

BOSTON



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2019 IEEE PHASED
ARRAY SYMPOSIUM

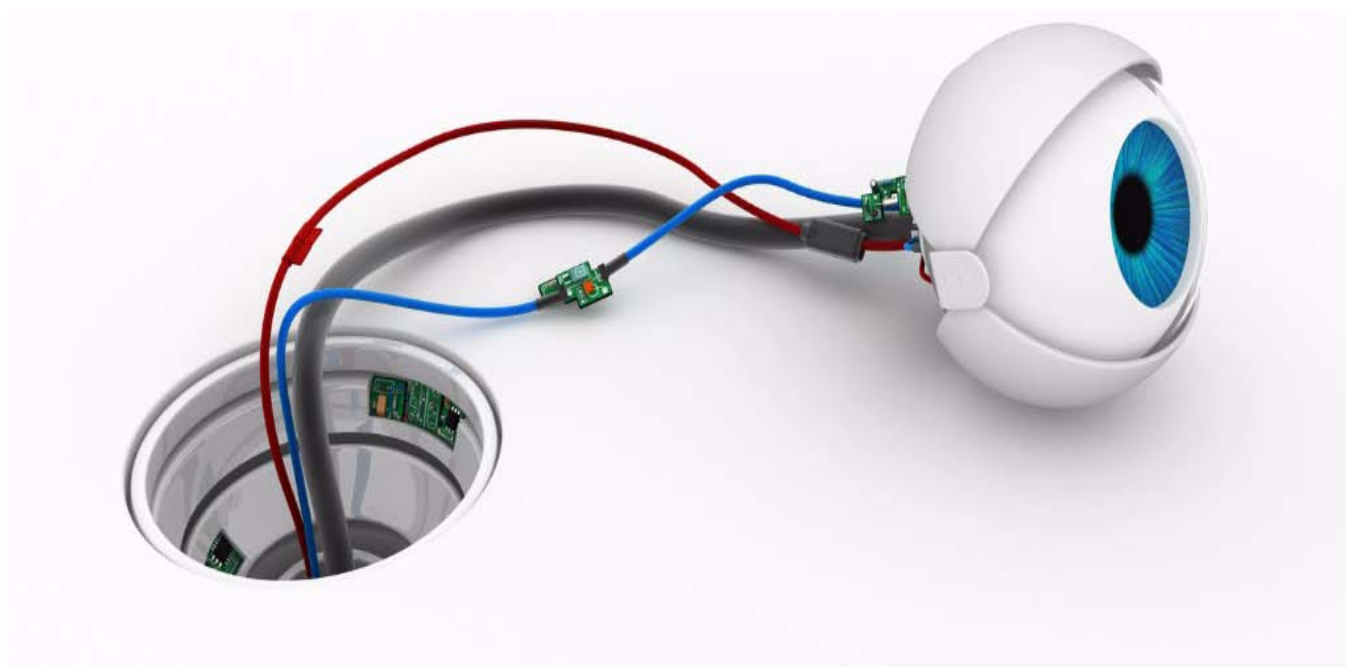
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2019 IEEE RADAR
CONFERENCE

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HIGH
PERFORMANCE
EXTREME
COMPUTING CONF.

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**2018 Outstanding Section Membership
Recruitment and Retention Performance**

Boston Section

 **IEEE**
*Advancing Technology
for Humanity*

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Potholes and Teenagers: The Rules of Engagement

by Karen Panetta, Reflector Editor



Do you remember when you were a teenager? Unfortunately, I do and quite vividly. As you probably already know, rule number one for teenagers is that teenagers know everything and are experts on everything, especially on topics, for which they have no prior experience. Teenager rule

number two is that parents of teenagers know nothing, and the life experiences and wisdom parents possess is not relevant or applicable for teenagers.

I always get asked, "What advice do you wish someone had given you as a teenager, that you know now?" The answer is quite simple. It does not matter what anyone told me or advice they provided. I would have ignored it.

For instance, my father, who worked in the construction industry, once suggested I consider civil engineering as a possible discipline to study in college. I responded with, "No way, I don't want to fill potholes for the rest of my life."

Being a "binary" teenager, which means everything was either a "yes or no" and nothing in between, I had already made up my mind at his suggestion. The answer was "no". There was no need to conduct any further investigation on the matter and the case was closed.

If I could go back in time, I'd give myself a smack up the side of the head for all the great advice I ignored, especially my father's advice to go into business for myself.

Today, I would be quite content with a multi-million-dollar contract filling potholes on our roadways.

Also, knowing there is never a shortage of potholes in our great state, I would have had tremendous job security.

Now, I realize that I know absolutely nothing, even though I am not yet the parent of a teenager, who will eventually tell me this. This realization has turned out to be a good thing. Why? Because now, I try not to make assumptions, jump to conclusions or rip people's faces off for comments that show how truly clueless and uninformed they are about a topic. I look at every interaction, and attendance at a technical meeting as an opportunity to educate myself, and others and most importantly, to keep innovation brewing.

However, I do still hiss and growl at people who engage in unethical behaviors. Some things I just cannot and do not wish to change.

I have mentored and worked with cohorts of students for over twenty years. They come to me with their dreams and aspirations and I have learned quite a bit from them.

In academic engineering programs, all students are required to do a capstone design project. Some choose their own project concepts, others allow the Professors to choose for them. Over the years, I have seen creativity in overdrive from my students. One thing I have learned is that rule number one applies. They know everything, well almost everything.

The students may not have the exact path carved out on where they are going, but they are confident that they will get there. It is my job to help them do exactly that, even if I don't quite comprehend the value proposition in what they are proposing.

In some cases, colleagues have said, “Why don’t you tell the kid what a stupid idea that is?”, I always remember the rules. Teenagers know everything and I know nothing. I never tell them they cannot do something or not to bother even trying. I always give them the tools to investigate the options and determine the feasibility for themselves. The proposed projects, where I struggle to understand what customer base on earth would buy the resulting products, are usually the projects that have made my students millionaires.

There is something about young engineers naivety that keeps their perspectives fresh and unbounded. It is truly refreshing.

An IEEE colleague once told me the story of a Venture Capitalist (VC) who saw a thirty second pitch for a start-up company back in the 1980’s. The VC said the young entrepreneurs showed him a realistic animation of a person morphing (transforming) into an animal.

The VC’s response was “so what?” and made the executive decision not to fund the company.

That company is now known as Pixar. Even today, that VC keeps kicking himself for his poor decision. I have personally exceeded a lifetime limit of poor decision making during my teenage years. So, knowing that teenagers and young adults know almost everything and will most likely ignore advice, which they view as authoritative directives, I always encourage them to make decisions for themselves based on their own investigations and discoveries. I always tell them to never give up on their dream goals and add that I am still working on achieving my own dream goals.

The fact that I still have my own aspirations surprises them. After all, rule number three of teenagers is that anyone over the age of 25 is considered old. At this point in my life, they think I should just climb in the box and close the lid. Young people expect to be successful right now, and not when they are “old”.

Thus, all this has reinforced that unless I see imminent danger including ethical issues, my student mentoring approach is to listen, support, advise and most importantly, learn. One of the best ways I have found to arm students with information without stuffing it down their throats is to introduce them to the networks of individuals who know how to nurture good ideas and turn them into successful entrepreneurial ventures and products.

Here in the IEEE Boston Section, we have many groups that are doing just this. One is the Entrepreneurs’ Network (www.boston-enet.org) and the other is the Consultants Network (www.boston-consult.org). These individuals have mastered the art form of knowing how to give young people advice, while making everyone value the advice and use it.

These affinity groups are not only providing resources to help young professionals meet their goals, but are the strongest support network for those of us who aren’t quite ready to climb into the box and close the lid on our own innovation dream goals.

To answer the question, “What do I wish I had known back then?” I wish I had known that I didn’t know everything and that to be successful, assuming we know nothing can remove all boundaries on innovation.

IEEE Boston Section Spring 2019 Professional Development Program

Practical RF PCB Design, Wireless Networks, Products and Telecommunications

(14 hours of instructions!)

Dates: 9:00AM - 4:30PM, Monday & Tuesday, March 11 & 12

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Henry Lau, Lexiwave Technology

Overview: One of the most demanding consumer products in the market is the wireless telecommunication product. A well-designed Radio Frequency Printed Circuit Board (RF PCB) contributes significantly to the success of any wireless product as the layout of the PCB greatly affects the performance, stability and reliability of the product. In today's highly competitive wireless products market with increasingly compressed development time-frame, there is a strong demand for RF professionals who possess the knowledge and experience to design top-performing RF PCBs in less number of iterations. What matters is whether your level of competence is up to the required standard to meet such demand.

Audience: RF Designers, Wireless Product Designers, Field Application Engineers, Design Managers and related professionals.

Benefits: This course aims to provide participants with an insightful training on RF PCB design from a practical, industrial perspective. Participants will be led through a systematic, theoretical presentation with case studies on commercial products in the training. The course will be conducted by an RF expert with rich industrial experience. It is suitable for RF professionals who want to keep up-to-date their skills and knowledge in RF PCB design and stay competitive.

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Full Course description at :

<http://ieeeboston.org/practical-rf-pcb-design-wireless-networks-products-telecommunications-spring-2019/>

Software Development for Medical Device Manufacturers - An intensive two-day course

Time & Date: 8:30AM - 4:30PM, Wednesday & Thursday, April 10 & 11, 2019

(14 hours of instruction!)

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Steve Rakitin, President, Software Quality Consulting, Inc.

OVERVIEW Developing software in compliance with FDA, EU regulations and international standards is challenging. This two-day intensive course provides practical guidance and suggestions for developing software that complies with applicable FDA and EU regulations, guidance documents and international standards such as IEC 62304 and ISO 14971. The focus of this course is interpreting Design Controls for software. Each section of the Design Controls regulation (820.30) is discussed from the software perspective. Corresponding requirements from IEC 62304 are woven into the flow.

In-depth discussion of critical topics such as Requirements, Software Verification & Validation, Risk Management and Fault Tree Analysis are included. In addition, techniques for validating software development tools and software used in Manufacturing and Quality Systems are also discussed. Interactive group exercises are included to facilitate discussion and learning.

WHO SHOULD ATTEND Software and firmware engineers, software managers, RA/QA staff, validation engineers, and project managers. Anyone interested in learning how to develop medical device software in compliance with regulations, standards and guidance documents. **See Page 26**

Full course Description at, <http://ieeeboston.org/software-development-medical-device-manufacturers>

continued on next page

The Fundamentals of Bioelectronics for Applications in Neuroprosthetics

Time & Date: 8:00AM - 3:00PM, Friday, April 12, 2019

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Marie Tupaj, Middlesex Community College

Description: This course covers the field of bioelectronics, specifically electrode design and implementation, for applications in neuroprosthetics. Electrode materials, electrode array fabrication, electrode modeling, electrical stimulation parameters, bioelectrode charge transfer mechanisms, and interfaces with biological systems are discussed. The fundamental theories of electromagnetism and a history of bioelectromagnetics are reviewed.

Target Audience: This class is designed for engineers transitioning into the field of bioelectronics, electronics engineers interested in neurobiologics, and professionals looking for an understanding of bioelectronics to complete their job. **See Page 25**

Full description at,

<http://ieeeboston.org/fundamentals-of-bioelectronics-for-applications-in-neuroprosthetics/>

Python Applications for Digital Design and Signal Processing (11 hours of instruction!)

Time & Date: 6:00 - 9:00PM, Wednesdays, March 6, 13, 20, 27

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Dan Boschen

Course Summary

This is a bring-your-own laptop, hands-on course in the popular and powerful open source Python programming language. Dan provides simple, straight-forward navigation through the multiple configurations and options, providing a best-practices approach for quickly getting up to speed using Python for solving signal processing challenges. Students will be using the Anaconda distribution, which combines Python with the most popular data science applications, and the Jupyter Notebooks for a rich, interactive experience.

Jupyter Notebooks This course makes extensive use of Jupyter Notebooks which combines running Python code with interactive plots and graphics for a rich user experience. Jupyter Notebooks is an open-source web based application (that can be run locally) that allows users to create and share visually appealing documents containing code, graphics, visualizations and interactive plots. Students will be able to interact with the notebook contents and use “take-it-with-you” results for future applications in signal processing.

Target Audience: This course is targeted toward users with little to no prior experience in Python, however familiarity with other modern programming languages and an exposure to object-oriented constructs is very helpful. Students should be comfortable with basic signal processing concepts in the frequency and time domain. Familiarity in Matlab or Octave is not required, but the equivalent operations in Python using the NumPy package will be provided for those students that do use Matlab and/or Octave for signal processing applications.

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Full Description at, <http://ieeeboston.org/python-for-signal-processing/>

DSP for Wireless Communications (13 hours of instruction!)**Time & Date:** 6:00 - 9:00PM, Tuesdays, April 9, 16, 23, 30, May 7**Location:** Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA**Speaker:** Dan Boschen

Course Summary: This course is a fresh view of the fundamental concepts of digital signal processing applicable to the design of mixed signal design with A/D conversion, digital filters, operations with the FFT, and multi-rate signal processing. This course will build an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and applications in GPS and mixed signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges in both the analog and digital domains, and not a tutorial on working with specific DSP processor hardware.

Now with Jupyter Notebooks! This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a “take-it-with-you” interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so. This course will not be teaching Python, but using it for demonstration. A more detailed course on Python itself is covered in a separate IEEE Course “Python Applications for Digital Design and Signal Processing”. Students will be encouraged but not required to bring a laptop to class, and all set-up information for installation will be provided prior to the start of class. **See Page 30**

Full Description at,**<http://ieeeboston.org/digital-signal-processing-dsp-wireless-communications/>****DSP for Software Radio (13 hours of instruction!)****Time & Date:** 6:00 - 9:00PM, Wednesdays, May 15, 22, 29, June 5, 12**Location:** Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA**Speaker:** Dan Boschen

Course Summary This course builds on the IEEE course “DSP for Wireless Communications” also taught by Dan Boschen, further detailing digital signal processing most applicable to practical real-world problems and applications in radio communication systems. Students need not have taken the prior course if they are familiar with fundamental DSP concepts such as the Laplace and Z transform and basic digital filter design principles. The course title has been changed with some minor additions but this is the same course that was previously taught titled “More DSP for Wireless Communications”, with the addition of Python demonstrations using Jupyter Notebooks.

