

BOSTON



THE REFLECTOR

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How to Use Simulation and
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(LAST NOTICE,
REGISTER NOW!)

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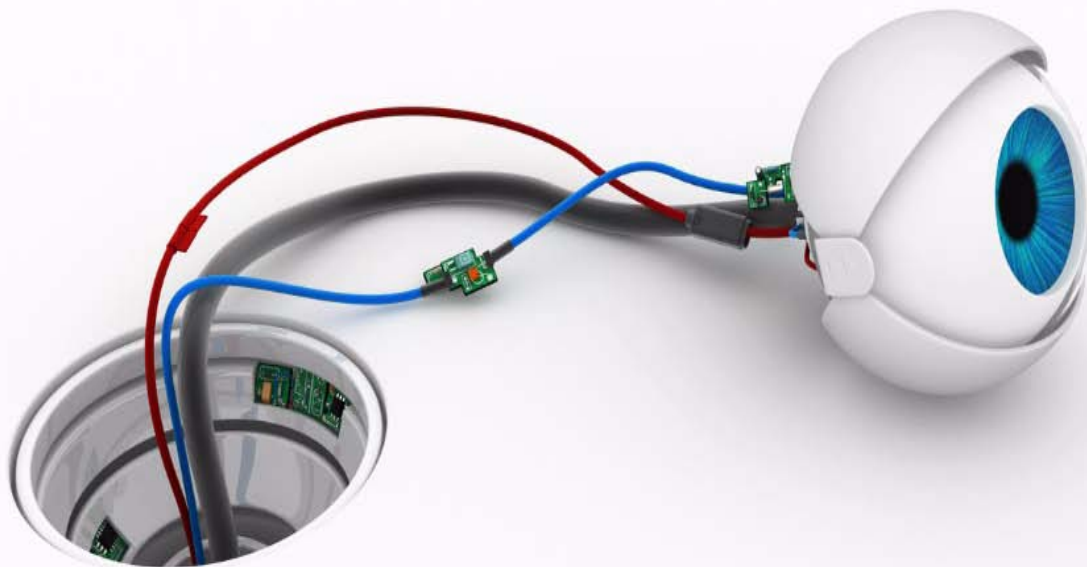


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Boston Section IEEE

Arthur Winston - Boston Section IEEE Future Events Co-Chair

If you are reading this editorial, you are most likely a member of the IEEE Boston Section. You live and work here or are now retired here. You may have come from another part of the US or from a different country, and it may have been that you went to school here or took a job in a technological company. I did. I came from Canada to attend MIT. I intended to return to Canada. I didn't. Except for a short time in Texas, I have spent most of my life here.

When we say Boston, we mean Greater Boston, including the surrounding towns. Boston, the city, is relatively small with a population of about 690,000. Greater Boston has a population of about 7 times this. It is the home of many historical events and leading organizations, past and present. The first shot in the American Revolution occurred here (Lexington). MIT and Harvard are recognized as first-class world universities and there are 44 colleges and universities in Greater Boston. Buzz Aldrin, upon graduating from MIT, became the second astronaut to land on the moon in the first landing. (I had the honor of being invited to lunch with Bizz and his father, as Buzz neared graduation, to advise him on his future. I suggested the NASA astronaut connection though I am sure he would have reached this conclusion without me.) (Excuse me for occasionally being personal but it just reflects my love for the area.) For other activities, it is possible to swim in lakes, the ocean, or ski and hike on local trails and mountains. Boston is also very sports-minded and has major pro-

fessional teams. Bill Koch funded MIT to develop the hull for his boat for the America 3 Cup race which he won. (I had the honor of hosting him at the request of MIT to celebrate his victory.) In summary, some of the Greater Boston's most well-known contributions involve the region's higher education and medical institutions. Greater Boston has been influential in American history and industry. The Region and the state of Massachusetts are global leaders in biotechnology, engineering, higher education, and finance.

With this lovely and cultural city and its great environment, it is only fitting and not surprising, that we have an extremely good IEEE Section. The Boston Section is celebrating its 121st birthday. The Boston Section is the largest section in Region 1 and is one of the most active sections of the IEEE. (There are 342 sections throughout the world.) The Section provides service to its Chapters, provides lectures of value to its members, and manages major conferences. Unlike most sections, we are fortunate to have our own Business Manager. Under the leadership of Section Chair, Marie Tupaj, Business Manager, Bob Alongi and the Executive Committee, the section is really humming with activity.

As a past President of IEEE, I had the opportunity to visit many locations and sections, and the more I have travelled the world, the more I have come to appreciate Boston and the Boston Section of IEEE.



IEEE Boston Section Volunteer Raffle Winner!

The IEEE Boston Section held its annual “Leadership Forum” on June 15, 2021. All the Boston Chapter and Affinity Group leaders who attended the meeting were entered into a raffle for an Apple iwatch. This year’s raffle winner is Aakash Deliwala, Chair of the Boston Consumer Technology Chapter. Congratulations, Aakash!

There will be a leadership forum planned in 2022 and all eligible local volunteers will be invited and are encouraged to attend the event to be entered into a similar raffle in 2022.

IEEE Boston Section Social Media Links:

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

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

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

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

Call for Articles

Now that the Reflector is all electronic, we are expanding the content of the publication. One of the new features we will be adding are technical, professional development, and general interest articles 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 or general interest articles should have broad applicability to the engineering community and should not explicitly promote services for which a fee or pay-

ment 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/interest 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

IEEE Boston Section Online Courses:

(Students have 180 day access to all online, self-paced courses)

Electronic Reliability Tutorial Series - (Fall 2020)

Full course description and registration at ,
<http://ieeeboston.org/electronic-reliability/>

High Performance Project Management

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

Introduction to Embedded Linux Part I

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

Embedded Linux Optimization - Tools and Techniques

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

Embedded Linux Board Support Packages and Device Drivers

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

Software Development for Medical Device Manufacturers

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

Fundamental Mathematics Concepts Relating to Electromagnetics

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

Reliability Engineering for the Business World

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

Design Thinking for Today's Technical Work

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

Fundamentals of Real-Time Operating Systems

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

CALL FOR IEEE BOSTON SECTION AWARDS NOMINATIONS (2021)

DISTINGUISHED SERVICE AWARD

Description - The purpose of the Distinguished Service Award is to honor an IEEE Boston Section member who has made exceptional and distinguished contributions to the Boston IEEE Section. The Distinguished Service Award is to honor an IEEE Boston Section member who has made exceptional and distinguished contributions to the Boston IEEE Section. This award is a wood, engraved plaque with the recipient's citation.

Administration - The Distinguished Service Award will be administered by the Boston Section's Awards Committee. The Awards Committee will submit their recommendations to the Section's Executive Committee for approval.

Eligibility - Individuals nominated for this award must be members of the Boston Section and the IEEE. The award is based upon evidence of distinguished service to the Boston Section. Selection criteria include leadership roles and leadership quality, innovative and important services/contributions to the Boston Section

DISTINGUISHED MEMBER AWARD

Description - The purpose of this award is to recognize distinguished long-term service to the Boston Section of the IEEE and significant contributions in an IEEE field of interest. The Distinguished Member Award recognizes outstanding long-term service (10-years or more) to the Boston Section and significant contributions in an IEEE field of interest. This award is a wood, engraved plaque with the recipient's citation

Administration - The Distinguished Member Award will be administered by the Boston Section's Awards Committee. The Awards Committee will submit their recommendations to the Section's Executive Committee for approval.

Eligibility - Individuals nominated for this award must have been members of the Boston Section for at least the previous ten (10) years. Multiple awards may be given each year, if suitable candidates are nominated. Individuals nominated for this award must currently be members of the Boston Section and members of the IEEE. The award is based upon evidence of distinction in long-term service to the Boston Section and for contributions to the fields of interest to the IEEE. Selection criteria include leadership roles and leadership quality, innovative and important contributions to the Boston Section, service and dedication to the Boston Section, and technical achievements in the fields of interest to the IEEE.

STUDENT ACHIEVEMENT AWARD

Description - The purpose of the Student Achievement Award is to recognize a college student who demonstrates the potential to become distinguished leader and outstanding contributor in an IEEE field of interest. This award is a wood, engraved plaque with the recipient's citation. The Student Achievement Award is to recognize a college student who demonstrates the potential to become a distinguished leader and outstanding contributor in an IEEE field of interest.

Administration - The Student Achievement Award will be administered by the Boston Section's Awards Committee. The Awards Committee will submit their recommendations to the Section's Executive Committee for approval.

Eligibility - An individual nominated for this award must be a student (sophomore year or higher), in good standing, at an institution of higher education located in the Boston Section or be a legal resident within the Boston Section who is attending an institution of higher education outside the Section. The nomination must be submitted by, or endorsed by, the student's major professor, academic advisor or Dean of the department/college they are attending. All nominees' major field of study must be in an IEEE field of interest. The award is based upon evidence of distinguished leadership, accomplishment, and/or outstanding contributions that further the aims of the IEEE.

The deadline for submitting nominations for the 2021 Boston Section Awards is Friday, December 31, 2021.

**Nominations can be submitted to the Boston Section Awards Committee at
ieeebostonsection@gmail.com**

Consumer Technology Society Call for Volunteers!

