasingly offer standard communications peripherals and larger memories on-chip, developers are faced with greater software complexity. This session will overview the TI-RTOS, which provides an integrated set of development tools and embedded software components (including SYSBIOS and StellarisWare/MWare), enabling developers to focus on application differentiation and easily port to other TI MCUs. We will begin with the business model, and licensing terms and then discuss each embedded software component, including the RTOS, file system, USB, TCP/IP, wireless stacks, and device drivers, which reduce the effort required by developers to add feature such as Ethernet or USB connectivity to their products. In addition, we will illustrate the configuration tools associated with these components that enable developers to optimize features and footprint for their application. We will conclude with a summary of the roadmap and release schedule for each MCU family and which boards are supported.

Directions
Corporate College East is easily accessed by traveling south on I-271, exiting at 28B Harvard Road. Proceed turning right off of the exit ramp, traveling west on Harvard Road. The entrance to Corporate College East is located on Richmond Road.

Corporate College East
4400 Richmond Road
Warrenville Hts., OH 44128

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