Now with Jupyter Notebooks! This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a “take-it-with-you” interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so.

Target Audience: All engineers involved in or interested in signal processing for wireless communications. Students should have either taken the earlier course “DSP for Wireless Communications” or have been sufficiently exposed to basic signal processing concepts such as Fourier, Laplace, and Z-transforms, Digital filter (FIR/IIR) structures, and representation of complex digital and analog signals in the time and frequency domains. Please contact Dan at boschen@loglin.com if you are uncertain about your background or if you would like more information on the course. **See Page 32**

Full description at, <http://ieeeboston.org/digital-signal-processing-dsp-wireless-communications-2/>

IEEE Boston Section Online Courses:

(Students have 90 day access to all online, self-paced courses)

Verilog101:Verilog Foundations

Full course description and registration at ,
<http://ieeeeboston.org/verilog-101-verilog-foundations-online-course/>

System Verilog 101: Design Constructs

Full course description and registration at ,
<http://ieeeeboston.org/systemverilog-101-sv101-design-constructs-online-course/>

System Verilog 102: Verification Constructs

Full course description and registration at ,
<http://ieeeeboston.org/systemverilog-102-sv102-verification-constructs-online-course/>

High Performance Project Management

Full course description and registration at ,
<http://ieeeeboston.org/high-performance-project-management-online-course/>

Introduction to Embedded Linux Part I

Full course description and registration at ,
<http://ieeeeboston.org/introduction-to-embedded-linux-part-i-el201-online-course/>

Embedded Linux Optimization - Tools and Techniques

Full course description and registration at ,
<http://ieeeeboston.org/embedded-linux-optimization-tools-techniques-line-course/>

Embedded Linux Board Support Packages and Device Drivers

Full course description and registration at ,
<http://ieeeeboston.org/embedded-linux-bsps-device-drivers-line-course/>

Software Development for Medical Device Manufacturers

Full course description and registration at ,
<http://ieeeeboston.org/software-development-medical-device-manufacturers-line-course/>

Fundamental Mathematics Concepts Relating to Electromagnetics

Full course description and registration at ,
<http://ieeeeboston.org/fundamental-mathematics-concepts-relating-electromagnetics-line-course/>

Reliability Engineering for the Business World

Full course description and registration at ,
<http://ieeeeboston.org/reliability-engineering-business-world-line-course/>

Design Thinking for Today's Technical Work

<http://ieeeeboston.org/design-thinking-technical-work-line-course/>

Fundamentals of Real-Time Operating Systems

<http://ieeeeboston.org/fundamentals-of-real-time-operating-systems-rt201-on-line-course/>

January Chapter Meeting Summary

Life Members (in co-sponsorship with IEEE NH Section, NH Life Members, and the SEE Science Center, Manchester, NH) – 6:00PM, Tuesday, 8 January -

The Tech and Implications of Cryptocurrency

Crypto Currency is getting to be a “big thing” even here in New England, as is the underlying Block Chain Technology. Join a discussion on the implications of cryptocurrency with a panel of experts at this joint IEEE and SEE Science Center event. Meeting Location: Stark Brewing Company’s Bo’s Lounge, 500 Commercial St,

Manchester, NH. **See Page 13.**

Entrepreneurs’ Network – 6:00PM, Tuesday, 8 January - From Concept To Cashflow

Come learn strategies to bring your new business/startup from concept to positive cash flow. If you aren’t sure how to produce revenue join us for advice on how to begin and sustain your company’s sales efforts. Don’t be confused by all the jargon out there! There are many different strategies and opinions, but every company is different. Therefore, your plan to get move towards positive cash flow will be unique to your company. Our panelists combine many years of sales successes and failures in many verticals and will be joining together to discuss how to begin and ultimately consistently grow your sales. Location: Draper Labs, Hill Building, One Hampshire Street, Cambridge, MA. **See Page 11.**

Reliability Society – 5:30PM, Wednesday, 9 January -

Introduction to Thermal Imaging using Infrared Technology - Jeff Steele.

This talk is targeted to people that have not used or are new to Thermal Imaging. We will discuss the physics of how thermal imaging works and some of the common misconceptions. We will explore the various camera/sensor types, how they are different from each other, optics/lenses and the applications that leverage their strengths. We will finish with how the images can be analyzed and exported to other applications for further analysis or report generation. Meeting Location: MIT Lincoln Laboratory, 3 Forbes Rd, Lexington, MA, 02421. **See Page 14.**

Entrepreneurs’ Network – 6:30PM, Tuesday, 15 January

From Life Science / Tech Ideas to Profit

PRE-MEETING DINNER at 5:15 PM (sharp) at Bertucci’s, Waltham

Transforming ideas into profits is necessary to sustain a business, and the product development process is a critical component in transforming life science and tech ideas into profitable companies. The process is not always straightforward as marketplace demands, and other factors will shape the final product, but all of these are not known initially. The discovery process via research, trial and error, and important feedback from early adopters can be long, complex, and expensive, especially for an early-stage company that is bootstrapping or for any company with a short runway. Location: Constant Contact, Inc., Reservoir Place, 3rd Floor Great Room, 1601

continued next page

Trapelo Rd., Waltham, MA. **See Page 15.**

Computer Society, GBC/ACM and BostonCHI – 7:00PM, Thursday, 17 January.

Why Is Hiring Great UX Professionals So Damn Challenging? Jared M. Spool, co-CEO of Center Centre and founder of UIE

In the span of a few short years, user experience design has gone from being barely understood to becoming. Informal reception coordinated by BostonCHI at 6:30PM - a key competitive factor for today's businesses. The demand for UX professionals has never been greater. This newfound success has made it challenging for teams to hire great UX professionals. It's equally as difficult for highly-qualified UX professionals to land great positions. There's a mismatch between the outcome we desire and the hiring practices we use. Meeting Location: Vistap-

Call for Articles

Now that the Reflector is all electronic, we are expanding the content the publication. One of the new features we will be adding are technical and professional development articles of interest to our members and the local technology community. These will supplement the existing material already in our publication.

Technical submissions should be of reasonable technical depth and include graphics and, if needed, any supporting files. The length is flexible; however, a four to five page limit should be used as a guide. An appropriate guide may be a technical paper in a conference proceeding rather than one in an IEEE journal or transaction.

Professional development articles should have broad applicability to the engineering community and should not explicitly promote services for which

a fee or payment is required. A maximum length of two to three pages would be best.

To ensure quality, technical submissions will be reviewed by the appropriate technical area(s). Professional articles will be reviewed by the publications committee for suitability. The author will be notified of the reviewers' decision.

The Reflector is published the first of each month. The target submission deadline for the articles should be five weeks before the issue date (e.g., June 1st issue date; article submission is April 27). This will allow sufficient time for a thorough review and notification to the author.

We are excited about this new feature and hope you are eager to participate!

Submissions should be sent to;
ieeebostonsection@gmail.com

Entrepreneurs' Network – 6:00PM, Tuesday, 8 January

From Concept To Cashflow

Come learn strategies to bring your new business/startup from concept to positive cash flow. If you aren't sure how to produce revenue join us for advice on how to begin and sustain your company's sales efforts. Don't be confused by all the jargon out there! There are many different strategies and opinions, but every company is different. Therefore, your plan to get move towards positive cash flow will be unique to your company. Our panelists combine many years of sales successes and failures in many verticals and will be joining together to discuss how to begin and ultimately consistently grow your sales.

Agenda:

6:00-7:00 PM - Registration & networking
 7:00-7:10 PM - ENET Chairman's announcements
 7:10-7:25 PM - E Minute - Up to 3 Startup companies' presentations
 7:25-8:15 PM - Two expert speakers on the night's topic
 8:15- 8:30 PM - Audience / Speakers Q & A
 8:30 - 9:00 PM - Final networking includes meeting presenting speakers

A question and answer session follows the presentation, and panelists will be available afterwards for responses to individual questions. As with every ENET meeting you will also get the chance to network with the panelists and other meeting attendees, both before the start of the meeting and afterwards.

Panel:

Kathy Yenke, Founder Sales Catalyst Solutions



Kathy Yenke is the founder of Sales Catalyst Solutions, a sales consultancy specializing in revenue growth and sales excellence. Utilizing the proven Sales Xceleration platform, Kathy helps clients exceed their growth and sales targets across a range of industries by creating a tailored sales strategy, developing effective sales processes, and assuring that sales execution ignites growth.

Kathy possesses over 25 years of sales leadership experience in various high technology markets where she has led regional, national and global sales, marketing and business development teams to superior results. As a sales mentor, her passion and contagious enthusiasm results in teams consistently overachieving business goals and breaking through growth barriers.

Dave Hall, Startup CEO and Advisor



Dave Hall is a Startup CEO and Advisor to growing companies looking to increase revenue, build brand awareness and connect with key partners & channels. I'm building a fractional business model to work with several companies in the Salesforce Community to support their strategic growth plans.

Moderator:

Tom Libby CEO Diversified Sales Solutions Co-Founder Smarketing Institute

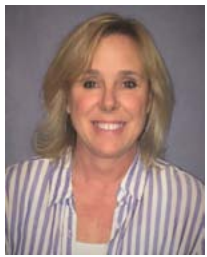


Tom is a seasoned Sales VP and Business Development Executive. He is a Co-Founder of the SmarketingInstitute. Org and the CEO of Diversified Sales Solutions, Inc., a firm that provides outsourced sales solutions. Getting a Sales strategy right is part vocation and part mission for Tom. Over the past 18 years, Tom has developed his management, leadership, and sales skills in diverse industries and includes experiences in startups, small companies up to and including fortune 500 companies.

Tom, has received numerous awards and accolades during his career. He is a business professional with demonstrated results, as well as the ability to produce in high-pressure situations. Today, Tom uses his sales & management experience to deliver interim management, training, and coaching to small companies

Organizer:

Susan McKenney - Founder Diversified Sales and Smarketing Institute



Susan McKenney is founder of Diversified Sales Solutions and the Smarketing Institute. She helps small companies and startups achieve sales success through management, performance, and planning. She helps corporations exceed their business goals by Team building, development, sales

enablement and sales process improvement. She most recently launched the Smarketing Institute to address the close relationship and need for Sales and Marketing in small businesses and startups using Local Sales and Marketing Professionals.

She is a former Sales professional with over twenty years of experience across many industries. Her background includes executive sales management, sales team creation, sales training. Susan has helped build regional, sales organizations, creating direct selling teams. She has developed and conducted "custom" sales and product training programs for small companies and startups., She has consulted many small businesses in MA in the last six years

E-Minute Presentations will be given at the start of the meeting. These very short presentations enable young startup entrepreneurs to gain experience in presenting their summary business plans to expert panels and audiences.

Location: Draper Labs, Hill Building, One Hampshire Street, Cambridge, MA

Registration:

ENET Member - Free

Non-ENET Member – \$10.00

Registration:

<https://www.boston-enet.org/event-3097470/Registration>

COST AND REGISTRATIONS: ENET meetings are free to ENET members and \$10 for non-members. To expedite sign-in for the meeting, we ask that everyone -- members as well as non-members -- pre-register for the meeting online. Pre-registration is available until midnight the day before the meeting. If you cannot pre-register, you are welcome to register at the door.

REFRESHMENTS: PIZZA, SALAD AND SOFT DRINKS WILL BE SERVED AT THE MEETING.

LOCATION: Draper Laboratory, Hill Building, One Hampshire St. Cambridge, MA 02139 (directions). The entrance is called One Hampshire St but is actually on Broadway. Attendees must arrive at Draper Labs before 7pm. Entrance will be locked after 7pm.

PUBLIC TRANSPORTATION: Kendall Square stop on the Red Line.

PARKING: There is a public parking lot across the street from Draper. Also, \$10 parking is available after 6pm at Yellow Garage https://en.parkopedia.com/parking/garage/kendall_center_yellow_garage/02142/cambridge/ and Blue Garage https://en.parkopedia.com/parking/garage/kendall_center_blue_garage/02142/cambridge/dd

Life Members (in co-sponsorship with IEEE NH Section, NH Life Members, and the SEE Science Center, Manchester, NH) – 6:00PM, Tuesday, 8 January

The Tech and Implications of Cryptocurrency

Crypto Currency is getting to be a “big thing” even here in New England, as is the underlying Block Chain Technology. Join a discussion on the implications of cryptocurrency with a panel of experts at this joint IEEE and SEE Science Center event.

Chris Rietmann is the owner of a small New Hampshire business, Route 101 Local Goods, in Keene, NH, and Executive Director of Bitcoin Embassy NH; a project to provide education, networking and support to the growing cryptocurrency space. Chris has been active in cryptocurrencies since 2012, and his shop is home to the first publicly accessible Bitcoin Vending Machine in NH. His shop has accepted cryptocurrencies for payment since 2015. After spending decades working in information technology, Chris is an activist and entre-

preneur, working with consumers and businesses to promote cryptocurrencies in everyday life. Classes for individuals and businesses are offered free of charge at the Embassy.

This meeting will be held at the Stark Brewing Company's Bo's Lounge, 500 Commercial St, Manchester, NH., Tuesday January 8th 6-8 p.m. Reserve your seat (and receive any meeting updates) via the IEEE Event page link below: <https://events.vtools.ieee.org/m/183592>

Arrive early (5:30) for a good seat, and to be able to order your drink, dinner or such at your expense. Introductions and discussion with the panel including Chris will be 6-7:30 p.m. To answer questions, contact the coordinators via the vtools website.

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This talk is targeted to people that have not used or are new to Thermal Imaging. We will discuss the physics of how thermal imaging works and some of the common misconceptions. We will explore the various camera/sensor types, how they are different from each other, optics/lenses and the applications that leverage their strengths. We

will finish with how the images can be analyzed and exported to other applications for further analysis or report generation.