We are currently looking for volunteers who would be interested in pushing forward the mission of the Consumer Technology (CT-S), Boston Chapter. The chapter is looking for volunteers to help organize chapter meetings and help meet the needs of the local CT-S member needs.

The Boston Section is organizing chapters into groups of similar technical interest areas to pool their resources for easier and better chapter collaboration in planning the chapter events.

If you have interest in volunteering for a chapter leadership position or are interested in learning more about what these volunteer positions may entail, please send an email to Karen Safina in the IEEE Boston Section office at, ieeebostonsection@gmail.com

Aakash Deliwala, Chair, IEEE Boston Consumer Technology Chapter

Engineering in Medicine & Biology Society Call for Volunteers!

We are currently looking for volunteers who would be interested in pushing forward the mission of the Engineering in Medicine & Biology Society (EMBS), Boston Chapter. The EMBS - Boston Chapter was recently approved in July 2021, and we're looking to make a significant impact in the area of Biomedicine, Bioengineering, and Biotechnology in the region. The chapter is looking for volunteers to help organize chapter meetings and help meet the needs of the local EMBS members.

The Boston Section is organizing chapters into groups of similar technical interest areas to pool their resources for easier and better chapter collaboration in planning the chapter events.

If you have interest in volunteering for a chapter leadership position or are interested in learning more about what these volunteer positions may entail, please send an email to Karen Safina in the IEEE Boston Section office at, ieeebostonsection@gmail.com.

Aseem Singh, Marie Tupaj, Co-Chairs, Boston EMBS Chapter

IEEE Video Series

A collaborative discussion panel featuring esteemed members from the Institute of Electrical and Electronics Engineers has convened in 2021 to produce educational video presentations that embrace IEEE's mission of advancing technology for humanity.

Among the programs they've produced include "Electric Vehicles: Fun Saving Our Planet", "Greener Power For More Electric Vehicles", "Overcoming Nuclear Fears To Achieve Net Zero CO2 By 2050" and "Achieving a Net Zero Carbon Future", and "Green Energy's Economic Progress". Projects currently in production include the expansive topic of futurology, with a focus on increasing the efficiency and transformation of aging electrical power generating stations and infrastructure to accommodate nuclear power; reviewing the viability of alternative energy (such as geothermal, wind and solar); and focusing on 'cleaner' fossil fuels that are more environmentally-friendly to slow the rate of climate change.

These shows are produced and directed by Lennart E.

Long, IEEE Senior Life Member from the Executive Committee and Past Chair of the Boston Section; Dr. Paul H Carr, BS, MS, MIT; PhD Brandeis U, IEEE Life Fellow; Dr. Ted Kochanski, SB (MIT), Ph.D (U.Texas, Austin), IEEE Global Education for Microelectronic Systems and former Boston Section Chair; and Dr. Ken Laker, B.E. (Manhattan College), M.S. and Ph.D. (New York University), IEEE Life Fellow and past President of IEEE.

The panel is moderated by five-time Boston/New England Emmy Award-winner and television personality and star of "The Folklorist," John Horrigan.

These video programs with presentations and discussions can be accessed at the IEEE Boston Section video portal at <https://vimeo.com/user18608275>.

We are looking for any IEEE members that would like to appear on the program in the role of presenter or discussion expert. Simply reach out to Robert Alongi at the Boston Section at, ieeebostonsection@gmail.com.

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.



MIT URTC 2021 10/8 - 10/10, 2021

UNDERGRADUATE RESEARCH TECHNOLOGY CONFERENCE

IN PARTNERSHIP WITH



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technology?
Looking to share
your work with
peers and
professionals?**

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URTC 2021!**

PAPERS

EARLY SUBMISSION DEADLINE	JULY 11, 2021
EARLY NOTIFICATION OF ACCEPTANCE	JULY 31, 2021
REGULAR SUBMISSION DEADLINE	JULY 31, 2021
REGULAR NOTIFICATION OF ACCEPTANCE	AUGUST 21, 2021

POSTERS & LIGHTNING TALKS

SUBMISSION DEADLINE	AUGUST 29, 2021
NOTIFICATION OF ACCEPTANCE	SEPTEMBER 5, 2021

CONFERENCE DATES

10/8 - 10/10, 2021

Technical Tracks

1. **Biological and Biomedical Engineering (BioEECS)**
2. **Circuits, Materials, and Nanotechnologies**
3. **Computer Systems, Theoretical Computer Science and Mathematics**
4. **Machine Learning / Artificial Intelligence (AI)**
5. **Robotics and Controls**
6. **Security and Communications**
7. **Space Application and Technologies**
8. **Innovation Research**

Submission Site:

<https://cmt3.research.microsoft.com/URTC2021>

Entrepreneurs' Network – 7:00PM, Tuesday, October 5

Can Your Startup Compete in the Market?

Location: Webinar

Registration: <https://boston-enet.org/event-4411615>**ENET Member - Free****General Public – \$10.00**

Competition is a fact of life - it isn't good or bad, it just is. For an entrepreneur, trying to succeed with a shiny new startup, competition can be a driving force for success, or the makings of an existential crisis. Success as an entrepreneur requires an understanding of the target market and the competitive landscape within that market. And the market can be wildly dynamic, with competing companies (and their products/services) emerging and departing. The market might be local, regional, national, or global, and the competition can include players from other startups to multinational corporations. Even when launching a completely new product for a new market, there are competitors. For example: whatever did people do before your start-up came along?

How can your startup compete in the market? Determining what is the market you're competing in is good to know, as is a thorough understanding of what other company offerings you would have to displace to succeed. Is the market highly saturated? Is it ready for a massive (or even minor) disruption? How will you make money (a key - not to be underestimated - aspect of operating a business)? Who will be buying what you're selling? Please join our panel of experts on these topics, and more, to learn how to make your startup competitive, and to increase the odds of success.

Agenda:

6:00 – 7:00 PM – Networking on Zoom

7:00 – 7:10 PM – ENET Chairperson's announcements

7:10 – 7:25 PM – eMinute Pitch - Up to 3 Startup companies' presentations

7:25 – 8:10 PM – expert speakers on the night's topic

8:10 – 8:30 PM – Moderator and Audience Q & A with the speakers

8:30 – 9:00 PM – Networking on Zoom (meet with speakers & moderator)

(all times are USA Eastern Daylight time)

Speakers:



Karen Utgoff, Principal, Karen Lauter Utgoff Consulting; UMass Amherst I-Corps Site Director

Karen Utgoff has worked with technology startups, small businesses, and non-profit research organizations on market-related challenges and research commercialization opportunities for over 20 years. Her expertise includes market-oriented business strategy, business planning, entrepreneurial/start-up marketing, strategic marketing, startup funding plans, and new venture development. She has helped startups and non-profit research organizations raise over \$7 million in investment and grant funding to support venture development and innovation programs.

Karen's experience includes customer discovery and business model development for concept and early prototype stage startups/companies as well as going concerns. She is a long-time volunteer for MassChallenge and the Cleantech Open Northeast. She earned her MBA from The Wharton School at The University of Pennsylvania.

Currently Karen leads Venture Development at the UMass Amherst Institute for Applied Life Sciences (IALS) and the campus I-Corps (Innovation Corps) Site. She also serves as an adjunct instructor in the New England Regional Innovation Node Spark Program @ MIT and the NSF National I-Corps Teams Program. <https://www.linkedin.com/in/karenutgoff/>



Alicia Williams, Founder & Creative Director, Aliste Marketing

Alicia Williams is the Founder & Creative Director of Aliste Marketing, a boutique marketing agency. Alicia helps clients' transformations from unseasoned startups into unfettered successes.

Her impressive personal accomplishments and passion for helping fellow entrepreneurs realize their own

dreams have garnered her numerous accolades, including the 2016 Outstanding Women of Family Business award, recognition as one of Worcester Business Journal's 40 Under Forty, and the honor of being the Spotlight Entrepreneur for Capital One Spark.

Shortly after graduating in 2008, Alicia launched her new venture from her laundry room during an economic recession when entrepreneurship was highly discouraged. Alicia refused to believe that her creativity and passion were limited to the 9-5 corporate realm, and more than a decade later, she continues to break the status quo as an industry leader.

Alicia's gift for out-of-the-box creative strategies with real metrics to show ROI have won her a dedicated client base as well as the attention of branding giants like Microsoft and Staples, both of whom have invited Alicia to present her take on marketing strategy. She's also a Certified Women Owned Business, Certified Green Business, HubSpot Partner Certified, and Constant Contact Certified Authorized Local Expert. As a valued media commentator and published author, Alicia has been featured on USA Weekly, Authority Magazine, Thrive Global, CMS Wire, and CBS Radio The Sports Hub.

<https://www.linkedin.com/in/aliste/>

Sibylle Hauser, Strategic Advisor – Life Science, Richtr Financial Studio

Sibylle Hauser's international professional career spans over 25 years in global Pharma incl. Boehringer Mannheim/Roche for 9 years, emerging Biotech and global contract manufacturing at Vetter Pharma with a successful track

record in corporate business development, licensing, fundraising, strategic planning and international marketing including a US biopharmaceutical product launch. In 2003 she moved from Germany to San Diego, CA and is well connected within the Life Science Community today.

As Strategic Advisor – Life Science at Richtr Financial Studio she supports innovative founders and companies in the life science space. One of the expert niches is "Positioning for Capital".