Jeff Steele has worked in the field of Measurement and Testing for over 30 years. He has a BS in Electrical and Computer Engineering from Clarkson University. He currently is employed by FLIR Systems, a leader in Thermal Imaging technology.

Meeting Location: MIT Lincoln Laboratory, 3 Forbes Rd, Lexington, MA, 02421

Registration:

<http://ewh.ieee.org/r1/boston/rl/events.html>

Directions to 3 Forbes Road, Lexington, MA:

- Take Route 128/I-95 to Exit 30B, Route 2A Westbound.
- At the first traffic light, turn left onto Forbes Road.
- Go to the end of the street.
- At the traffic circle, turn right.
- Go halfway around the traffic circle and turn into the parking lot for MIT Lincoln Laboratory
- The main entrance is straight ahead, shared with "agenus".

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

Facebook: <https://www.facebook.com/IEEEBoston>

YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Entrepreneurs' Network – 6:30PM, Tuesday, 15 January

From Life Science / Tech Ideas to Profit

PRE-MEETING DINNER at 5:15 PM (sharp) at Bertucci's, Waltham

Transforming ideas into profits is necessary to sustain a business, and the product development process is a critical component in transforming life science and tech ideas into profitable companies. The process is not always straightforward as marketplace demands, and other factors will shape the final product, but all of these are not known initially. The discovery process via research, trial and error, and important feedback from early adopters can be long, complex, and expensive, especially for an early-stage company that is bootstrapping or for any company with a short runway.

Tonight's panelists are experts in the product development field with expertise and experience to ease this process for early-stage startups. The panel of experts consists of consultants who offer end-to-end product development services and those with specialized services, as well as entrepreneurs who have made products and turned their idea into profits. Panelists will cover prototyping, design, engineering, manufacturing, and marketing services everything you need to develop a new product and bring it to the market successfully. They will also share tips of what worked, what did not work, lessons learned, and common pitfalls to avoid in the product development process while converting ideas into marketable and successful products.

Agenda:

6:30-7:30 PM - Registration & networking
 7:30-7:40 PM - ENET Chairman's announcements
 7:40-7:55 PM - E Minute - Up to 3 Startup companies' presentations
 7:55-8:45 PM - 3 expert speakers on the night's topic
 8:45-9:00 PM - Audience / Speakers Q & A
 900-930 PM - Final networking includes meeting presenting speakers

A question and answer session follow the presentation, and panelists will be available afterwards for responses to individual questions. As with every ENET meeting

you will also get the chance to network with the panelists and other meeting attendees, both before the start of the meeting and afterwards.

Panelists:



Andrea Krajewska, Co-founder and CEO at Boston Embedded

Andrea Krajewska is an experienced Electrical and Computer Engineer who married her passion for System Dynamics and Engineering to bring a unique perspective to the complex, multidimensional problems inherent

in the product design process. She has moved Boston Embedded (www.BostonEmbedded.com) from exclusively providing additional engineering resources, to an innovative device design firm specializing in firmware architecture, electronics, embedded product design, and project management. Her team at Boston Embedded has a track record of creating successful engineering teams and products within a multitude of industries including robotics, IoT, consumer, autonomous vehicles and space. Andrea holds a BS in Electrical and Computer Engineering and Minor in System Dynamics from Worcester Polytechnic Institute.



Hari Chauhan, Ph.D.

Venture Team|Analog Garage @Analog Devices Inc

Hari is a technology specialist and business development associate with the Venture Team|Analog Garage, which is a corporate venture team of Analog Devices Inc. As a part of venture team, he

leads projects in collaboration with startups to advance the product development for quick time to market.

Hari received a Master of Technology in VLSI Design from C-DAC India, as well as the M.S. and Ph.D. degrees in Electrical Engineering from Northeastern University in 2011 and 2016, respectively.



Karim Azer

Head of the quantitative systems pharmacology (QSP) and DMPK modeling at the Bill & Melinda Gates Medical Research Institute

Karim's work is focused on leveraging the spectrum of bioinformatics, systems biology, QSP and DMPK modeling approaches, and data analytics, to

address translational medicine needs of the institute, in the areas of tuberculosis, malaria, diarrheal and enteric diseases, and maternal-neonatal health. Karim's efforts are also dedicated to the development of supportive computational and mathematical approaches and pipelines to enable robust in-silico simulations and visualizations of models and model outputs. Karim received his Ph.D. in Applied Mathematics from the Courant Institute of Mathematical Sciences at NYU and holds an M.S. in Applied Mathematics from Courant Institute at NYU, and B.S. degrees in Mathematics and Computer Science from Rutgers University. He has worked in the pharmaceutical industry for over 20 years, employing a wide variety of modeling, both mechanistic and empirical, and computer science approach to address drug discovery and development questions in R&D.

Previously at Sanofi, he formed and headed the quantitative systems pharmacology group, supporting programs across several disease areas, including immunology, rare diseases, cardiovascular and oncology. He also led the development of technical capabilities in support of model development, calibration, qualification, and simulation, in collaboration with academic partners and Institutes. Prior to Sanofi, he was at Merck, where he established a quantitative group spanning a broad range of computational approaches to drug discovery, development, and translational medicine, including both mechanistic and empirical models, image and signal processing, data analytics, and high-performance computing, and where he led modeling efforts in support of early clinical development and translational medicine programs. He has served on a number of professional societies such as American College of Clinical Pharmacology (ACCP), American Society of Mechanical Engineering (ASME), IEEE, Society for Industrial and Applied Mathematics (SIAM), and International Society of Pharmacometrics (ISOP), and continues to be active in the community. He has publications in the areas of applied mathematics, modeling applications and meth-

odologies in drug discovery and development, image and signal processing, and data analytics



Tom Calef

VP, Engineering, Activ Surgical

Tom is a highly accomplished medical roboticist and seasoned leader of engineering teams capable of developing breakthrough innovation in surgical robotics. Tom holds multiple patents in robotics and surgical devices and has

an extensive track record of taking surgical robotic platforms to market, having managed multiple surgical robotics products through 510k approval.

Currently, Tom is on the founding team of Activ Surgical, leveraging technology developed at Children's National Medical Center in Washington DC to create the first machine learning engine for surgical robotics. Activ is delivering innovative real-time visualization and perception data to the surgical staff, enabling higher levels of confidence in even the most demanding procedures.

Tom has a BS in Computer Engineering and an MS in Mechanical Engineering, both from the University of Massachusetts Dartmouth. Tom has extensive student mentoring experience while mentoring a local high school FIRST robotics team for 20+ years. He enjoys ocean activities such as fishing and boating with his wife, Auna, and their three children.

Moderator



Maureen Mansfield, ALM

CSO, MANSFIELD LAW ~Protect Your Passion~

Vice Chair, Boston Entrepreneurs' Network (ENET)

Maureen is passionate about protecting passions and implementing business development strategies to protect, build, and commercialize startups, inventions, and

early and growth stage companies with MANSFIELD LAW ~Protect Your Passion~.

She brings experience in entrepreneurship, strategy, business development, and contract compliance to entrepreneurs, inventors, and businesses that are building innovative products and services, inventions, and cutting-edge technologies. During her graduate stud-

ies, Maureen co-founded a startup that bootstrapped to a funding event. After sharing her story at Boston ENET's event on bootstrapping, Maureen was asked to join as a volunteer and now serves a Vice Chair, Alliances. Maureen began her career as a TV reporter, her dream job, and has since worked for family-owned businesses to Fortune 50 companies on assignments in both the private and public sectors for projects of local, national, and international scope. She has helped many companies enjoy their most successful years in sales by initiating and developing new businesses, markets, and service models. This often involved innovating and implementing work processes and business analytics that built efficiencies while driving brand value and saving time and money for both the companies and clients, sometimes discovering fraud. Maureen co-founded two charities that continue today for an alumni group and a professional organization.

Maureen holds a BA in Journalism and Mass Communication and a BA in Communication Studies, Film and Video Broadcasting and Theatre Arts Tracks, both selective programs from The University of Iowa. She earned a Masters of Liberal Arts (ALM) in Management, emphasis in Finance and Control, with honors from Harvard University. Scholarships and Dean's Lists enabled her to complete her degrees. Maureen also holds certificates in Project Management. You can follow Maureen on Twitter @MaureenManALM.

E-Minute Presentations will be given at the start of the

meeting. These very short presentations enable young startup entrepreneurs to gain experience in presenting their summary business plans to expert panels and audiences.

Directions: Constant Contact is adjacent to RT 128 / 95 at Exit 28B.

See: <http://www.constantcontact.com/about-constant-contact/office-location-waltham.jsp>

Location: Constant Contact, Inc., Reservoir Place, 3rd Floor Great Room, 1601 Trapelo Rd., Waltham, MA

Registration:

ENET Member Rate - Free

MDG Member – \$15.00

Non-ENET Member Rate – \$20.00

Student – \$10.00

Register at

<https://www.boston-enet.org/event-3097477/Registration>

Reservations: Please register at <https://boston-enet.org/event-2990367/Registration>. ENET Constant Contact meetings are free to ENET members and \$20 for non-members. No reservations are needed for the pre-meeting dinner. To expedite sign-in for the meeting, we ask that everyone -- members as well as non-members -- pre-register online. Pre-registration is available until midnight the day before the meeting. If you cannot pre-register, you are welcome to register at the door.

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

Facebook: <https://www.facebook.com/IEEEBoston>

YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Computer Society, GBC/ACM and BostonCHI – 7:00PM, Thursday, 17 January

Why Is Hiring Great UX Professionals So Damn Challenging?

Jared M. Spool, co-CEO of Center Centre and founder of UIE

Informal reception coordinated by BostonCHI at 6:30PM

Vistaprint, 275 Wyman St., Waltham, MA

[Admission is free, but you must register at <http://jaredspooljan2019.eventbrite.com/?aff=ieee>]



In the span of a few short years, user experience design has gone from being barely understood to becoming a key competitive factor for today's businesses. The demand for UX professionals has never been greater.

This newfound success has made it challenging for teams to hire great UX professionals. It's equally as difficult for highly-qualified UX professionals to

land great positions. There's a mismatch between the outcome we desire and the hiring practices we use.

Hiring is now the biggest challenge that the UX design community faces, as we grow our influence inside our organizations and deliver great products and services. And yet, when do we focus on designing an effective hiring process?

In this informative and entertaining presentation, Jared will share how hiring practices can hurt a team's efforts to grow. He'll walk us through a proven, intentionally-designed hiring process that delivers highly-qualified team members, while also creating a delightful candidate and interviewer experience.

A not well-known fact: In 2015, Jared Spool joined President Obama's White House staff to help the newly-created U.S. Digital Service design their hiring process. It was a high-priority, high-risk effort that couldn't afford to turn great candidates away, nor bring on under-qualified new hires. During his tenure, USDS grew its team of amazing designers, developers, product managers, system reliability engineers, and policy specialists from 20 people to more than 220, all in less than 6 months. At Center Centre/UIE, he's coached UX managers and hiring teams on the best ways to hire hundreds of new

team members and grow their teams. He's used his knowledge to build an online workshop, HiringMasterclass.com, which trains teams all over the world.

Jared does all of this to help fulfill the hundred-year mission of Center Centre/UIE (the company he founded in 1988): eliminate all the bad design from the world. As he sees it, the only way to make that happen is to ensure every organization has the UX professionals they need to deliver well-designed products and services. You'll find his writing at uie.com. You can also follow his adventures on the Twitters at @jmspool, where he tweets daily about UX design, design strategy, design education, and the wondrous customer service habits of the airline industry.

This meeting will be held at Vistaprint's facility at 275 Wyman St in Waltham. Park in the garage or the large parking lot in back of the garage and walk around to the main entrance. 275 Wyman St can be reached from the North by taking exit 28 from rt 128/95 making a left hand turn onto Trapelo Rd, and then another right hand turn onto Smith St (which becomes Wyman St after about 1/2 mile) once you cross Rt 128. From the South, take exit 27A-B from I-95/128 and stay in the exit lane until you get to the Wyman St turn off. Don't take the sharp right onto 3rd Ave and Totten Pond Rd. There's also a shortcut coming from Cambridge on Rt 2. Get off Rt 2 at the Waltham St/Lexington exit, take a left hand turn onto Hayden Ave, then make another left at the traffic light onto Smith St.

We will be taking Jared to dinner at Green Papaya after the talk at about 9pm.

Up-to-date information about this and other talks is available online at

<http://ewh.ieee.org/r1/boston/computer/>.

You can sign up to receive updated status information about this talk and informational emails about future talks at <http://mailman.mit.edu/mailman/listinfo/ieee-cs>, our self-administered mailing list.

For more information contact Peter Mager (p.mager@computer.org)



CALL FOR PAPERS

2019 IEEE International Symposium on Phased Array Systems and Technology

Revolutionary Developments in Phased Arrays

**Sponsors****Platinum**

Westin Waltham Hotel, Greater Boston, Massachusetts, USA

www.array2019.org**Gold****Silver****Bronze****15–18 October 2019****About the Symposium**

Phased array systems continue to be a rapidly evolving technology with steady advances motivated by the challenges presented to modern military and commercial applications. This symposium will present the most recent advances in phased array technology and provide a unique opportunity for members of the international community to interact with colleagues in the field of Phased Array Systems and Technology.

**Suggested Topics**

- System Architecture
- Aperture Design
- Antenna Elements
- Beamforming Techniques
- T/R Modules
- Signal Processing for Arrays
- Array Measurements
- Advanced Materials
- Packaging and Manufacturing Techniques
- Applied Computational Electromagnetics
- 5 G
- Metamaterials
- Radio Astronomy

See website: www.array2019.org for details**Special Sessions**Please provide suggestions for special sessions to the Technical Program Chair at info@array2019.org**General Paper Submission Information**

All paper submissions will be peer reviewed and must be received in PDF format via the symposium web site on or before Friday, 15 March 2019. This is a firm deadline. Papers will not be accepted after this date. Papers must be in IEEE dual-column format and must be 2 pages (minimum) to 8 pages (maximum) in length including figures. Additional instructions are on the website www.array2019.org/call-for-papers

Paper Template and Submission ProceduresTemplate and submission procedures are available at www.array2019.org/call-for-papers**Technical Program Schedule**

Please note: Our submission process and dates have been streamlined – plan accordingly.

15 March 2019 – Full paper submission deadline

- Submitted paper must be final and in IEEE dual-column format, not an abstract
- Submitted paper must be 2–8 pages in length including figures

30 April 2019 – Author notification of paper acceptance**1 Sept. 2019** – Conference registration deadline for accepted authors**Conference Committee****Conference Chair:**

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Greg Charvat, Humatics Inc.

Greg Arlow, Lockheed Martin

**Technical
Co-Sponsors**

Radar Conference 2019

Boston



Revolutions in Radar

Sponsors

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Silver



About the Conference

22-26 April 2019

Westin Waterfront Hotel
Boston, Massachusetts, USA

www.radarconf19.org

A radar revolution is underway, made possible by the rapid evolution of digital electronics, and powered by new innovative architectures, advanced components, novel waveforms and sophisticated processing techniques. Please join us in historic Boston, birthplace of the original American Revolution, as we continue this new revolution in radar technology. The beautiful Westin Waterfront hotel, located in the heart of Boston's seaport district, will make the perfect venue for the international community as we meet to share the latest advances in radar. The conference will include three days of parallel technical sessions, and two days of tutorials with ample opportunity to interact with international radar experts from around the world.

Tutorials and Special Sessions

Please submit suggestions for tutorial topics or special sessions to the Technical Program Chair at info@radarconf2019.org

Suggested Topics

- Radar phenomenology
- Antenna technology
- Radar Electronics
- Over the horizon radar (OTHR)
- Bistatic, multistatic & passive radar
- Networked & distributed radar
- Commercial radar
- mm-wave & THz radar
- Environmental Sensing
- Airborne & space based
- SAR and ISAR imaging
- ATR and classification
- Tracking
- Cognitive methods
- Waveform diversity
- Spectrum sharing
- Electronic warfare
- Emerging Systems and Technology

Paper Submission Procedures

See website for details

Important Dates	
Special Session Proposals Due	17 Aug 2018
Tutorial Submissions Due	30 Aug 2018
Paper Submissions Due	17 Oct 2018
Notification of Acceptance	14 Jan 2019
Paper Submission Due	25 Feb 2019

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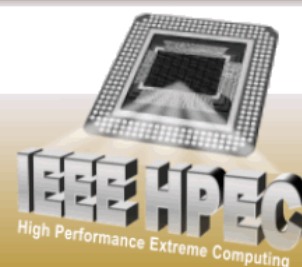
CALL FOR PAPERS



2019 IEEE High Performance Extreme Computing Conference (HPEC '19)

Twenty-third Annual HPEC Conference

24 - 26 September 2019
Westin Hotel, Waltham, MA USA



www.ieee-hpec.org

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IEEE Boston Section

The IEEE High Performance Extreme Computing Conference (HPEC '19) will be held in the Greater Boston Area, Massachusetts, USA on 24 – 26 September 2019. The HPEC charter is to be the premier conference in the world on the confluence of HPC and Embedded Computing.

The technical committee seeks new presentations that clearly describe advances in high performance extreme computing technologies, emphasizing one or more of the following topics:

- Machine Learning
- Graph Analytics and Network Science
- Advanced Multicore Software Technologies
- Advanced Processor Architectures
- Automated Design Tools
- Big Data and Distributed Computing
- Case Studies and Benchmarking of Applications
- Advanced Cloud Computing
- Computing Technologies for Challenging Form Factors
- ASIC and FPGA Advances
- Data Intensive Computing
- Digital Front Ends
- Fault-Tolerant Computing
- General Purpose GPU Computing
- High Performance Data Analysis
- Interactive and Real-Time Supercomputing
- Mapping and Scheduling of Parallel and Real-Time Applications
- New Application Frontiers
- Open System Architectures
- Secure Computing & Anti-Tamper Technologies
- Quantum/Hybrid Computing
- AI Computing

HPEC accepts two types of submissions:

1. Full papers (up to 6 pages, references not included), and
2. Extended abstracts (up to 2 pages, references included).

IMPORTANT DATES:

Submission Deadline: **May 17, 2019**

Notification of Acceptance: **July 1, 2019**

Camera Ready Deadline: **August 31, 2019**

Preference will be given to papers with strong, quantitative results, demonstrating novel approaches or describing high quality prototypes. Authors of full papers can mark their preference for a poster display or an oral presentation. Presenters who wish to have hardware demonstrations are encouraged to mark their preference for a poster display. Accepted extended abstracts will be displayed as posters. Papers can be declared "student paper" if the first author was a student when doing the presented work, and will be eligible for the "IEEE HPEC Best Student Paper Award." Papers should not be anonymized. All paper and extended abstract submissions need to use the approved IEEE templates. Full paper submissions with the highest peer review ratings will be published by IEEE in the official HPEC proceedings available on IEEE eXplore. All other accepted submissions and extended abstracts are published on ieee-hpec.org.

Vendors are encouraged to sign up for vendor booths. This will allow vendors to present their HPEC technologies in an interactive atmosphere suitable for product demonstration and promotion. We welcome input (hpec@ieee-hpec.org) on tutorials, invited talks, special sessions, peer reviewed presentations, and vendor demos. Instructions for submitting will be posted on the conference web site shortly.

Practical RF PCB Design, Wireless Networks, Products and Telecommunications

Time & Date: 9:00AM - 4:30PM, Monday & Tuesday, March 11 & 12, 2019
(13 hours of instruction!)

Speaker: Henry Lau, Lexiwave Technology

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Overview: One of the most demanding consumer products in the market is the wireless telecommunication product. A well-designed Radio Frequency Printed Circuit Board (RF PCB) contributes significantly to the success of any wireless product as the layout of the PCB greatly affects the performance, stability and reliability of the product. In today's highly competitive wireless products market with increasingly compressed development time-frame, there is a strong demand for RF professionals who possess the knowledge and experience to design top-performing RF PCBs in less number of iterations. What matters is whether your level of competence is up to the required standard to meet such demand.

Audience: RF Designers, Wireless Product Designers, Field Application Engineers, Design Managers and related professionals.

Benefits: This course aims to provide participants with an insightful training on RF PCB design from a practical, industrial perspective. Participants will be led through a systematic, theoretical presentation with case studies on commercial products in the training. The course will be conducted by an RF expert with rich industrial experience. It is suitable for RF professionals who want to keep up-to-date their skills and knowledge in RF PCB design and stay competitive.

OUTLINE

1. Printed circuit board design for RF circuits

From product design, circuit design to PCB design
Layer stack-up assignment
Grounding methods and techniques
Interconnects and I/O
Bypassing and decoupling
Partitioning methods

2. Printed circuits board design for other circuits

Clock circuits
Base-band circuits
Audio circuits
Power supplies
Impedance-controlled circuits

3. PCB design for EMC/EMI compliance

EMC/EMI compliance
Grounding methods
Decoupling methods
Shielding methods

4. Additional Design Techniques

Production concerns
Systematic product design approach
RF Modules
Evaluation boards
Other RF concerns
Casing design

5. Case studies

Expertise:

Henry Lau received his M.Sc. and MBA degrees from UK and USA respectively. He has more than 25 years of experience in designing RF systems, products and RFICs in both Hong Kong and US. He worked for Motorola and Conexant in US as Principal Engineer on developing RFICs for cellular phone and silicon tuner applications. Mr Lau holds five patents all in RF designs. He is currently running Lexiwave Technology, a fables semiconductor company in Hong Kong and US designing and selling RFICs, RF modules and RF solutions. He has also been teaching numerous RF-related courses internationally.

*notes, lunch and coffee breaks
included with registration*

**Decision (Run/Cancel) Date for this Courses is
Monday, March 4, 2019**

Payment received by February 25

IEEE Members \$415

Non-members \$445

Payment received after February 25

IEEE Members \$445

Non-members \$465

<http://ieeeboston.org/practical-rf-pcb-design-wireless-networks-products-telecommunications-spring-2019/>

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically divers sections of the IEEE. We have over 20 active chapters and affinity groups.

If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/> .

Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- Honoraria can be considered for course lecturers
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Software Development for Medical Device Manufacturers -

An intensive two-day course

Time & Date: 8:30AM - 4:30PM, Wednesday & Thursday, April 10 & 11, 2019
(14 hours of instruction!)

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Steve Rakitin, President, Software Quality Consulting, Inc.

OVERVIEW

Developing software in compliance with FDA, EU regulations and international standards is challenging. This two-day intensive course provides practical guidance and suggestions for developing software that complies with applicable FDA and EU regulations, guidance documents and international standards such as IEC 62304 and ISO 14971. The focus of this course is interpreting Design Controls for software. Each section of the Design Controls regulation (820.30) is discussed from the software perspective. Corresponding requirements from IEC 62304 are woven into the flow.

In-depth discussion of critical topics such as Requirements, Software Verification & Validation, Risk Management and Fault Tree Analysis are included. In addition, techniques for validating software development tools and software used in Manufacturing and Quality Systems are also discussed. Interactive group exercises are included to facilitate discussion and learning.

WHO SHOULD ATTEND

Software and firmware engineers, software managers, RA/QA staff, validation engineers, and project managers. Anyone interested in learning how to develop medical device software in compliance with regulations, standards and guidance documents.

COURSE OUTLINE

• Introduction

- Medical Device Definitions – FDA and EU
- Regulatory Roadmap and FDA/EU Device Classification Schemes

–FDA Regulations and Guidance Documents for Software

- Standards – ISO 13485, IEC 62304, ISO 14971, EN-14971, IEC 60601, and IEC 62366-1
- All Software is Defective

- Interpreting Design Controls for Software
 - Software Development Models
 - Design and Development Planning
 - Design Inputs
 - About Requirements...
 - Requirements Exercise
 - Design Outputs
 - Design Reviews
 - Design Verification

• Software Verification Techniques

- Design Validation

• Software Validation Process

- Design Transfer
- Design Changes
- Design History File

• Validation of...

- Software Tools used to develop Medical Device Software
- Software used in Manufacturing
- Software used in Quality Systems

• Risk Management

- Standards and Regulations
- Terms and Concepts
- Risk Management Process
- Risk Management Tools and Techniques

- **Fault Tree Exercise**
 - Data Collection and Analysis
 - Documentation Requirements
- **Summary**
- **Comprehensive reference materials included**

Speaker Bio:

Steven R. Rakitin has over 40 years experience as a software engineer including 25 years of experience in the medical device industry. He has worked with over 85 medical device manufacturers worldwide, from start-ups to Fortune 100 corporations. He has written several papers on medical device software risk management as well as a book titled: Software Verification & Validation for Practitioners and Managers.

He received a BSEE from Northeastern University and an MSCS from Rensselaer Polytechnic Institute. He earned certifications from the American Society for Quality (ASQ) as a Software Quality Engineer (CSQE) and Quality Auditor (CQA). He is a Senior Life member of IEEE and a member of MassMEDIC. He is on the

Editorial Review Board for the ASQ Journal Software Quality Professional.

As President of Software Quality Consulting Inc., he helps medical device companies comply with FDA regulations, guidance documents, and international standards in an efficient and cost-effective manner.

***notes, lunch and coffee breaks
included with registration***

**Decision (Run/Cancel) Date for this Course is
Monday, March 25, 2019**

Payment received by March 19

IEEE Members	\$495
Non-members	\$535

Payment received after March 19

IEEE Members	\$535
Non-members	\$565

<http://ieeeboston.org/software-development-medical-device-manufacturers>

IEEE Boston Section Social Media Links:

Twitter: <https://twitter.com/ieeeboston>

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YouTube: <https://www.youtube.com/user/IEEEBostonSection>

Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

The Fundamentals of Bioelectronics for Applications in Neuroprosthetics

Time & Date: 8:00AM - 3:00PM, Friday, April 12, 2019

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Marie Tupaj, Middlesex Community College

Description:

This course covers the field of bioelectronics, specifically electrode design and implementation, for applications in neuroprosthetics. Electrode materials, electrode array fabrication, electrode modeling, electrical stimulation parameters, bioelectrode charge transfer mechanisms, and interfaces with biological systems are discussed. The fundamental theories of electromagnetism and a history of bioelectromagnetics are reviewed.

Target Audience:

This class is designed for engineers transitioning into the field of bioelectronics, electronics engineers interested in neurobiology, and professionals looking for an understanding of bioelectronics to complete their job function.

Outline

Module #1: Electromagnetics in Biological Systems

The first lecture will identify and describe electromagnetic fields in biology then explain the effects of electric fields when applied to biological tissue and living systems. Topics covered include: Maxwell's Equations, history of bioelectromagnetics, biological effects (tissue growth, regeneration, cell communication) and biological mechanisms (action potentials, impulse propagation, ion channel and receptor activation) of electrical stimulation, and charge transfer to biological systems.

Module #2: Bioelectronics: Electrode Materials, Design, and Fabrication

The second lecture will discuss electrode materials, electrode configurations, and electrode fabrication

techniques. Topics include: key electrode properties (biocompatibility, mechanics, surface chemistry, charge transfer), common electrode materials (gold, platinum, titanium, carbon, PEDOT), electrode substrates, electrode configurations (capacitors, coils, microelectrode arrays), microelectrode array structure, electrode arrays (microwires, polymer arrays), and electrode micro-fabrication techniques (photolithography, sputtering).

Module #3: Bioelectronics: Electrode Characterization and Testing

Topics of this lecture include: electrode characterization techniques (impedance, wettability, roughness, conductivity, thickness, composition, mechanical integrity), and electrode rejuvenation.

Module #4: Bioelectronics: Electrode Modeling, Stimulation, and Devices

Topics include: electrode modeling with COMSOL, stimulation regimens (pulse shape, location, duration), field strength, stimulation devices (inductively coupled, capacitively coupled, microelectrode array systems), neurotransmission, and neural recordings (local field potentials, noise).