In 2014 she joined the SOCAL Chapter of Women in Bio and started a local female founders' group in 2018. As national Chair of Women in Bio-Entrepreneur Cen-

ter with 90+ associated female founders in the life sciences across the US she supports the organizations mission to "move the needle" in funding \$\$ for female (Co-)founders in the life sciences.

Since 2020 she serves as member of BIOCOM Capital Committee as well as the Scientific Investment Advisory Committee at the Gates Center for Regenerative Medicine, University of Colorado. She also serves on the Member Advisory Board at CrowdSmart, a SaaS investment diligence platform using AI and collective intelligence to improve prediction science of investment success while reducing bias.

Sibylle holds a graduate degree in business administration from Friedrich-Alexander-University in Erlangen-Nuremberg, Germany.

<https://www.linkedin.com/in/sibyllehauser/>



Roger Frechette, Life Science Business Executive / Entrepreneur / Mentor

My daily purpose is to exercise an innate drive to transform ideas and projects into life-changing commercial assets. In the life science business, this is the long game, requiring boundless energy and creativity, coupled with knowledge, experience, and patience. Consulting services include advisory and fractional executive engagements in operations, strategic planning and business development.

In my work, I leverage an extensive global network and insights derived from >20 years of experience in business development, calibrated with an extensive science background. My career has encompassed success as a business executive, project/alliance manager and entrepreneur, and also as a scientist, including leadership of discovery/preclinical development teams resulting in a new drug candidate – NDAs for omadacycline submitted by Paratek in early 2018.

<https://www.linkedin.com/in/rogerfrechette/>

Entrepreneurs' Network – 7:00PM, Tuesday, October 19

BUILD A BETTER BUSINESS MODEL FOR YOUR STARTUP

Details Coming Soon!

See the ENET website: boston-enet.org

Guest Article

Knowing your Competition and Establishing your Market Niche to set your Startup Apart

By Robert A. Adelson - Chair Emeritus of Boston Entrepreneurs' Network



For the founder and entrepreneur launching a startup company, it is important understand the market for your products or services, and to understand your competition when you enter that market.

When you are seeking angel or VC investment or trying to recruit co-founders and first employees or contractors, all will be

looking for your competitive analysis and how from your knowledge of the market, you can set your startup apart, including the following:

- Knowledge and mastery of the place your company's products or services fill in your target marketplace;
- What market niche you intend to enter and can dominate
- Your plan for how your company will penetrate the target
- Identity of your chief competitors, both direct competitors and indirect competitors that could be substitutes for your product or service
- The value proposition that you offer that will enable you to overcome the normal tendency for no change
- Strengths of the competition and your plan to overcome those
- Weakness of your competitors and your plan to avoid those same weaknesses
- Barriers to entry you would seek to create to surmount new competition once you gain market traction

If your product fills a need, you are not alone:

There will be competition

Too often, entrepreneurs believe their product or service is unique, and that it is just intuitive to them, that if they provide that product or service, customers will flock to them, the product will be profitable and their company a great success.

Under those circumstances, a prospective investor will invariably ask – “Well, what about the competition?” To which many such entrepreneurs often reply, “Best of all. There is no competition”. That is always the wrong answer to potential investors.

Investors always assume, that if this is truly a good market, with a real need for your product or services, there will be competition. If you don't understand and recog-

nize who your competition is, that is a bad sign to the investors, that you do not understand your market. Thus, it is incumbent on the entrepreneur to understand that competition and be in position to provide a compelling competitive analysis.

On the other hand, if there truly is no competition, then yours may be what investors like to call - a product or service in search of a need. That conclusion is not good either. When an investor feels there truly is no competition, that no one is now satisfying this market need, the investor is likely to then also conclude this is just not a market worth entering and not a business opportunity worthy of investment.

Knowledge of your marketplace and Niche you fill

Before you launch your company, you want to do your homework. You want to access all public information available on the internet and elsewhere about your market and current industry trends, The more you learn, you want to keep your eyes open toward profitability, to identify a smaller segment, a niche in the overall market where you can develop a competitive edge.

As part of this due diligence process, you will want to visit websites of potential competitors, sample their products and services, make inquiries to customers and suppliers, to fully assess how your own company's market entry would impact the market.

A competitive analysis is incredibly useful because it reveals your company's true position within the market. It shows you what your competitors are doing and demonstrates to potential investors how you are unique from the competition. After completing a competitive analysis, you will have a better understanding of your competitive advantage and be able to foresee any potential barriers your startup has to enter the market.

At the same time, your competition can be one of your greatest sources of new ideas when starting a business. There is no need to reinvent the wheel. The successful companies have figured out what works best through years of testing and copying what works.

Finally, in seeking out your market niche, don't focus solely on displacing known alternatives. Often your big-

gest competitor is “none of the above” - that is, customers doing nothing...sticking with the status quo. Thus, it is just as important to tailor your messaging to address the status quo. To get the customer to move, your value proposition needs to be sharpened and compelling. Fear, uncertainty and doubt need to be overcome by detailed ROI calculations, part of a sharp focused pitch, as you focus on and try to “own” your niche of the market.

Identification and Analysis of your Competition

But beyond using the competition to aid you in the determination of your product differentiation, value proposition and market niche, knowing your competition is critical to your successful launch, to gaining the traction you will need if your company is to be a success.

You need to be aware of the rival's strengths and weaknesses. You need to find out their costs structure, management, and organizational systems, mission and objectives, size, production methods, and sales performance.

Your competitor's analysis should incorporate the pricing history of the competitor's products and the changes that caused a modification in pricing strategies. Also, when do your competitors perform their promotional activities?

And while you are doing that you need to take a broad view of who are your competitors. How are their products, services and/or applications different and similar to yours? This will help you understand your point of difference or unique selling point, that is what makes you better than your competitors.

In making this analysis, you cannot limit yourself to just direct competitors. You need to take into account others who are well positioned to potentially enter your market. In an excerpt from her book “How to Start a Life Science Company”, Founder and scientist Leah Cannon, Ph.D. gives the following example of that point of in-direct competition you need to take into account:

Your life sciences startup is developing a new therapeutic for lymphoma, but what about companies developing therapeutics for other cancers? Could any of these also be used to treat lymphoma? Are there any companies creating medical devices to either help treat or diagnose lymphoma? What about companies developing medical devices or diagnostics for other cancers? Does anyone have a cancer diagnosis platform? These are not direct competitors today, but might become such in the near future.

<https://medium.com/life-science-startups/how-to-start-a-life-science-company-2401f2889339>

See also: <https://www.amazon.com/dp/0648142329>

As a startup, you want to know who else is providing the product or service that you plan to offer in the market, and who might potentially provide it. You want to be able to give the investor a sense of confidence in your market know that your startup knows and can surmount its likely competition. Investors don't need to see every single potential competitor, at least in your initial pitch, but they do need to know that you know about every competitor and you know how you are different and why you are better. It will also help you work out appropriate pricing for your application and put a dollar value on your company when you are ready to look for investment.

Barriers to Entry and Sustaining your Market Position.

Competitors will consistently try to offer better customer service, product quality and marketing. In healthy markets, buyers will demand the best solutions for their specific needs.

To maintain your market position, once you have established your niche, it is best to build a barrier to entry based on customer loyalty and consistent delivery of a quality product or service. Serial Entrepreneur Firas Kittaneh, writing in Entrepreneur magazine, quotes Dharmesh Shah, HubSpot co-founder and CTO, as follows: “You are often your biggest competitor. You should not completely ignore your competition, but the biggest battle happens inside of the four walls of your startup's office. Startups come down to pure execution of a strategy on a daily basis and maintaining the faith for the long haul. Most startups don't lose to competition, but because they lose the will to fight.”

<https://www.entrepreneur.com/article/249541#:~:text=Dharmesh%20Shah%2C%20co%2Dfounder%20and,are%20often%20your%20biggest%20competitor.&text=Most%20startups%20don't%20lose,Competition%20is%20good>. See also:

<https://pdrwebsolutions.com/ethically-steal-from-your-competitors/>

Instead of focusing your energy on outdoing the competition, invest in becoming a customer-centric organization. This way, you will boost buyer loyalty and easily defend against aggressive suppliers or vendors intent on stealing your clients. At the end of the day, it is your users -- not your competitor -- who have the power to make or break your business.

Robert A. Adelson, Esq. is principal of the firm Adelson & Associates, LLC in Boston, MA. He has over 20 years' experience in business, tax and executive employment law, and represents small companies, entrepreneurs, executives and consultants. He can be reached at rob@attorneyadelson.com

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Control Systems Society - Schenectady, Boston and Cleveland Chapters – 12:00PM, Thursday, October 7

Control Co-Design: Toward Comprehensive and Holistic Treatment of Physical and Control System Design

Location: This event is virtual

Please visit the event page to attend virtually
<https://events.vtools.ieee.org/m/282642>

In the development of actively controlled engineering systems, physical system (plant) design decisions influence how plant control systems should be designed to improve performance, and control design decisions affect optimal plant design decisions. This characteristic is known as bi-directional design coupling. Conventional sequential design strategies used in practice (i.e., plant design followed by control design) do not fully capitalize upon this coupling. Mechatronics design philosophy is holistic in nature, but established methods lack the ability to articulate and exploit plant-control design coupling in a comprehensive way. Control co-design (CCD) methods formalize treatment of coupling to achieve system-optimal performance. CCD has been applied to niche applications, such as control-structure interaction, for some time. A resurgence in CCD research, however, has produced more comprehensive theoretical foundations and increasingly practicable CCD methods. Specifically, these methods support rigorous treatment of physical system design elements, provide tools for balancing plant and control design complexity, and enable the discovery of non-obvious superior design solutions.

Current CCD research goals include progress toward theory and methods that balance deeper treatment of both physical and control system design, while holistically managing the interface between these design domains. Great progress has been made utilizing open-loop optimal control methods to support increasingly realistic treatment of physical system design, but has

left a gap in accounting for the information-based constraints of implementable feedback control systems. Recent efforts to address these open challenges will be discussed after reviewing key CCD concepts and research milestones. Finally, opportunities for coordinated CCD research community efforts to more fully realize the potential of comprehensive and balanced CCD strategies will be explored.

James Allison is an associate professor and the Jerry S. Dobrovolsky Faculty Scholar at UIUC. He is a faculty member of the Industrial and Enterprise Systems Engineering and Aerospace Engineering departments, and is the director of the UIUC Engineering System Design Laboratory. He holds MS and Ph.D. degrees in Mechanical Engineering, and an MS in Industrial and Operations Engineering, all from the University of Michigan. He has co-authored over 125 research publications and is a recipient of the NSF CAREER Award, the ASME Design Automation Young Investigator Award, ASME papers of distinction, and several teaching, mentoring, and advising awards. His work focuses on the creation and analysis of novel quantitative design methods for engineering systems, primarily CCD optimization. His investigations span a wide range of application domains, including wind/water energy systems, spacecraft control, aircraft cooling systems, intelligent structures, vibration isolation and control, multi-scale scramjet design optimization, automotive systems, power electronics, and complex fluid systems.

For more information and registration:
<https://events.vtools.ieee.org/m/282642>

Geoscience & Remote Sensing Society – 6:00PM, Wednesday, October 13

Simulating the Performance of Ocean-Observing Imaging Payloads for Nanosatellites

Speaker: Candence Brea Payne

Location: Zoom



Earth's oceans are the largest defining feature of our planet and arguably an invaluable resource. Consequences of climate change threaten to have substantial and irreversible negative effects on our oceans, making it crucial to quickly understand and quantify behavioral changes resulting from increased human impact.

Near-continuous, large-scale monitoring from space is revolutionizing methods for monitoring and forecasting ocean behavior. Nanosatellite platforms offer a potential solution for large-scale deployment of ocean-sensing instruments that provide detailed measurements of critical characteristics. Monitoring these key features provides valuable insight to behavioral changes within the context of our shifting climate.

Constellations of nanosatellites that target key ocean characteristics could provide continuous ocean monitoring with high spatiotemporal resolution. Compared with current state-of-the-art ocean-observing spacecraft, such as NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) with a repeat cycle of 16 days, nanosatellites in Low-Earth Orbit (LEO) can observe the same ground scene roughly once every five days. While spacecraft such as NASA's Geostationary Operational Environmental Satellite (GOES) achieves high temporal resolution, imaging the same scene every 30 seconds to 15 minutes depending on target region size, they are limited to imaging a single ground scene due to their stationary placement. Constellations of nanosatellites offer opportunities for measurement improvement including reducing revisit rates down from several days to hours, as well as increasing surface coverage through placement in orbital planes of varying inclinations.

Informative, emergent information such as sea surface salinity, front location, and fauna concentrations (namely phytoplankton) are derived from measuring key characteristics such as ocean color and Sea Surface Temperature (SST). Existing nanosatellite constellations such as Planet's Flock-3p, composed of 88 3U (10 x 10 x 30 cm) CubeSats, provide daily coverage of Earth's

land mass; however, they do not yet target oceans and coastal regions, nor tailor their imaging bands for these specific measurement needs. We present a concise set of ocean measurement band centers for an imaging payload targeting ocean color, a key behavioral feature. We assume narrow-band (10 - 15 nm bandwidth) ocean color measurements (390 nm - 865 nm) and constrain the payload to within the volume of a U-class (3U / 6U / 12U) nanosatellite located in LEO (~ 450 km altitude). A radiometric link approach is used to develop a tool that compares the performance of multiple different available Commercial Off-the-Shelf (COTS) detectors, as well as different detector and optical front-end combinations. As detector sensitivity performance is driven primarily by aperture size and focal length, the imaging payload is assumed to have a scalable aperture (e.g. Diameter, focal length) and tunable sensor parameters (e.g., pixel pitch, number of pixels, sensor format). We simulate the sensor's performance primarily by scaling the aperture from 0.5 cm to 20 cm diameter, suitable for 0.5U - 12U CubeSat volumes. Simulation results determine key "cut-off" regions where collected data no longer achieve the desired measured sensitivity of the target feature. A discussion of the radiometric approach, including definition of the measurement and detector parameter trade-space, is provided, along with preliminary results of the simulated performance.

Cadence Payne is a 4th year PhD student in the department of Aeronautics and Astronautics in the Space Telecommunications, Astronomy, and Radiation Laboratory advised by Dr. Kerri Cahoy. Her research at MIT focuses on technology development for small, Earth-observing spacecraft called CubeSats. She is currently the lead Systems Engineer for the Auroral Emission Radio Observer (AERO), a 3U CubeSat that uses a 4-meter vector sensor antenna to probe low-frequency emission from the Earth's aurora. She is also supporting AEROS, a joint mission with MIT Portugal that collects data for climate and weather monitoring via ocean observations. She graduated from Morehead State University in 2017 with a BS in Space Science and a minor in astronomy.

Register: <https://events.vtools.ieee.org/m/265365>

Power & Energy Society - 6:00PM, Tuesday, October 19
 IEEE PES BOSTON TECHNICAL MEETING & AWARDS NIGHT

Planning for Resilience: The Texas Example

Speaker: Damir Novosel, President and Founder, Quanta Technology

Location: Online only via MS Teams; no in-person gathering



Meeting Agenda:

6:00 PM – Welcome and Opening Remarks - Souresh Mukherjee, Chair, IEEE PES Boston Chapter

6:15 PM – 2020 Awards Presentation

- Outstanding Engineer Award
- Outstanding Young Engineer Award
- Outstanding Volunteer Award

6:20 PM – Women in Power (WiP) - Marissa Petersile, WiP Boston Chair

6:30 PM – Keynote Speaker - Damir Novosel, President and Founder, Quanta Technology - “Planning for Resilience: The Texas Example”

7:45 PM – Raffle, Note of Thanks & Wrap-up

The record low temperatures and severe winter storms observed in Texas in the winter of 2021 have caused massive outages, leaving 4.4 million homes without power for long durations. It has further emphasized importance of improving resilience of the Texas electric grid as well as the overall North American grid, particularly under the evolving impacts of climate change. As the modernized and resilient electrical grid is also an enabler to increase penetration of renewable resources and electrification, it is important to review the main causes of the issues in Texas and how it could be avoided in the future. This presentation will also address how an industry-wide holistic framework for resilience planning and investment prioritization is strongly

needed to both mitigate and adapt to the evolving impacts on the electric grid.

Damir Novosel is president and founder of Quanta Technology, a subsidiary of Quanta Services, a Fortune 250 company. Previously, he was vice president of ABB Automation Products and president of KEMA T&D US. Dr. Novosel is also an adjunct professor of Electrical Engineering at North Carolina State University. Damir was elected to National Academy of Engineers in 2014. He served as president of the IEEE Power and Energy Society and VP of Technical Activities. He is presently chairing IEEE Industry Technical Support Leadership Committee and is a member of the IEEE Standards Association Standards Board. He is a member of the CIGRE US National Committee and received the CIGRE Attwood Associate and the Distinguished Member awards. Damir holds 17 US and international patents, published over 200 articles and reports, and contributed to 6 books. Damir is an IEEE Fellow since 2003, holds PhD, MSc, and BSc degrees in electrical engineering from Mississippi State University (where he was a Fulbright scholar), the University of Zagreb, Croatia, and the University of Tuzla, Bosnia, and Herzegovina, respectively. Dr. Novosel was selected as Mississippi State University Distinguished Engineering Fellow in 2015.

Free and Open to the Public; RSVP is appreciated
 Visit the IEEE PES Boston Chapter website for further details - <http://www.ieeepestexas.org/>

Antennas and Propagation Society – 1:30PM, Friday, October 22

Antennas, Arrays & Calibration: Beam Forming and Beam Steering

Speaker: Prof. Dr. Levent Sevgi - IEEE APS Distinguished Lecturer – IEEE Fellow

Location: U-Mass Lowell, Southwick 240
(virtual options will also be made available, check back later on vtools for details)

Register: <https://events.vtools.ieee.org/m/283825>



The antenna is an electromagnetic (EM) radiator that emits radio frequency power. In other words, it is a transducer that converts voltage [V] to the electric field [V/m] (or vice versa). This IEEE AP-S DL talk will focus on electromagnetic radiators, antennas, antenna arrays and calibration. First, antenna as a trans-

ducer will be discussed and its circuit and electromagnetic models will be reviewed. Fundamental antenna terms and concepts will be summarized. Then, differences between communication and EMC antennas will be given. Finally, antenna calibration will be explained. In the second part, formation of antenna arrays will be presented and their beam forming and beam steering capabilities will be shown via a simple, MATLAB-based ARRAY virtual tool. Any 2D array (i.e., linear, planar, circular, etc.) may be designed by the user and its 2D and 3D radiation characteristics can be investigated using this tool. Beam forming capabilities for different locations, number of radiators, as well as for operating frequencies can be visualized. The package may be used as an educational tool in many undergraduate antenna lectures. It may also be used to validate and verify the finite-difference time-domain (FDTD) and method of moments (MoM) packages in public domain or, for example, the ones supplied in [3]. Moreover, the user may improve package and add novel features by using the supplied source codes.