Module #5: Neuroprosthetic Implantation and Biological Interfaces

The last lecture discusses electrode implantation, applications, and use. Topics include: clinical background, nervous system anatomy, neuroprosthetic devices (retinal prosthetics, auditory implants, nerve guides, vagus nerve stimulation, TEMS, EEG, ECoG, limb prosthetics), neuroprosthetic-tissue interfaces, design require-

ments, short term and long term cell-tissue responses, electrode sterilization techniques, and device/patient safety.

Upon Completion of This Course You Will:

- Understand the effects of electric fields on cells and the optimal parameters for a biological response
- Learn bioelectrode design and fabrication techniques
- Understand key challenges in designing neuro-prosthetic devices

About the Instructor:

Marie Tupaj is a biomedical scientist and engineer with 10 years' experience in biomaterials, bioelectronics, and nerve cell biology. Marie has a B.S. in electrical engineering and a Ph.D. in biomedical engineering from Tufts University. As a doctoral student, Marie designed electrodes for encouraging nervous tissue development and developed silk based biomaterial conduits for peripheral nerve regeneration. These projects were supported by the NIH and the Armed Forces Institute of

Regenerative Medicine. As a postdoctoral fellow, Marie fabricated miniaturized biosensors and chemically modified surfaces for applications in the field of neuro-prosthetics. Marie has worked at high tech and biotech companies in the Boston area including Sun Microsystems, Organogenesis, and Histogenics Corporation. She is currently an Assistant Professor at Middlesex Community College in Bedford, MA.

***notes, lunch and coffee breaks
included with registration***

**Decision (Run/Cancel) Date for this Courses is
Friday, April 5**

Payment received by March 29

IEEE Members	\$225
Non-members	\$250

Payment received after March 29

IEEE Members	\$250
Non-members	\$275

<http://ieeeboston.org/fundamentals-of-bioelectronics-for-applications-in-neuroprosthetics/>

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

The Boston Section is one of the largest and most technically diverse sections of the IEEE. We have over 20 active chapters and affinity groups.

If you have an expertise that you feel might be of

interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/> .

Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

- Honoraria can be considered for course lecturers
- Applications oriented, practical focused courses are best (all courses should help attendees expand their knowledge based and help them do their job better after completing a course)
- Courses should be no more than 2 full days, or 18 hours for a multi-evening course
- Your course will be publicized to over 10,000 local engineers
- You will be providing a valuable service to your profession
- Previous lecturers include: Dr. Eli Brookner, Dr. Steven Best, Colin Brench, to name a few.

Python Applications for Digital Design and Signal Processing

(11 hours of instruction!)

Time & Date: 6:00 - 9:00PM, Wednesdays, March 6, 13, 20, 27

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

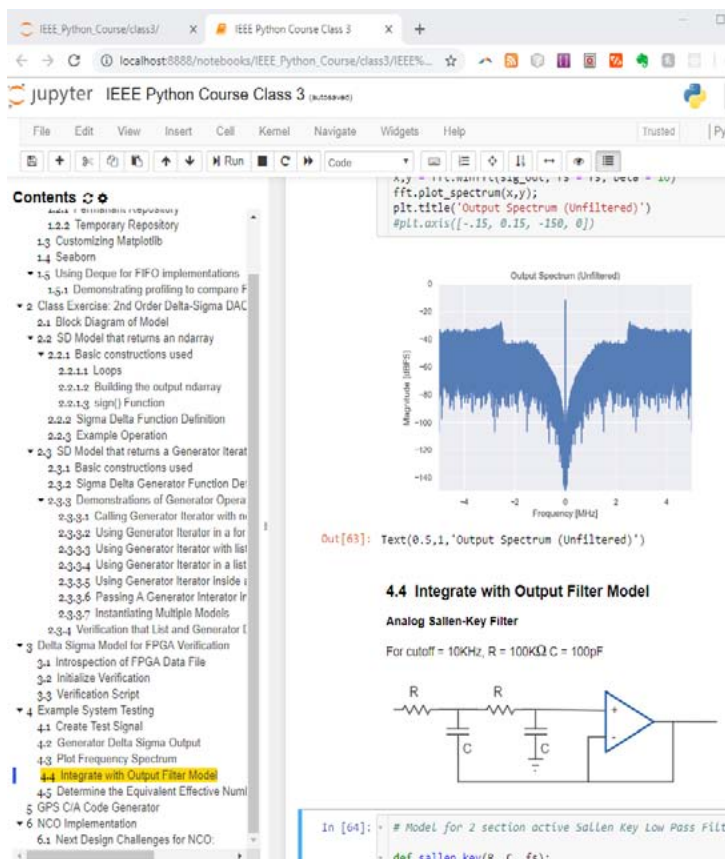
Speaker: Dan Boschen

Course Summary

This is a bring-your-own laptop, hands-on course in the popular and powerful open source Python programming language. Dan provides simple, straight-forward navigation through the multiple configurations and options, providing a best-practices approach for quickly getting up to speed using Python for solving signal processing challenges. Students will be using the Anaconda distri-

bution, which combines Python with the most popular data science applications, and the Jupyter Notebooks for a rich, interactive experience.

The course begins with basic Python data structures and constructs, including key “Pythonic” concepts, followed by an overview and use of popular packages for scientific computing enabling rapid prototyping for system design. Once a basic working knowledge of the language is established, students will create example designs including a sigma delta converter and direct digital synthesizer both in floating point and fixed point. This will include considerations for cycle and bit accurate models useful for digital design verification (FPGA/ASIC), while bringing forward the signal processing tools for frequency and time domain analysis.



Jupyter Notebooks

This course makes extensive use of Jupyter Notebooks which combines running Python code with interactive plots and graphics for a rich user experience.

Jupyter Notebooks is an open-source web based application (that can be run locally) that allows users to create and share visually appealing documents containing code, graphics, visualizations and interactive plots.

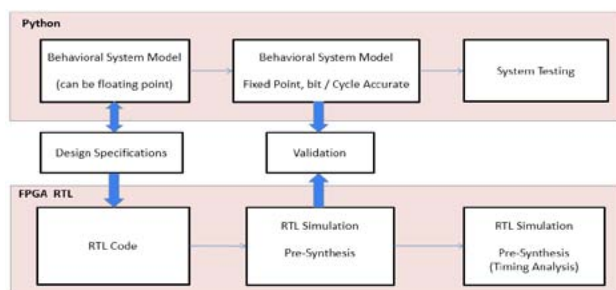
Students will be able to interact with the notebook contents and use “take-it-with-you” results for future applications in signal processing.

Target Audience:

This course is targeted toward users with little to no prior experience in Python, however familiarity with other

modern programming languages and an exposure to object-oriented constructs is very helpful. Students should be comfortable with basic signal processing concepts in the frequency and time domain. Familiarity in Matlab or Octave is not required, but the equivalent operations in Python using the NumPy package will be provided for those students that do use Matlab and/or Octave for signal processing applications.

Python for Verification



A laptop (Mac or PC) preconfigured with Anaconda is required; the specific installation instructions will be emailed to students prior to the start of class.

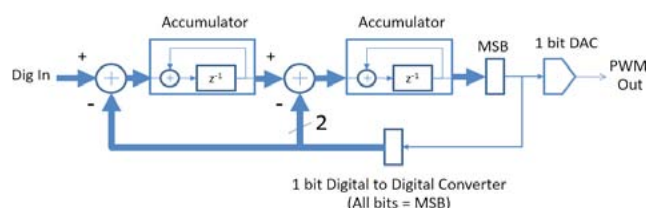
Benefits of Attending/ Goals of Course:

Each student that completes the course will have the tools in place to immediately put Python to use in their current work environment for scientific computing applications. After this course, you will love using Python as much as Dan does!

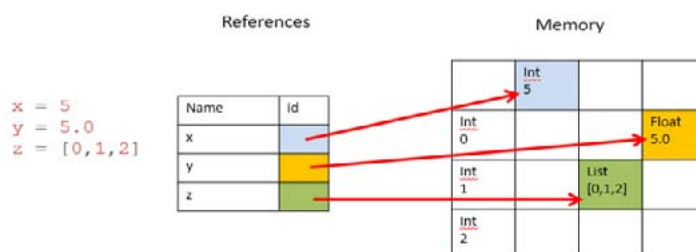
Topics / Schedule:

Class 1: Intro to Jupyter Notebooks, the Spyder IDE and the course design examples including Delta Sigma Converters, GPS Code Generators, and Numerically Controlled Oscillators. Core Python constructs.

2nd Order Delta Sigma DAC



Mutable / Immutable



Class 2: Core Python constructs, functions, reading writing data files.

Class 3: Signal processing simulation with popular packages including NumPy, SciPy, and Matplotlib.

Class 4: Bit/cycle accurate modelling and analysis using the design examples and simulation packages.

Speaker's Bio: Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 20 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems. Dan is currently at Microchip (formerly Microsemi and Symmettricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/dan-boschen>

Decision (Run/Cancel) Date for this Courses is Wednesday, February 27

Payment received by Feb. 20

IEEE Members \$325
Non-members \$350

Payment received after Feb. 20

IEEE Members \$350
Non-members \$375

DSP for Wireless Communications

(13 hours of instruction!)

Time & Date: 6:00 - 9:00PM, Tuesdays, April 9, 16, 23, 30, May 7

Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Dan Boschen

Course Summary:

This course is a fresh view of the fundamental concepts of digital signal processing applicable to the design of mixed signal design with A/D conversion, digital filters, operations with the FFT, and multi-rate signal processing. This course will build an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and applications in GPS and mixed signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges in both the analog and digital domains, and not a tutorial on working with specific DSP processor hardware.

Now with Jupyter Notebooks!

This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a “take-it-with-you” interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so.

This course will not be teaching Python, but using it for demonstration. A more detailed course on Python itself is covered in a separate IEEE Course “Python Applications for Digital Design and Signal Processing”.

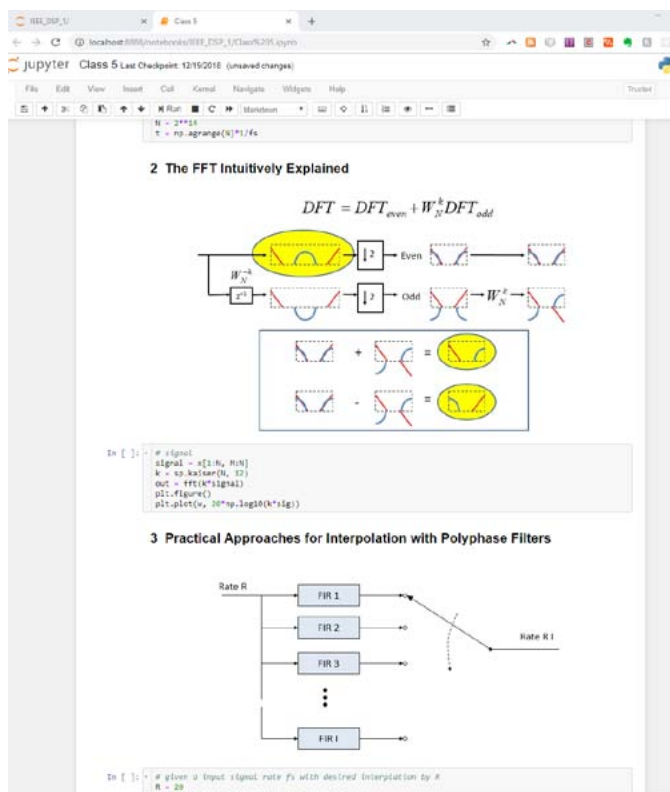
Students will be encouraged but not required to bring a laptop to class, and all set-up information for installation will be provided prior to the start of class.

Target Audience:

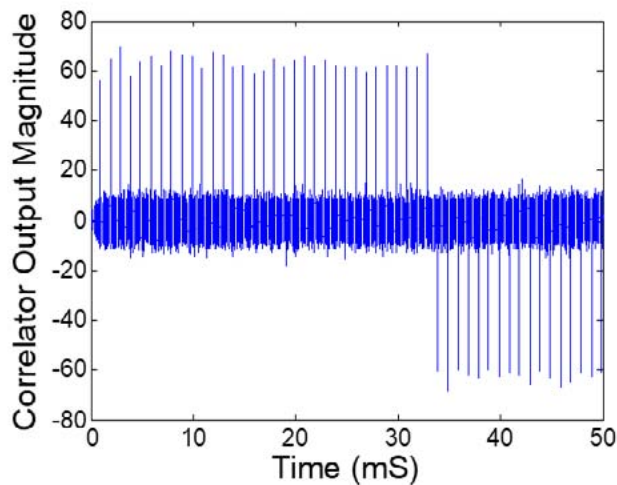
All engineers involved in or interested in signal processing applications. Engineers with significant experience with DSP will also appreciate this opportunity for an in-depth review of the fundamental DSP concepts from a different perspective than that given in a traditional introductory DSP course.

Benefits of Attending/ Goals of Course:

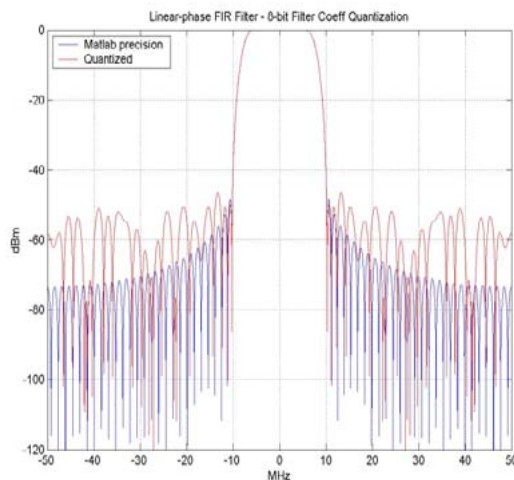
Attendees will build a stronger intuitive understanding of the fundamental signal processing concepts involved with digital filtering and mixed signal analog and digital design. With this, attendees will be able to implement more creative and efficient signal processing architectures in both the analog and digital domains.