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Prof. Dr. Levent Sevgi is a Fellow of the IEEE. He received his B. Eng., M. Eng., and PhD degrees in Electronic Engineering from Istanbul Technical University (ITU) in 1982, 1984 and 1990, respectively. In 1987, while working on his PhD, he was awarded a fellowship that allowed him to work with Prof. L. B. Felsen at Weber Research Institute / New York Polytechnic University York for two years. His work at the Polytechnic concerned the propagation phenomena in non-homogeneous open and closed waveguides.

He was with Istanbul Technical University (1991–1998), TUBITAK-MRC, Information Technologies Research Institute (1999–2000), Weber Research Institute / NY Polytechnic University (1988–1990), Scientific Research Group of Raytheon Systems Canada (1998 – 1999), Center for Defense Studies, ITUV-SAM (1993 –1998 and 2000–2002) and with University of Massachusetts, Lowell (UML) MA/USA as a full-time faculty (2012 – 2013) and with DOĞUS University (2001-2014).

Since Sep 2014, he has been with Istanbul OKAN University.

He has been an IEEE AP-S Distinguished Lecturer for the term 2020-2022. He served one-term in the IEEE AP-S AdCom (2013-2015) and one-term and as a member of IEEE AP-S Field Award Committee (2018-2019). He has been the writer/editor of the "Testing ourselves" Column in the IEEE AP Magazine (since Feb 2007), a member of the IEEE AP-S Education Committee (since 2006), He has also served in several editorial boards (EB) of other prestigious journals / magazines, such as the IEEE AP Magazine (since 2007), Wiley's International Journal of RFMiCAE (2002-2018), and the IEEE Access (2017-2019 and 2020 - 2022). He is the founding chair of the EMC TURKIYE International Conferences (www.emcturkiye.org).

He has been involved with complex electromagnetic problems and complex communication and radar systems for nearly three decades. His research study has focused on propagation in complex environments; electromagnetic scattering and diffraction; RCS prediction and reduction; EMC/EMI modelling, simulation, tests and measurements; multi-sensor integrated wide area surveillance systems; surface wave HF radars; analytical and numerical methods in electromagnetics; FDTD, TLM, FEM, SSPE, and MoM techniques and their applications; bio-electromagnetics. He is also interested in novel approaches in engineering education, teaching electromagnetics via virtual tools. He also teaches popular science lectures such as Science, Technology and Society.

He has given dozens of seminars, invited/keynote talks, organized/presented several tutorials, training sessions and short courses from half-day to three-days in universities/institutes all around the World. He has published more than a dozen special issues / sections in many journals as a guest editor and/or a co-guest editor.

His recent keynote talks are: (i) From Engineering Electromagnetics towards Electromagnetic Engineering: Teaching, Training Next Generations in MMS'2018 Mediterranean Microwave Symposium, Istanbul / Turkey, and in EuCAP 2019 European Conference on Antennas and Propagation, Krakow / Poland, (ii) Radiowave Propagation Modeling and Simulation in APCAP 2019 Asia-Pacific Conference on Antennas and Propagation, Incheon / S. Korea, and (iii) From Design to Market: EMC Engineering in InCAP 2018 Indian Conference on Antennas and Propagation, Hyderabad / India.

He has published many books/book chapters in English and Turkish, over 180 journal/magazine papers/tutorials and attended nearly 100 international conferences/symposiums. His three books Complex Electromagnetic Problems and Numerical Simulation Approaches, Electromagnetic Modeling and Simulation and Radiowave Propagation and Parabolic Equation Modeling were published by the IEEE Press - WILEY in 2003, 2014, and 2017, respectively. His fourth and fifth books, A Practical Guide to EMC Engineering (Sep 2017) and Diffraction Modeling and Simulation with MATLAB (Feb 2021) were published by ARTECH HOUSE. His h-index is 35, with a record of more than 4100 citations (source: Google Scholar, July 2021).

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Nuclear & Plasma Sciences and Social Implications of Technology Societies (co-sponsored by BU IEEE-HKN) – 7:00PM, Wednesday, October 27

Research and teaching “Plasma Green Energy Systems and Technologies”

Location: Photonics Building, ECE Department, Boston University, via zoom meeting:
<https://bostonu.zoom.us/j/97311694515?>

Speaker: Professor Min-Chang Lee ECE Department, Boston University

Research and teaching “Plasma Green Energy Systems and Technologies” will be discussed. The addressed work is a portion of the integrated research and academic programs established at Boston University, including plasma photonics and nanotechnology, plasma medicine, spacecraft propulsion, solar and plasma fusion as green energy sources and technologies. Singled out for discussion is our research on electromagnetic wave-plasma interactions applicable to plasma fusion and solar powered microwave transmissions systems. These academic and research activities are highlighted in an IEEE paper entitled “Teaching and Research on PlasmaBased Green Technologies and Some Environmental Issues” by Min-Chang Lee, published in Proceedings of 2019 IEEE International Symposium on Technology and Society (ISTAS 2019), ISBN: 978-1-7281-5480-0.

Professor Min-Chang Lee has been teaching and conducting research in the Department of Electrical & Computer Engineering at Boston University since 1991. He has developed an integrated educational and research program at Boston University in plasma-based green technologies, including theoretical study, field experiments, and laboratory simulation experiments. Professor Lee is the current Chair of Nuclear and Plasma Science Society (NPSS), Chair of Society on Social Implications of Technology in IEEE Boston Section, and Faculty Advisor of BU IEEE-HKN.

Location: Photonics Building, ECE Department, Boston University, via zoom meeting:
<https://bostonu.zoom.us/j/97311694515?>

Overview of the Boston SSIT and NPSS Chapters

By Professor Min-Chang Lee, Department of Electrical and Computer Engineering, Boston University

In IEEE Boston Section, Professor Min-Chang Lee of Boston University (BU) currently serves as the Chair of Nuclear and Plasma Science Society (NPSS), and the Chair of Society on Social Implications of Technology. Because of this connection, the Boston University IEEE Student Chapter, known as BU IEEE advised by Professor Lee, has been maintaining a close tie with the IEEE Boston Section, especially, the NPSS and SSIT. The following are some academic and research programs, related to IEEE Boston NPSS and SSIT activities.

Two Green Energy and Technology courses have been recently developed by Professor Lee at Boston Univer-

sity entitled (1) “Plasma Green Energy Systems”, and (2) “Plasma Engineering and Technologies”, respectively. The first course deals with “Plasma properties, fundamentals of fusion energy, plasma confinement and heating, laser inertial fusion, fusion reactors and technology, solar powered microwave transmission systems, environmental and safety issues, societal implications of fusion and solar energy”. The prerequisite for this undergraduate course is “General Physics: Electromagnetism”. The second course teaches “fundamentals of plasma engineering and experiments as well as selected technologies including plasma photonics and nanotechnology, plasma medicine, spacecraft

propulsion, solar and controlled fusion technologies". This graduate course also has "General Physics: Electromagnetism" as its prerequisite.

The development of these two courses is based on the research programs conducted by Professor Lee and his research collaborators, including his former and current students and colleagues working at universities and national labs. In brief, the research involves theoretical and experimental investigation of electromagnetic wave injection and interactions with plasmas in laboratory and field experiments. These academic and research activities are highlighted in an IEEE paper entitled "Teaching and Research on Plasma-Based Green Technologies

and Some Environmental Issues" by Min-Chang Lee, published in Proceedings of 2019 IEEE International Symposium on Technology and Society (ISTAS 2019), ISBN: 978-1-7281-5480-0.

Serving on the IEEE Boston Section Professional Development & Education (PD & E) Committee, Professor Lee has offered a series of seminars on his research programs at Boston University in the past several years, as announced in IEEE Boston The Reflector. These seminars, together with the two, aforementioned, new courses at Boston University, will form the foundation for Professor Lee to develop future IEEE short courses on Green Energy Systems and Technologies.

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.

Electronic Reliability Tutorial Series -

Fall 2021 Edition - Electronic Reliability Series 3:



How to use Simulation and Modeling techniques to Improve Reliability

Three new, LIVE WEBINAR courses!

Times & Dates: Each session is two hours and starts at 11:00AM ET, Oct 7, 14, 21

Last Notice Before Course Begins, Please Register Now !!!

Electronics perform critical functions in every major industry vertical, whether in automotive, aerospace, consumer, medical or industrial segments. With the advent of newer technologies (both at the component and material levels), shrinkage of feature sizes, more stringent environments and sophisticated power requirements, electronics face increasing reliability risks. Supply chain trends have changed over the years from a vertically integrated model to a more geographically diverse supply chain. All these trends have increased reliability risks for companies. However, the cost of reliability assurance activities is often a fraction of the cost of failure, with compounding benefits from conducting these activities early in the design process.

This set of three tutorials will highlight how simulation and modeling can be used to optimize the design, gain assurance of passing qualification tests, and mitigate reliability issues early in the design process.

Session 1) Solder Alloys and Modeling Solder Reliability for Electronic Assemblies

Abstract: Solder provides the structural and electrical connection between a printed wiring board (PWB) and electrical components. Solder is the most common material used for assembling electronics. However, while most materials only experience elastic deformation during use, solder is also one of the few structural materials that is expected to also undergo significant inelastic deformation during its lifetime.

Both elastic and inelastic deformation damages solder,

causing the solder joints to fail, and consequentially the printed circuit assembly to fail. Predicting when the solder joint fails is critical when using solder in harsh use environments. These harsh environments have loads that can come in several forms (i.e., drop/shock, vibration, temperature cycling).

While vibration causes high cycle fatigue of solder, most solder fatigue failures in electronics are thermo-mechanically driven due to temperature cycling which causes significant deformations and stresses due to coefficient of thermal expansion (CTE) mismatches between the PWB and components. To predict solder failure, a damage model must be used that relates deformation of the solder to cycles to printed circuit board assembly failure.

In this tutorial, we will discuss material characterization of various solder alloys, predictive solder fatigue damage models using a physics-of-failure approach (PoF) for printed circuit board assemblies and how to develop damage models using simulation and testing.

Target audience: Engineers involved in the design, simulation and modeling, manufacturing and/or reliability of complex printed circuit board assemblies.

Benefits of attending

- Learn about different solder alloys and their failure mechanisms
- Characterizing solder material properties for simulation and modeling
- Methods for predicting reliability of electronic assemblies

Dr. Nathan Blattau, Distinguished Engineer at Ansys, has been involved in the simulation and reliability of electronic equipment for over twenty years. Prior to joining Ansys, Dr. Blattau was the Vice President and Chief Scientist of DfR Solutions. He holds two patents and has authored over 20 papers and has presented on a wide variety of reliability issues within the electronics industry. His specialties include best practices in design for reliability, robustness of Pb-free, failure analysis, accelerated test plan development, nonlinear finite element analysis, and solder joint reliability. Dr. Blattau holds a Ph.D. in Mechanical Engineering, an M.S. in Mechanical Engineering, and a B.S. in Civil Engineering from the University of Maryland

Session 2) Printed Circuit Board Level Reliability Testing – Leveraging Testing, Failure Analysis, and Simulation to Improve Reliability

Abstract: Board Level Reliability Testing (BLRT) encompasses a range of environmental stress tests that evaluate the robustness of a semiconductor package once soldered to a printed circuit board (PCB). Solder joint reliability under thermal and mechanical loads has been the focus of BLRT programs, though increasingly other failure modes have also been identified for testing under these programs. While standards from organizations, such as JEDEC JEP150 and AEC Q104 (for automotive), provide guidance for BLRT testing, there is often ambiguity around test coupon design, test conditions, test duration, and failure criteria. This ambiguity can cause confusion, delay, and dissatisfaction up and down the supply chain.

Additionally, finite element modeling (FEM) is often underutilized in BLRT programs. Proactive simulation can be a helpful tool to design for reliability and improve overall BLRT robustness. This tutorial will cover tips for designing an appropriate BLRT program. This includes best practices in BLRT risk assessment, test coupon design, and experimental procedures. It will also review how to leverage simulation to improve BLRT design and performance.

Target audience: Engineers involved in the design, prototyping, qualification, or end use of new electronic package designs

Benefits of attending

- Learn about common failure modes and mechanisms of electronic package assemblies experienced

and tested for in Printed Circuit Board Reliability Testing

- Learn about best practices for designing and conducting a board level reliability test program (BLRT)
- Learn how to use simulation to predict qualification test performance and reduce design cycles

Michael Blattau is a Senior Consulting Engineer at Ansys with expertise in mechanical packaging of electronics. Prior to working for Ansys he was a Design Engineering Supervisor for over a decade with an embedded computer manufacturer. Michael brings significant expertise in electronics enclosure design, PCB layout, and FEA simulation and has a M.S., Electronic Packaging.

Nick Kirsch (MBA, PMP) leads the modeling and simulation team for ANSYS Reliability Engineering Services. He has a 9-year background as a project manager and engineer working with US Government and private sector clients to improve product performance, resolve manufacturing problems, manage complex testing programs, and provide expert analysis and guidance at all stages of the product development process. At ANSYS, his work focuses on validating and improving the mechanical performance of electronics systems through testing and FEA reliability simulations.

Session 3) Simulation Techniques to Evaluate ELK Stress During Chip Attach Process and Mitigate Failures

Abstract: Electronic component manufacturing requires a technology to connect a silicon die to a circuit. A popular method to do so is to flip the die and solder it using C4 bumps to a substrate. The substrate is then finished into a component. A major concern for flip chip technology is the expansion of the silicon die (2-3 ppm/°C) and the substrate (8-15 ppm/°C). The stress in the extreme low-k layers (ELK Stress) causes a brittle fracture).

This workshop is a hands-on tutorial on completing a simulation for this failure mode. The tutorial includes example files, analysis settings and best-known methods. The workshop will rely on the use of Ansys Sherlock, Ansys Mechanical and Ansys SpaceClaim inside the Ansys Workbench environment.

Target audience: Flip chip component designers and integrators, assembly bumping designers and manufacturers, chip attach, packaging and assembly engineers

Benefits of attending

- How to prevent flip Chip packaging and assembly issues
- Prevent ELK cracking problems before design
- Using simulation techniques to drive design for manufacturing (DfM)

Dr. Sharon is a diverse industry expert with research specialties including mechanical reliability of electronic systems and characterization; embedded components failure analysis and particle beam accelerator mechanical fatigue; multidisciplinary reliability of complex electromechanical systems; characterization and modeling of material behavior; mechanical performance of flip chip packages; and Physics of Failure of electromechanical and MEMS systems. In addition to his responsibilities at ANSYS - DfR, Dr. Sharon serves as an adjunct faculty member at the University of Maryland.

Tyler Ferris is a Senior Consulting Engineer at Ansys and is an expert in the use of reliability physics, finite element analysis and hands-on laboratory failure analysis. Tyler has consulted with customers in the aero-

space, automotive, industrial controls, data center industries and more, to evaluate system, PCBA and component-level failure risks and mitigation strategies.

- Benefits of attending
- How to prevent flip Chip packaging and assembly issues
- Prevent ELK cracking problems before design
- Using simulation techniques to drive design for manufacturing (DfM)

**Decision (Run/Cancel) Date for this Course is
One week prior to session**

Each session is a separate registration

IEEE Members - \$80

Non-members - \$100

https://ieeeboston.org/event/electronic-reliability-tutorial-series-3/?instance_id=3120

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Python Applications for Digital Design and Signal Processing

Dates & Times: Thursday, November 11, 2021, videos released weekly 2x1.5 hours
Live Workshops: 7:00 - 8:00PM ET; Tuesdays, November 16, 23, 30, December 7

Speaker: Dan Boschen

Location: Zoom

This is a hands-on course combining pre-recorded lectures with live Q&A and workshop sessions in the popular and powerful open-source Python programming language.

New Format with Pre-Recorded Videos: The course format has been updated to release pre-recorded video lectures that students can watch on their own schedule, and an unlimited number of times, prior to live Q&A workshop sessions on Zoom with the instructor. The videos will also be available to the students for viewing for up to two months after the conclusion of the course.

Overview: 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 modelling and analysis for applications in signal processing and digital design verification. Students will be using the Anaconda distribution, which combines Python with the most popular data science applications, and 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.

During the course 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 with Matlab or Octave is not required, but the equivalent operations in Python using the NumPy package will be provided for those students that do currently use Matlab and/or Octave for signal processing applications.

Benefits of Attending / Goals of Course: Attendees will gain an overall appreciation of using Python and quickly get up to speed in best practice use of Python and related tools specific to modeling and simulation for signal processing analysis and design.

All set-up information for the installation of all tools will be provided before the start of class.

Topics / Schedule:

Pre-recorded lectures (3 hours each) will be distributed Friday prior to all Workshop dates. Workshop/ Q&A Sessions are 7pm-8pm on the dates listed below:

Tuesday, November 16

Topic 1: Intro to Jupyter Notebooks, the Spyder IDE and the course design examples. Core Python constructs.

Tuesday, November 23

Topic 2: Core Python constructs; iterators, functions, reading writing data files.