Sliding Correlation



Linear Phase FIR Filter (8-bit quantized filter coefficients)

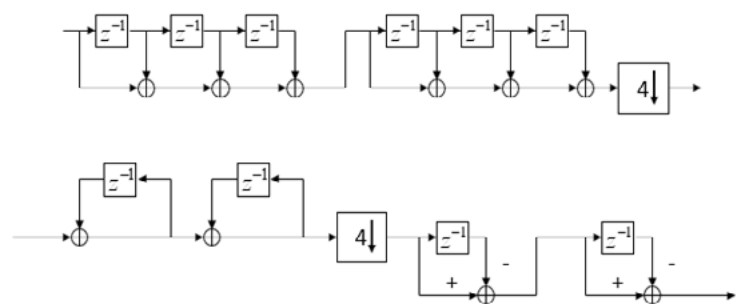


Class 5: Fast Fourier Transform, Multi-rate Signal Processing, Multi-rate Filters

Speaker's Bio:

Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless

Multi-stage CIC



communications systems. Dan is currently at Microchip (formerly Microsemi and Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/dan-boschen>

Topics / Schedule:

Class 1: Correlation, Fourier Transform, Laplace Transform

Class 2: Sampling and A/D Conversion, Z –transform, D/A Conversion

Class 3: IIR and FIR Digital filters, Direct Fourier Transform

Class 4: Windowing, Digital Filter Design, Fixed Point vs Floating Point

Decision (Run/Cancel) Date for this Courses is Tuesday, April 2

Payment received by March 26

IEEE Members \$350

Non-members \$385

Payment received after March 26

IEEE Members \$385

Non-members \$420

DSP for Software Radio

(13 hours of instruction!)

Time & Date: 6:00 - 9:00PM, Wednesdays, May 15, 22, 29, June 5, 12

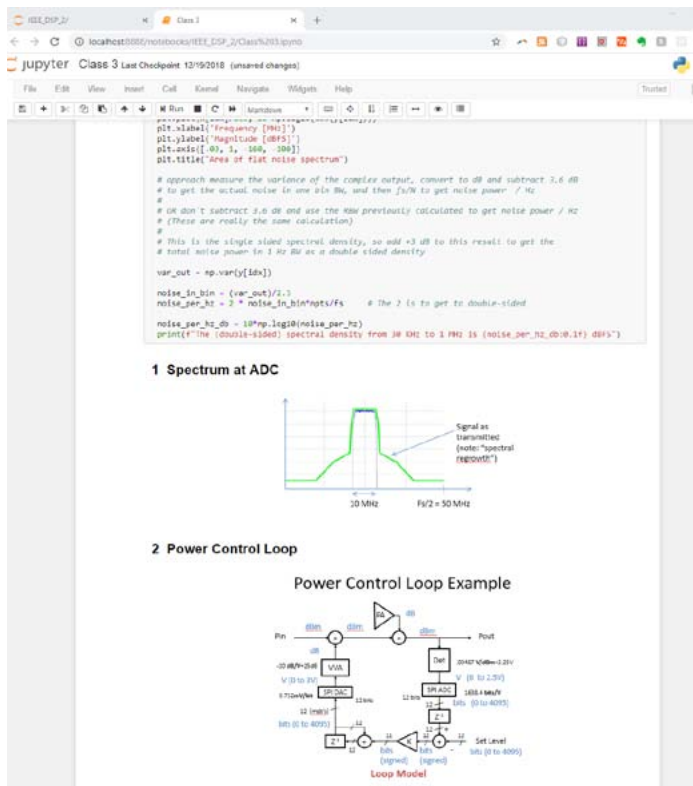
Location: Crowne Plaza Hotel, 15 Middlesex Canal Park Road, Woburn, MA

Speaker: Dan Boschen

Course Summary

This course builds on the IEEE course “DSP for Wireless Communications” also taught by Dan Boschen, further detailing digital signal processing most applicable to practical real-world problems and applications in radio communication systems. Students need not have taken the prior course if they are familiar with fundamental DSP concepts such as the Laplace and Z transform

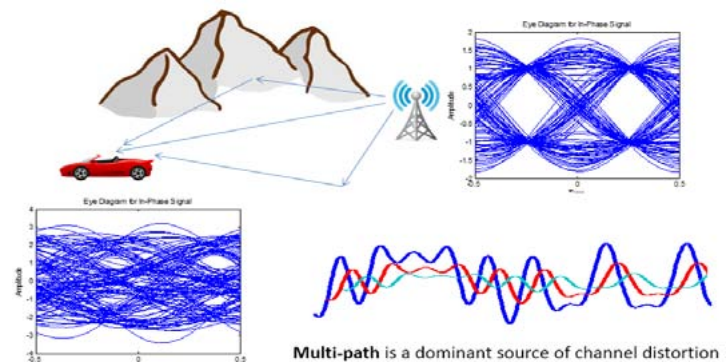
radios and modems for modern wireless communications. Specific areas covered include carrier and timing recovery, equalization, automatic gain control, and



and basic digital filter design principles. The course title has been changed with some minor additions but this is the same course that was previously taught titled “More DSP for Wireless Communications”, with the addition of Python demonstrations using Jupyter Notebooks.

This course brings together core DSP concepts to address signal processing challenges encountered in

Channel Distortion



considerations to mitigate the effects of RF and channel distortions such as multipath, phase noise and amplitude/phase offsets.

Dan builds an intuitive understanding of the underlying mathematics through the use of graphics, visual demonstrations, and real-world applications for mixed signal (analog/digital) modern transceivers. This course is applicable to DSP algorithm development with a focus on meeting practical hardware development challenges, rather than a tutorial on implementations with DSP processors.

Now with Jupyter Notebooks!

This long-running IEEE Course has been updated to include Jupyter Notebooks which incorporates graphics together with Python simulation code to provide a “take-it-with-you” interactive user experience. No knowledge of Python is required but the notebooks will provide a basic framework for proceeding with further signal processing development using that tools for those that have interest in doing so.

This course will not be teaching Python, but using it for demonstration. A more detailed course on Python itself

Benefits of Attending/ Goals of Course:

Attendees will gain a strong intuitive understanding of the practical and common signal processing implementations found in modern radio and modem architectures and be able to apply these concepts directly to communications system design.

Topics / Schedule:

Class 1: DSP Review, Radio Architectures, Digital Mapping, Pulse Shaping, Eye Diagrams

Class 2: ADC Receiver, CORDIC Rotator, Digital Down Converters, Numerically Controlled Oscillators

Class 3: Digital Control Loops; Output Power Control, Automatic Gain Control

Class 4: Digital Control Loops; Carrier and Timing Recovery, Sigma Delta Converters

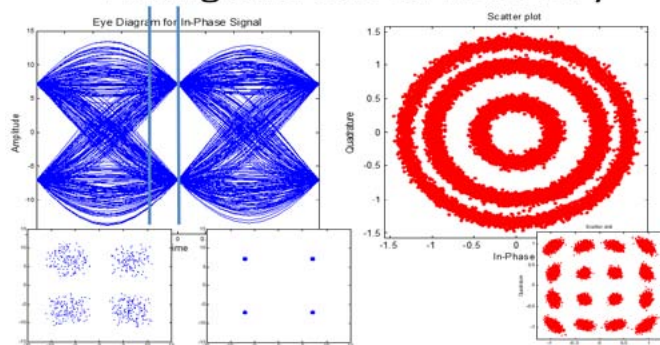
Class 5: RF Signal Impairments, Equalization and Compensation, Linear Feedback Shift Registers

Speaker's Bio:

Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems. Dan is currently at Microchip (formerly Microsemi and Symmetricom) leading design efforts for advanced frequency and time solutions.

For more background information, please view Dan's Linked-In page at: <http://www.linkedin.com/in/dan-boschen>

Timing and Carrier Recovery



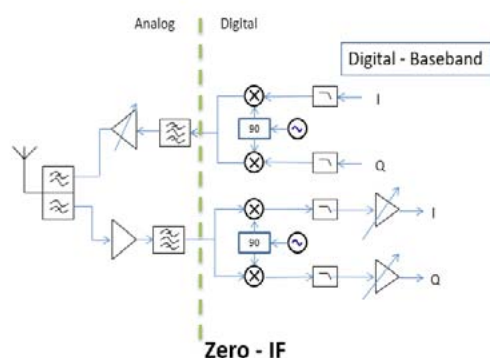
is covered in a separate IEEE Course "Python Applications for Digital Design and Signal Processing".

Students will be encouraged but not required to bring a laptop to class, and all set-up information for installation will be provided prior to the start of class.

Target Audience:

All engineers involved in or interested in signal processing for wireless communications. Students should have either taken the earlier course "DSP for Wireless Communications" or have been sufficiently exposed to basic signal processing concepts such as Fourier, Laplace,

Radio Architectures



and Z-transforms, Digital filter (FIR/IIR) structures, and representation of complex digital and analog signals in the time and frequency domains. Please contact Dan at boschen@loglin.com if you are uncertain about your background or if you would like more information on the course.

Decision (Run/Cancel) Date for this Courses is Wednesday, May 8

Payment received by May 1

IEEE Members	\$340
Non-members	\$375

Payment received after May 1

IEEE Members	\$375
Non-members	\$440

Fundamentals of Real-Time Operating Systems (*Online Edition*)

Students have access to this self-paced course for 90 days!!

Registration Fee: \$350

Course Summary - This course introduces the basics of Real-Time Operating Systems (RTOSes) using VxWorks and Linux as examples. The course focuses on the primary principles of RTOSes including determinism, real-time scheduling, interrupt latency and fast context switching as well as time and space partitioning in hard real-time environments. The first part of the course focuses on acquiring an understanding of microkernel and memory architectures for Real-Time including scheduling, signals, system calls, synchronization, inter-process communications and interrupt handling. The latter part of the course covers considerations for timing, memory management, device drivers, booting, debugging and deployment of Real-Time embedded systems.

Who Should Attend - The course is designed for real-time engineers who are using or intending to use a Real-Time Operating System. It is also targeted at experienced developers requiring a refresher course on RTOSes. This course will clearly demonstrate both the strengths and weaknesses of Real-Time Operating Systems used in Embedded Systems.

Course Objectives

- To provide a basic understanding of Real-Time Requirements and Design Decisions
- To understand the complexities of RTOS scheduling and synchronization
- To learn how to configure, boot, test and deploy Real-Time embedded systems
- To give students the confidence to apply these concepts to their next RTOS project

Lecturer – Mike McCullough is President and CEO of

RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. He has held a variety of software engineering positions at LynuxWorks, Embedded Planet, Wind River Systems and Lockheed Sanders. RTETC, LLC provides Real-Time embedded training and consulting to many embedded systems companies. RTETC focuses on Real-Time operating systems (RTOS), Linux and Android solutions for the embedded systems market.

Hardware and Software Requirements - The student should have a working Linux desktop environment either directly installed or in a virtualization environment or have access to a development environment for a Real-Time Operating System such as VxWorks. An Embedded Linux or VxWorks target hardware platform is useful but not absolutely required for this course.

Embedded Development Basics

Embedded Systems Characteristics
Embedded Real-Time Systems
Real-Time Enough
Embedded Linux and Real-Time

Real-Time Operating System Basics

Microkernel Architecture
Microkernel Scheduling
Determinism
Rate Monotonic Analysis and Fixed Priority Scheduling
Latency and Latency Measurements
Fast Context Switching
Real-Time Memory Architectures
Time and Space Partitioning and ARINC
Multiprocessor Basics
Amdahl's Law

RTOS Kernel Overview

Real-Time Scheduling and Task Management
Signals and System Calls
Synchronization

Inter-Process Communications (IPC)
 Interrupt Handling
 Error Handling
 Timing and Timers
 Real-Time Memory Management

Real-Time Scheduling

OS Scheduling Types
 Pre-emptive Multitasking
 Typical Scheduling Issues
 Linux Scheduling
 VxWorks Scheduling
 VxWorks Tasks
 VxWorks Real-Time Processes (RTPs)
 Linux Threads
 Task and Thread-Specific Data (TSD)
 Measuring Task and Thread Performance

Signals in Embedded RTOSes

System Calls in Embedded RTOSes

Synchronization

Via Global Data
 Via Semaphores, Files and Signals
 Condition and Completion Variables in Linux
 Mutexes in VxWorks and Linux
 Linux Futexes
 Software Watchdog Timers

Inter-Process Communications (IPC)

More Semaphores
 Message Queues
 Shared Memory
 Pipes and FIFOs
 Remote Procedure Calls
 Networking

Interrupts and Exception Handling

Basic Interrupt Process
 VxWorks intLib and exLib
 Routines You Can Call From Interrupt Context

Interrupt Service Routines (ISRs)

VxWorks and Linux ISRs

Bottom Halves in Linux

Deferring Work

Tasklets and Work Queues in Linux
 Helper Tasks

Error Handling

Error Handling Approaches in OS Design

Error Handling in VxWorks

Error Handling in Tasks and Interrupts
 Error Number Format
 Using errnoSet, errnoGet and printErrno
 Creating Your Own Errors

Error Handling in Linux

Standard Error Defines
 errno and perror
 strerror and strerror_r
 Resets, OOPS, Panics and Segmentation Faults

Error Logging Approaches

Timing and Timers

How RTOSes Tell Time
 VxWorks tickLib and timerLib
 Linux Kernel, POSIX and Interval Timers
 Linux High-Resolution Timers (HRTs)
 VxWorks taskDelay
 Linux Sleeping, Sleep Waiting and Spinlocks
 VxWorks Watchdog Timers (wdLib)
 Periodic Execution Example
 Deadline Miss Detection
 Embedded Recommendations for Timing

Memory Management and Paging

The VxWorks Memory Model
 Real-Time Memory Algorithms
 VxWorks memLib and memPartLib
 Linux, Memory and Demand Paging
 Mapping Device Memory in Linux
 The Slab Allocators in Linux
 The Linux /proc Filesystem
 Memory Barriers
 The Linux OOM Killer
 Reserving and Locking Memory
 Memory in Embedded Systems