Tuesday, November 30

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

Tuesday, December 7

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

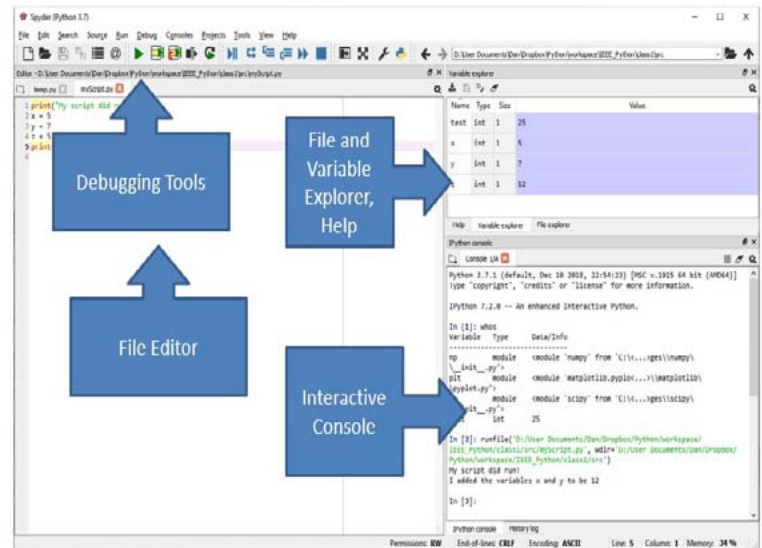
Speaker's Bio: Dan Boschen has a MS in Communications and Signal Processing from Northeastern University, with over 25 years of experience in system and hardware design for radio transceivers and modems. He has held various positions at Signal Technologies, MITRE, Airvana and Hittite Microwave designing and developing transceiver hardware from baseband to antenna for wireless communications systems and has taught courses on DSP to international audiences for over 15 years. Dan is a contributor to Signal Processing Stack Exchange <https://dsp.stackexchange.com/>, and 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 (<https://www.linkedin.com/in/dan-boschen/>)

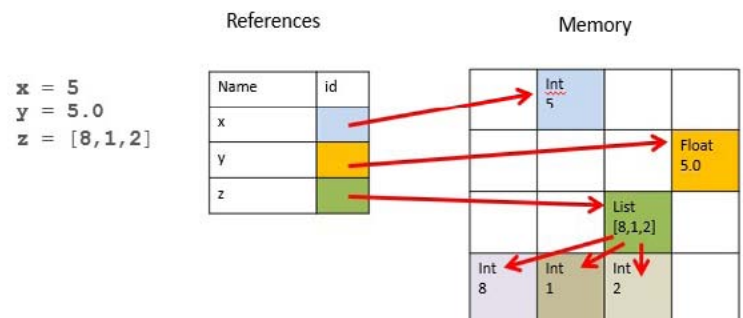
Decision (Run/Cancel) Date for this Course is Thursday, November 4, 2021

IEEE Members \$190
Non-members \$210

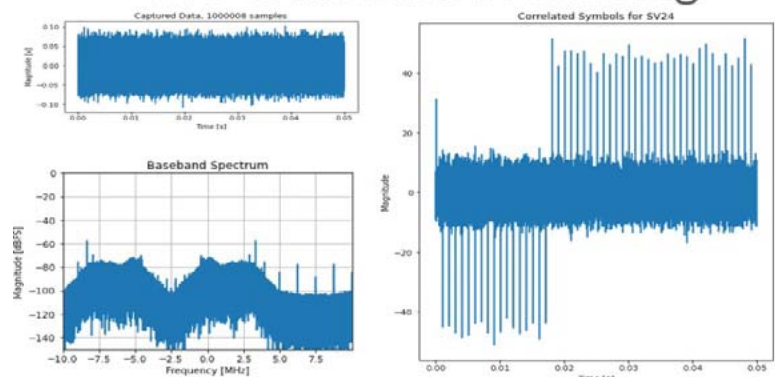
Spyder IDE



Mutable / Immutable



GPS Waveform Processing



https://ieeeboston.org/event/pythonapplications/?instance_id=3109

Digital Signal Processing (DSP) for Software Radio

Dates & Times: Thursday, October 7, 2021, Videos released weekly 2x1.5 hours
Live Workshops: 7:00 - 8:00PM ET; Tuesdays, October 12, 19, 26, November 2, 9

Speaker: Dan Boschen

Location: Zoom

*Last Notice Before
 Course Begins, Please
 Register Now !!!*

New Format Combining Live Workshops with Pre-recorded Video

This is a hands-on course providing pre-recorded lectures that students can watch on their own schedule and an unlimited number of times prior to live Q&A/Workshop sessions with the instructor. Ten 1.5 hour videos released 2 per week while the course is in session will be available for up to two months after the conclusion of the course.

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.

This course brings together core DSP concepts to address signal processing challenges encountered in radios and modems for modern wireless communications. Specific areas covered include carrier and timing recovery, equalization, automatic gain control, and 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 is covered in a separate IEEE Course routinely taught by Dan titled “Python Applications for Digital Design and Signal Processing”.

All set-up information for installation of all tools used 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, 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.

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

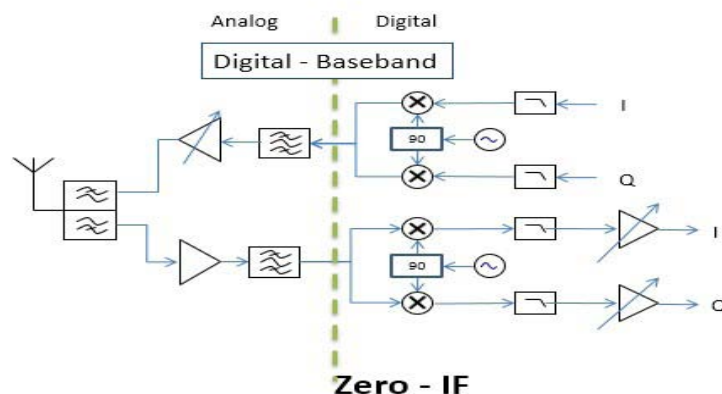
Class 5: RF Signal Impairments, Equalization and Compensation, Linear Feedback Shift Registers

Speaker's Bio:

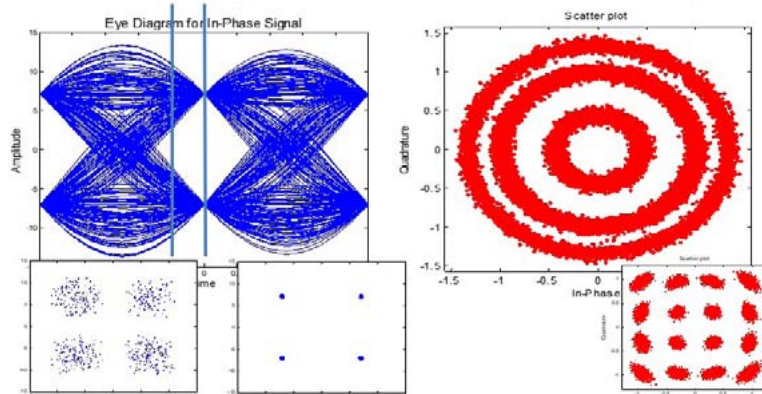
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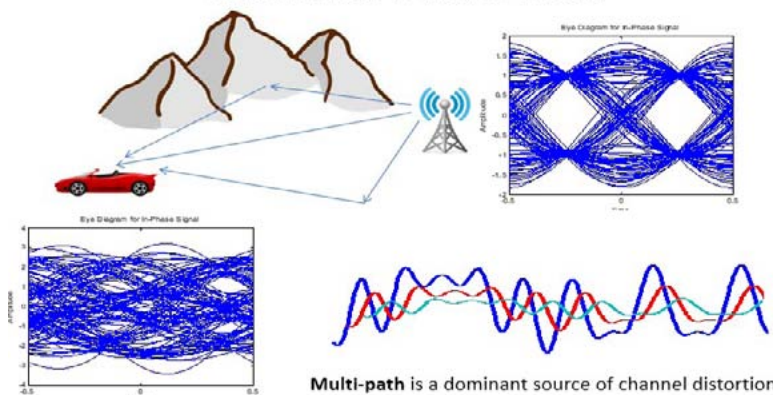
Radio Architectures



Timing and Carrier Recovery



Channel Distortion



**Decision (Run/Cancel) Date for this Course is
Thursday, September 30, 2021**

IEEE Members	\$190
Non-members	\$210

https://ieeeboston.org/event/dpswradio/?instance_id=3098

CALL FOR PAPERS

2022 IEEE International Symposium on Phased Array Systems and Technology

Revolutionary Developments in Phased Arrays



11–14 October 2022

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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 present a unique opportunity for members of the international community to interact with colleagues in the field of Phased Array Systems and Technology.

Suggested Topics

- Array Design
- Array Measurements
- Beamforming & Calibration
- T/R Modules
- Radar Systems
- Communications Arrays
- Metamaterial Phased Arrays
- Array Signal Processing
- mmWave and Terahertz
- Wideband Arrays
- Dual Polarized Arrays
- Weather Radar Arrays
- Automotive
- MIMO

See webpage for more details

Special Session Proposals

Please provide suggestions for special sessions to the Technical Program Chair at info@array2022.org

Publication Information

All paper submissions must be in IEEE dual-column format and must be 2 pages (minimum) to 8 pages (maximum) in length including figures, and must be submitted in PDF format via the symposium website (www.array2022.org/call-for-papers). Additional instructions are on the website. All papers will be peer reviewed. Authors of papers presented at ARRAY 2022 conference will be invited to submit an expanded version to the IEEE T-MTT Mini-Special Issue.

Important Dates

- Full paper submission (2-8 pages including figures) 12 March 2022
- Author notification 30 April 2022
- Conference registration deadline for accepted authors 01 Sept 2022

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Software Development for Medical Device Manufacturers

Web-based Course with live Instructor!

(11 hours of instructions!)

Times & Dates: 9AM - 4PM ET, Tuesday & Wednesday, November 9 & 10

Speaker: Steve Rakitin, Software Quality Consulting

Course Format: Live Webinar

COURSE SUMMARY: Developing software in compliance with the FDA Design Control regulation, changing FDA guidance documents and latest international standards is challenging. This intensive course provides practical solutions and suggestions for developing software in a manner that meets applicable FDA regulations, guidance documents and international standards, such as IEC-62304:2015. The focus is on interpreting Design Controls for software. Each section of the Design Controls regulation (820.30) is discussed from the perspective of software development. Discussions on key topics such as Software Requirements, Traceability, Design Reviews, Software Verification & Validation and Risk Management (including recently updated standards ISO-14971:2019 and EN-14971:2019) are included. Also discussed are FDA requirements for validation of software development tools and software used in Manufacturing and Quality Systems. Also discussed are recent FDA Guidance Documents on Cybersecurity, Mobile Apps, and Usability.

THIS COURSE IS INTENDED FOR: Software engineers, project managers, quality managers, software quality professionals, RA/QA staff, and anyone who needs to develop cost-effective processes and procedures that will enable their organizations to deliver high quality software-based medical devices that comply with FDA regulations and international standards. This course is also appropriate for people who are new to the medical device industry. Course notes, access to an extensive collection of reference documents and a training certificate are provided.

COURSE OUTLINE: This course will be presented with a live instructor using web-meeting software. The course content will be covered in 4 sessions as described below.

SESSION 1 – Regulatory Context

Duration ~3 hours with one 15 min break

This session will cover key regulatory requirements for medical device software in the US and EU.

Regulations and Guidance:

- FDA Medical Device Regulation (21 CFR Part 820 – specifically, design controls)
- EU Medical Device Regulation
- FDA Guidance Documents:
 - Guidance for Content of Pre-market Submissions for Medical Devices Containing Software
 - Off-the-Shelf Software Use in Medical Devices
 - General Principles of Software Validation
 - Content of Premarket Submissions for Management of Cybersecurity in Medical Devices
 - Policy for Software Device Functions and Mobile Medical Applications
 - Applying Human Factors and Usability Engineering to Medical Devices

International Standards:

- ISO 13485:2016 Medical Devices – Quality Management Systems
- IEC 62304: 2015 Medical Device Software – Software Lifecycle Processes
- ISO 14971: 2019 Application of Risk Management to Medical Devices

- EN 14971: 2019 Application of Risk Management to Medical Devices
- Off-the-Shelf (OTS) Software and Open Source software (SOUP)
- Discussion: All Software Is Defective...

SESSION 2 – FDA Design Controls and IEC 62304 – Part 1

Duration ~2.5 hours with one 15 min break

This session will cover FDA Design Controls and IEC 62304 requirements for medical device software.

- Design and Development Planning
 - How does Agile Development fit?
 - Medical Device Software Lifecycle Processes
- Risk Management
 - FDA Levels of Concern
 - IEC 62304 Software Safety Classification
- Software Requirements
 - Techniques for Removing Ambiguity from Requirements
- Software Architecture and Design
- Software Design Changes

SESSION 3 – FDA Design Controls and IEC 62304 – Part 2

Duration ~2.5 hours with one 15 min break

This session will cover Software Verification and Validation requirements.

- Software Implementation
- Software Verification
 - Technical Reviews
 - Static Analysis
 - Unit and Integration Testing
- System Testing
- Software Validation Testing

SESSION 4 – Software Tool Validation and Risk Management

Duration ~2.5 hours with one 15 min break

This session will cover Software Tool Validation and Risk Management requirements.

- Software Tool Validation

- Deciding which tools need to be validated
- Validation approach for software tools
- Validation of Manufacturing Software and Quality System Software
- Risk Management Using Fault Tree Analysis (FTA)
 - Review of ISO/EN 14971:2019 Requirements
 - Example of Fault Tree Analysis and Failure Modes Effect Criticality Analysis (FMECA)

About the instructor: Steven R. Rakitin has over 45 years experience as a software engineer. He has over 30 years of experience in the medical device industry and has been a medical device consultant for over 20 years. He has worked with over 100 medical device manufacturers and biotech companies worldwide, from startups to Fortune 100 corporations. He has published 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.

Steve works collaboratively with medical device companies to help them comply with FDA regulations, guidance documents, and international standards in an efficient and cost-effective manner.

**Decision (Run/Cancel) Date for this Course is
Wednesday, November 3, 2021**

IEEE Members	\$285
Non-members	\$345

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.

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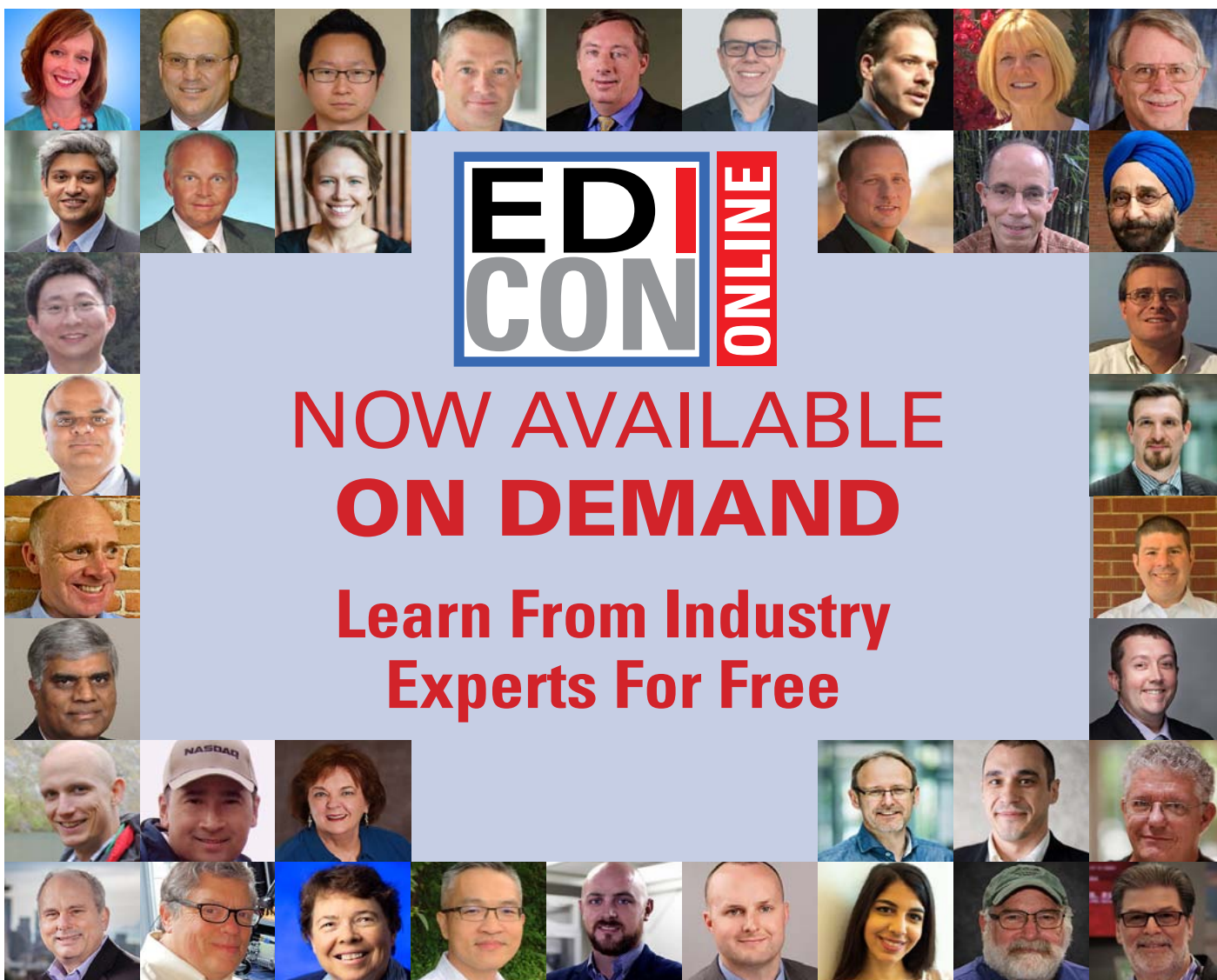
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IEEE HST Virtual Symposium Coming in November!

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HST Symposium Coming 8 – 9 November 2021

The 20th IEEE Symposium on Technologies for Homeland Security (HST '21 will be held November 8 - 9, 2021 as a virtual symposium. This symposium brings together innovators from leading academic, industry, businesses, Homeland Security Centers of Excellence, and government agencies to provide a forum to discuss ideas, concepts, and experimental results.

Produced by IEEE with technical support from IEEE, IEEE Boston Section, and IEEE-USA and organizational support from MIT Lincoln Laboratory and Raytheon, this year's event will once again showcase selected technical papers and posters highlighting emerging technologies in:



**Cyber
Security**



**Frontier and Emerging
Technologies**



**Climate and Homeland
Resilience**



**Border Security, Critical
Infrastructure Protection
& Law Enforcement**

See IEEE-HST.ORG for more details!