Device Drivers in VxWorks

File Descriptors
 The VxWorks IO Subsystem
 VxWorks ioLib, fioLib and iosLib

The 5 Basic Device Driver Types

- Char, Block and Network Drivers
- Virtual Drivers and Basic I/O Drivers
- Other Device Drivers
- The VxBus in VxWorks

Device Drivers in Linux

- File Descriptors in Linux
- The UNIX Device Driver Model
- Major and Minor Numbers
- The New Device Driver Model

The VxWorks Boot Process

- VxWorks Boot Example
- Configuration Files
- Application Startup
- VxWorks 7

The Linux Boot Process

- The Root Filesystem in Linux
- Bootloaders and U-Boot
- Configuring Linux
- Embedded Linux Boot Methods
- Building and Booting from SD Cards and eMMC
- Yocto and Poky

Debugging Basics

- How Software Debuggers Work
- Debuggers and Intrusion
- Types of Debugging Approaches
- Process-Level vs System-Level Debug

Process-Level Debug

- GDB, GDB Server and the GDB Server Debugger
- The VxWorks Debug Agent (WDB)
- Other Debug Tools for Linux and VxWorks
- A Remote Debug Example
- Printing and Logging

System-Level Debug

- LTTng and the VxWorks Systems Viewer (Windview)
- System-Level Debug Tools
- The /proc and /sys Virtual Filesystems in Linux
- Linux Kernel Debug
- Linux Crash Dumps

Deploying VxWorks Systems

- VxWorks Systems Customization and Configuration
- VxWorks Field Upgrades

Deploying Embedded Linux Systems

- Linux Systems Customization and Configuration
- Choosing and Building the Root Filesystem
- Module Decisions
- Final IT Work
- Final deployment of Embedded Linux Field Systems

RTOS Trends

Some Final Recommendations

- Getting Help
- Measuring Performance
- Managing Memory
- Things To Remember

<http://ieeeboston.org/fundamentals-of-real-time-operating-systems-rt201-on-line-course/>

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Google+: <https://plus.google.com/107894868975229024384/>

LinkedIn: <https://www.linkedin.com/groups/IEEE-Boston-Section-3763694/about>

Embedded Linux Board Support Packages and Device Drivers *(Online Edition)*

Students have access to this self-paced course for 90 days!!

Registration Fee: \$350

Course Summary - This video course provides advanced training in the development of Embedded Linux Board Support Packages (BSPs) and Device Drivers. The first part of the course focuses on BSP and Software Development Kit (SDK) development in an Embedded Linux context with a focus on application performance measurement and improvement. The latter part of the course covers Embedded Linux Device Driver development including key device driver decisions and deployment considerations for Embedded Linux BSPs.

Who Should Attend - The course is designed for real-time engineers who are developing Embedded Linux BSPs and Device Drivers for Embedded Linux distributions. It is also targeted at experienced developers requiring a refresher course on Linux BSP and Device Driver development.

Course Objectives

- To gain an understanding of the complexities of BSP and SDK development and their uses in Embedded Linux systems.
- To provide a basic understanding of the Linux I/O Subsystem and the Device Driver Models provided with Embedded Linux distributions.
- To gain an in-depth understanding of character-based device drivers in Embedded Linux
- To understand key device driver subsystems including relatively slow I/O interconnects such as I2C, SPI and USB as well as high-speed interfaces such as Ethernet, USB 3.0 and PCIe

- To give students the confidence to apply these concepts to their next Embedded Linux project.

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. A 20-year electronics veteran, he has held various positions at LynuxWorks, Tilera, Embedded Planet, Wind River Systems, Lockheed Sanders, Stratus Computer and Apollo Computer. RTETC, LLC is a provider of Eclipse-based software development tools, training and consulting services for the embedded systems market.

Course Schedule

Getting Started with Embedded Linux

Embedded Linux Training Overview
Linux Terminology, History and the GPL
Building the Kernel Source Code
Embedded Linux Kernels
BSPs and SDKs

Linux References (Books and Online)

BSP Requirements

U-Boot and Bootloader Development

Embedded Linux BSP Development Basics

Basic BSP Development

Files and Filesystem Support

The I/O Subsystem: Talking to Hardware

Memory Management and Paging

Error Handling in Embedded Linux BSPs

Timing and Timers

Interrupt and Exception Handling in BSPs

BSP Deployment Issues and Practices

Embedded Linux SDK Basics

The 3 Pieces of an SDK

Embedded Linux Distributions and the GNU Compiler

Collection (GCC)	BootLoader Optimizations
Other Embedded Linux Development Tools	Boot Time Measurements
Library Support, Glibc and Alternatives	Effective Memory and Flash Usage
SDK Deployment and Support	Filesystem Performance Measurement
Debugging	Some Ideas on Performance Measurement
GDB, GDB Server and the GDB Server Debugger	
Other Debug and Test Tools	The Original UNIX Device Driver Model
An Eclipse Remote Debug Example	The fops and file structs
Advanced Debug with printk and syslogd	The inode and dentry structs
System-Level Debug	Major and Minor Numbers
System-Level Debug Tools	Embedding Channel Information
The /proc and sys Filesystems	Deferring Work
Advanced Logging Methods	The /proc Filesystem
KGDB and KDB	Configuring the Device Driver
Crash Dumps	A Simulated Device Driver
Debugging Embedded Linux Systems	Modularization Revisited
Configuring Embedded Linux	The Evolution of a New Driver Model
Config Methods	The Initial Object-Oriented Approach
Config Syntax	Platform Devices and Drivers
Adding Code to the Linux Kernel	A Generic Subsystem Model
Booting Embedded Linux	The Generic Subsystem Model in Detail
Processor Startup	Subsystem Registration
Initial Functions	The Probe and Init Functions
The initcalls	The Show and Store Functions
Using __init Functions	User Access via the /sys Filesystem
NFS Booting	Configuring the New Device Driver
Root File Systems	The udev Linux Application
RAMdisk Booting with initrd	Comparing the Two Driver Models
RAMdisk Booting with initramfs	The Flattened Device Tree (FDT)
initrd vs initramfs	openBoot and its Effect on Embedded Linux
Root File System Development	The Device Tree Script (dts) File
Busybox Development	The Device Tree Compiler (dtc)
Building a RAMdisk for an initrd	The Device Tree Blob (dtb) File
Building a RAMdisk for an initramfs	Building a dtb File
Flash File System Development	Hybrid Device Drivers
	Other fops Functions
Testing and Debug of Embedded Linux BSPs	The Need for ioctl
Kernel Debug and Kernel Probes	Linux Device Driver Subsystems
Kexec and Kdump	Direct Connect Device Drivers
The Linux Test Project (LTP)	Serial/Console Drivers, I2C & SPI
Performance Tuning Embedded Linux BSPs	Real-Time Clocks and Watchdogs
Virtualization	GPIO and the Pinmux
Measuring Embedded Linux BSP Performance	Flash MTDs and Direct Memory Access
Common Considerations	USB, Power and CPU Management
Uncommon Considerations	Video and Audio

PCI and VME
 Block Devices
 RAMdisk and Flash Filesystems
 MMCs and SD Cards
 Network Device Drivers
 MAC and PHY Device Drivers
 net_device and net_device_stats
 Network Device Initialization
 Device Discovery and Dynamic Initialization
 Network Interface Registration
 Network Interface Service Functions
 Receiving and Transmitting Packets
 Notifier Chains and Device Status Notification
 Unwired Device Drivers
 Wireless Device Drivers (WiFi, WLAN)
 Bluetooth and BlueZ
 Infrared and IrDA
 Cellular from 2G to 5G

Drivers in User Space
 Accessing I/O and Memory Regions
 User Mode SCSI, USB and I2C
 UIO
 High-Speed Interconnects
 PCIe
 iSCSI
 Infiniband
 FibreChannel
 Debugging Device Drivers
 kdb, kgdb and JTAG
 Kernel Probes
 Kexec and Kdump
 Kernel Profiling
 User Mode Linux
 Performance Tuning Device Drivers
 Some Final Recommendations

<http://ieeeboston.org/embedded-linux-bsps-device-drivers-line-course/>

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Embedded Linux Optimization - Tools and Techniques (*Online Edition*)

Students have access to this self-paced course for 90 days!!

Registration fee: \$250

Summary - This video course provides advanced training in the debugging, testing, profiling and performance optimization of Embedded Linux software. The first part of the course focuses on advanced debugging, testing and profiling in an Embedded Linux context with a focus on using Eclipse, Backend Debuggers, JTAG and In-Circuit Emulators as well as Kernel Logging capabilities and Kernel Hacking. The latter part of the course covers performance measurement and optimization affecting boot, memory, I/O and CPU performance and key performance optimization tools for Embedded Linux software including the perf tool, advanced cache usage and compiler-based optimization.

Who Should Attend - The course is designed for real-time engineers who are developing high-performance Linux applications and device drivers using Embedded Linux distributions. It is also targeted at experienced developers requiring a refresher course on Advanced Embedded Linux optimization.

Course Objectives

- To understand debugging, profiling and testing high performance Embedded Linux software.
- To provide an overview of Linux application performance measurement and optimization.
- To understand the tools used for performance optimization of Embedded Linux software.

- To give students the confidence to apply these concepts to their next Embedded Linux project.

Lecturer – Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. He has held a variety of software engineering positions at LynuxWorks, Embedded Planet, Wind River Systems and Lockheed Sanders. RTETC, LLC provides real-time embedded training and consulting to many embedded systems companies. RTETC focuses on real-time operating systems (RTOS), Linux and Android solutions for the embedded systems market.

Getting Started with Embedded Linux

Embedded Linux Training Overview

Terminology

Linux Versioning

The GPL

Building the Kernel Source Code

Embedded Linux Kernels

BSPs and SDKs

Linux References (Books and Online)

A Development Cycle Focused on Performance

A Basic Optimization Process

Basic Debugging Review

Embedded Applications Debug

GDB, GDB Server and the GDB Server Debugger

Other Debuggers

An Eclipse Remote Debug Example

Debugging with printk, syslog, syslogd and LTTng

System-Level Debug

System-Level Debug Tools

The /proc and /sys Filesystems

Basic Logging	New Tracing Methods
KDB and KGDB	SystemTap
Crash Dumps and Post-Mortem Debugging	Ftrace, Tracepoints and Event Tracing
Debugging Embedded Linux Systems	Tracehooks and utrace
Backend Debuggers	Profiling
In-Circuit Emulators	Basic Profiling
Hardware Simulators	gprof and Oprofile
Analyzers	Performance Counters
Requirements Development	LTTng
Performance Requirements	Another DDD Example
Derived Requirements	Manual Profiling
Testability and Traceability	Instrumenting Code
Reviewing Requirements	Output Profiling
Designing for Performance	Timestamping
Design for Test (DFT)	Addressing Performance Problems
Agile Software Design	Types of Performance Problems
Software and Linux Decomposition	Using Performance Tools to Find Areas for
Memory Management	Improvement
CPU and OS Partitioning	Application and System Optimization
Design Reviews	CPU Usage Optimization
Coding for Performance	Memory Usage Optimization
Coding Standards and Consistency	Disk I/O and Filesystem Usage Optimization
Languages, Libraries and Open Source Components	Measuring Embedded Linux Performance
Learning Magic Numbers	Some Ideas on Performance Measurement
Letting Compilers Work For You	Common Considerations
Global, Static and Local Variables	Uncommon Considerations
Code Reviews	Using JTAG Methods
	BootLoader Measurements
Software Testing	Boot Time Measurements
Unit-Level Testing	The Perf Tool
System-Level Testing	Origins of Perf
Code Coverage Tools	The Perf Framework
gcov	Perf Commands and Using Perf
Automated Testing	Listing Events
Some Embedded Linux Test Recommendations	Counting Events
DebugFS	Profiling with Perf
Configuring DebugFS	Static Tracing with Perf
DebugFS Capabilities	Dynamic Tracing with Perf
Advanced Logging	Perf Reporting
LogFS	Performance Tool Assistance
Using Logwatch and Swatch	Recording Commands and Performance
Using syslogd and syslog-ng	System Error Messages and Event Logging
Tracing	Dynamic Probes
ptrace and strace	Jprobes and Return Probes
	Kernel Probes

Kexec and Kdump	Improving System Memory Performance
Improving Boot Performance	Memory Performance Statistics
Boot Time Optimization	Linux Performance Tools for Memory
The Linux Fastboot Capability	Process-Specific Memory Performance Tools
Building a Smaller Linux	More Stupid Cache Tricks
Building a Smaller Application	Improving I/O and Device Driver Performance
Filesystem Tips and Tricks	Disk, Flash and General File I/O
Some Notes on Library Usage	Improving Overall Performance Using the Compiler
Improving Kernel Performance	Basic Compiler Optimizations
Kernel Hacking	Architecture-Dependent and Independent Optimization
CONFIG_EMBEDDED	Code Modification Optimizations
Configuring printk	Feedback Based Optimization
Test Code	Application Resource Optimization
Configuring Kernel and IO Scheduling	The Hazard of Trust
	An Iterative Process for Optimization
Improving CPU Performance	Improving Development Efficiency
Run Queue Statistics	The Future of Linux Performance Tools
Context Switches and Interrupts	Some Final Recommendations
CPU Utilization	
Linux Performance Tools for CPU	
Process-Specific CPU Performance Tools	
Stupid Cache Tricks	

<http://ieeeboston.org/embedded-linux-optimization-tools-techniques-line-course/>

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Software Development for Medical Device Manufacturers (Online Edition)

Students have access to this self-paced course for 90 days!! Registration Fee : \$125

Course Description This course provides an introduction to the development of medical device software. The course is comprised of 4 modules that range from 30-45 minutes in duration. The focus is on complying with FDA Design Controls and IEC 62304 requirements.

This course is intended for software developers who are actively involved in developing medical device software.

Module 1

- Medical Device Definitions: FDA and European Union (EU)
- Regulatory Roadmap
- FDA/EU Device Classifications
- FDA QSR Regulation
- FDA Guidance Documents that pertain to medical device software

Module 2

- International Standards that pertain to medical device software
- Types of Software Regulated by FDA
- Quality System basics: Procedures, Work Instructions and Records
- ALL Software is Defective...

Module 3:

- Design Control Overview
- General Requirements
- Design and Development Planning
- Software Development Models
- Design Input
- About Requirements...
- Design Output

- Design Reviews

Module 4:

- Design Control (continued)
- Design Verification
- Software Verification Process
- Testing Overview
- Design Validation
- Software Validation Process
- Design Changes
- Design Transfer
- Design History File
- Course Summary

Speaker Bio:

Steven R. Rakitin has over 40 years experience as a software engineer including 25 years of experience in the medical device industry. He has worked with over 85 medical device manufacturers worldwide, from startups to Fortune 100 corporations. He has written several papers on medical device software risk management as well as a book titled: Software Verification & Validation for Practitioners and Managers.

He received a BSEE from Northeastern University and an MSCS from Rensselaer Polytechnic Institute. He earned certifications from the American Society for Quality (ASQ) as a Software Quality Engineer (CSQE) and Quality Auditor (CQA). He is a Senior Life member of IEEE and a member of MassMEDIC. He is on the Editorial Review Board for the ASQ Journal Software Quality Professional.

As President of Software Quality Consulting Inc., he helps medical device companies comply with FDA regulations, guidance documents, and international standards in an efficient and cost-effective manner.

<http://ieeeboston.org/software-development-medical-device-manufacturers-line-course/>

Fundamental Mathematics Concepts Relating to Electromagnetics (*Online Edition*)

Students have access to this self-paced course for 90 days!!

Registration Fee: \$150

Course Summary This course is designed for people wishing to refresh or to learn the fundamental mathematical concepts that are used to describe electromagnetic wave behavior. The modules address all of the basic math concepts covered in a traditional undergraduate electromagnetics course in an ECE curriculum. These concepts include Vector Basics, Integral Vector Calculus, Differential Vector Calculus, Fundamental Coordinate Systems and Complex Numbers. After completing these modules, a person should have sufficient math skills to pursue graduate studies in electromagnetics and/or be able to decipher the math presented in an upper-level text on the subject.

Target audience: This course is designed for people wishing to refresh or to learn the fundamental mathematical concepts that are used to describe electromagnetic wave behavior.

Course chapters

1. Vector Basics
2. Dot Product

3. Cross Product
4. Contour Integration
5. Vector Algebra
6. Surface Integration
7. Metric Coefficients
8. Coordinate Systems
9. Vector Coordinate Conversion
10. Del Operator and the Gradient
11. The Curl
12. Divergence
13. Stokes Theorem
14. Divergence Theorem
15. Laplacian
16. Complex Numbers

Instructor's Bio:

Dr. Kent Chamberlin is the Chair and a Professor in the Department of Electrical and Computer Engineering. In his more than thirty-five years in academia, he has performed research for more than twenty sponsors, including the National Science Foundation. He has received two Fulbright awards, including the prestigious Fulbright Distinguished Chair, which he served in Aveiro, Portugal. He has also served as an Associate Editor for the Institute for Electrical and Electronics Engineers, and he continues to be active in performing and publishing in a range of research areas.

<http://ieeeboston.org/fundamental-mathematics-concepts-relating-electromagnetics-line-course/>

Reliability Engineering for the Business World *(Online Edition)*

Students have access to this self-paced course for 90 days!!

Registration Fee: \$320

Course Description

This course is about becoming a leader in reliability engineering. While statistics are the tools of reliability engineering, it takes knowledge not only of these tools but also of the business. Developing knowledge of the business, from sales, engineering, customer service, to supply chain management can determine how effective you can be in improving reliability.

Never take anything for granted, even some rules of thumb in reliability can be misleading, this course will show you how to prove what truly happens in the real world and how to effect change in any part of the business where it is needed. We will explore the balance sheet, organizational structure, customers, service, and high volume manufacturing. It's not just about how often things fail, it is also about where the defect came from, what is the financial effect, the recovery, when should a business take field action, effect of human error, failure analysis/material science, reliability testing, and much more. I will also discuss how you develop executive buy in for change. The course assumes a basic knowledge in reliability statistics. There are 12 sessions that cover the following topics.

Course Outline

Basics – Measurements
Business Model
Design Model (HW and SW)

HALT/RDT/Predictions
Manufacturing Model
Early Life Failures
Wear Out and Mid Life Crisis
Advanced Reliability

Course Objective

To teach you how to become the go to person in your business for objective business sensed reliability answers and requirements.

Instructor's Bio

Kevin is an innovative leader in reliability methodologies with more than 30 years experience in the storage industry. In his latest role as Director of Engineering, he developed a top down reliability/availability management process for design organizations developing mission-critical storage systems. Kevin previously directed the most extensive HALT/HASS operation in the industry, with over 300 chambers worldwide. He has written several papers, consulted with many companies, 3 patents awarded and 2 pending related to systems reliability and test.

His most recent work has been performing system architectural analysis to optimize system availability, serviceability and costs. Providing guidance to development to maximize system reliability and reduce service costs. He has provided consultation to many large companies such as EMC, CISCO, AT+T, HP, Seagate and many others. His position and experience has enabled him to perform extensive field studies and design of experiments. Kevin has developed many

<http://ieeeboston.org/reliability-engineering-business-world-line-course/>

Introduction to Embedded Linux

(Online Edition)

Students have access to this self-paced course for 90 days!! **Registration Fee: \$350**

Course Summary:

This first of a 2-part series introduces the Linux Operating System and the use of Embedded Linux Distributions. The course focuses on the development and creation of applications in an Embedded Linux context using the Eclipse IDE. The first part of the course focuses on acquiring an understanding of the basic Linux Operating System, highlighting areas of concern for Embedded Linux applications development using Eclipse. The latter part covers the methods for booting Embedded Linux distributions including embedded cross-development and target board considerations.

Who Should Attend:

The course is designed for real-time engineers who are building Embedded Linux solutions. It is also targeted at experienced developers requiring a refresher course on Embedded Linux. This course will clearly demonstrate both the strengths and weaknesses of the Linux Operating System in Embedded Systems.

Course Objectives:

To provide a basic understanding of the Linux OS and the Eclipse IDE framework.

To gain an understanding of the complexities of Embedded Linux Distributions and their use in embedded systems.

To give students confidence to apply these concepts to their next Embedded Linux project

Hardware and Software Requirements

The student should have a working Linux desktop environment either directly installed or in a virtualization environment. The desktop Linux should have the GNU compiler and binary utilities (binutils) already installed. A working Eclipse C/C++ installation or prior knowledge of C-based Makefiles is

useful for completion of lab exercises. Lab solutions are also provided with the course. An Embedded Linux target hardware platform is useful but not absolutely required for this course.

Additional Reference Materials

Linux Kernel Development by Robert Love

Linux System Programming by Robert Love

Linux Debugging and Performance Tuning by Steve Best

Optimizing Linux Performance by Phillip G. Ezolt

Embedded Linux Primer by Christopher Hallinan

Pro Linux Embedded Systems by Gene Sally

Embedded Linux Development Using Eclipse by Doug Abbott

Linux Device Drivers by Jonathan Corbet et al

Essential Linux Device Drivers by Sreekrishnan Venkateswaran

Course Downloadable Content:

Video Lecture

Hands-On Lab Instructions

Hands-On Lab Solutions

Additional Related Materials

The Basics

Linux Terminology, History and Versioning

The Linux Community: Desktop & Embedded

The GPL

Linux References (Books and Online)

Getting Started

Kernel Source Code

Building the Kernel

Embedded Linux Kernels

Linux 2.6

Basic Kernel Capabilities

Process and Threads Management

Signals and System Calls

Synchronization, IPC and Error Handling

Timing and Timers

Memory Management and Paging
The I/O Subsystem: A Tale of Two Models
Modularization

Debugging

Process-Level and System-Level Debug
GDB and KGDB
GDB Server and Remote Debugging

An Eclipse Debug Example

Other Debug and Test Tools

Other System-Level Debug Approaches

Process & Threads Management

What are Processes and Threads?
Virtual Memory Mapping
Creating and Managing Processes and Threads
Thread-Specific Data (TSD) POSIX
The Native POSIX Threading Library (NPTL)
Kernel Threads

Signals

System Calls

Scheduling

Linux 2.4 and 2.6 Scheduling Models
The O(1) Scheduler
The Completely Fair Scheduler (CFS)

Synchronization

Via Global Data
Via Semaphores, Files and Signals

Inter-Process Communications (IPC)

Message Queues
Semaphores Revisited
Shared Memory
Pipes, FIFOs and Futexes
Remote Procedure Calls
Networking

Error Handling

errno and perror
strerror and strerror_r
oops, panics and Segmentation Faults

Timing

How Linux Tells Time

Kernel, POSIX and Interval Timers
High-Resolution Timers (HRTs)

Memory Management and Paging

Demand Paging and Virtual Memory
Allocating User and Kernel Memory
Mapping Device Memory
The Slab Allocator
The OOM Killer
Memory in Embedded Systems

Modularization

Creating a Module and Module Loading
Dependency Issues
In Embedded Systems

Shared Libraries

A Shared Library Example
Static and Dynamic Libraries

The I/O Subsystem: A Tale of Two Models

The Original Device Driver Model
The Standard I/O Interface
The New Device Driver Model and Kernel Object Classes
Initialization
Platform Devices, Busses, Adapters and Drivers
Comparing the Two Models

Embedded Linux Trends

Development, Monitoring and Testing

Some Final Recommendations

Lecturer:

Mike McCullough is President and CEO of RTETC, LLC. Mike has a BS in Computer Engineering and an MS in Systems Engineering from Boston University. A 20-year electronics veteran, he has held various positions at Titera, Embedded Planet, Wind River Systems, Lockheed Sanders, Stratus Computer and Apollo Computer. RTETC, LLC is a provider of Eclipse-based development tools, training and consulting for the embedded systems market.

Design Thinking for Today's Technical Work

(Online Edition)

Students have access to this self-paced course for 90 days!!

Registration Fee: \$160

Course Description:

This course covers the principles of Design Thinking; the steps commonly used; how it enhances the likelihood of success in a wide variety of applications; and, in particular, how to apply it to technical work. Examples of its application to technical work are presented along with the successes that followed.

Design Thinking has garnered much attention in recent years mainly as a way to design consumer products that engage users, such as Apple's iPhone. But its use is spreading to situations ranging from how to provide medical care to planning one's career. This course explains what Design Thinking is about, but, most important, explains how an individual can apply Design Thinking to their own technical work. Care has been taken to focus the course content on using Design Thinking as a structured, practical process for the daily work of technical professionals. A specific technical example is carried through the teaching of the five stages of Design Thinking. The course covers applying Design Thinking to the range of tasks performed during a technical project, including design of: technical functions; user interactions (if applicable); factors for business success; solutions to problems that arise; and project presentations and reports to influence adoption of project outcomes, funding approval, and hiring for consulting. The content applies to employees of large to small companies, start-ups, consultants and contract work, and government organizations. The course is focused on an individual worker employing Design Thinking.

Course Objectives

Provide an understanding of Design Thinking and how an individual can apply it to their technical work:

- Understand the steps of Design Thinking (Understand, Define, Ideate, Prototype, and Test)
- Learn how to apply Design Thinking in technical work
- Understand where Design Thinking can be applied in project activities.

Who Would Benefit from this Course

Anyone who works on solutions to problems or designs hardware, software, products, services, and processes. This includes technical professionals, project managers, and organizational managers. Also, anyone who wants to learn what Design Thinking is about in a practical sense.

Course Modules

- Module 1 – How Design Thinking Can Help Technical Work (60 minutes)
- Module 2 – Understand: Explore the Problem (44 minutes)
- Module 3 – Define: Synthesize What Is Needed (23 minutes)
- Module 4 – Ideate: Generate Solutions (26 minutes)
- Module 5 – Prototype: Build Versions to Test (23 minutes)
- Module 6 – Test: Examine and Learn (28 minutes)
- Module 7 – Design Thinking for Presenting and Writing (23 minutes)

- Module 8 – Getting Started with Design Thinking (30 minutes)

Speaker biography

Speaker: James L. Poage, President/Owner JLP Performance Consulting

Dr. James L. Poage has been designing future concepts for Air Traffic Control for 25 years, first with the Volpe National Transportation Systems Center and then for the past dozen years as an independent consultant (JLP Performance Consulting). He has taught short courses on Benefit-Cost analysis to the FAA and NASA, as well as spoken at conferences and published in professional journals. Over the past 15 years, Dr. Poage has been applying Design Thinking to his project work; to marketing

his consulting services; and to planning briefings, reports, and courses. His clients have included FAA, NASA, BAE Systems, Engility, Georgia Tech University, San Jose State University, and Saab Sensis. Dr. Poage has co-authored the book, *Flair: Design Your Daily Work, Products, and Services to Energize Customers, Colleagues, and Audiences* (Maven House Press, 2016), with his daughter, Jennifer Poage who works in fashion design. Dr. Poage has a Ph.D. in applied mathematics from the Harvard University School of Engineering and Applied Sciences and a M.S. and B.S. in electrical engineering from Stanford University.

Note: Course participants will receive a copy of the book, *Flair*.

Call for Course Speakers/Organizers

IEEE's core purpose is to foster technological innovation and excellence for the benefit of humanity. The IEEE Boston Section, its dedicated volunteers, and over 8,500 members are committed to fulfilling this core purpose to the local technology community through chapter meetings, conferences, continuing education short courses, and professional and educational activities.

Twice each year a committee of local IEEE volunteers meet to consider course topics for its continuing education program. This committee is comprised of practicing engineers in various technical disciplines. In an effort to expand these course topics for our members and the local technical community at large, the committee is publicizing this CALL FOR COURSE SPEAKERS AND ORGANIZERS.

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If you have an expertise that you feel might be of interest to our members, please submit that to our online course proposal form on the section's website (www.ieeeboston.org) and click on the course proposal link (direct course proposal form link is

<http://ieeeboston.org/course-proposals/>. Alternatively, you may contact the IEEE Boston Section office at ieeebostonsection@gmail.com or 781 245 5405.

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