MAKING OUR FOOTPRINT IN SILICON VALLEY

- OUR FIRST EVER COURSE ON THE WEST COAST

Some argue that technology drives humans apart. MIT believes that the shared interest of technology and innovation brings people together. This philosophy was in full effect in late March when MIT Professional Education brought the *Designing Efficient Deep Learning Systems* course to Samsung Research America in Mountain View, California.

The course was a melting pot of tech giants, with engineers and managers from Facebook, Google, Microsoft, and other major firms in attendance. It was also inspiring to see how many MIT alumni ended up representing the face of Silicon Valley - and technology as a whole. The diverse representation of participants was incredibly engaged. Even in our connected world, everyone ignored their phones, engaged with Professor Vivienne Sze, and discussed course content with one another

during breaks. "Prof. Vivienne took the participants into an engaging thought process of how to ask the right questions about not just building but also evaluating AI optimized hardware that might be launched in the market in the future," said Rolly Seth, Program Manager at Microsoft Garage.

As MIT looks to continue its leadership in machine learning and artificial intelligence, MIT Professional Education realizes the need to answer a call for training on this topic. This cohort of passionate participants was eager to learn, and was actively seeking hands-on training in their field, to reconnect

with the community, and to test themselves and see not just where their knowledge is currently, but to see if they're going in the right direction.

The trip to Silicon Valley was a new experience for MIT Professional Education, too, as we've never had the chance to bring one of our courses there — and that's a big part of our mission moving forward. We will continue to expand, to bring the education to you, to reconnect with the MIT community, and to continue MIT's devotion to advancing technology and innovation.
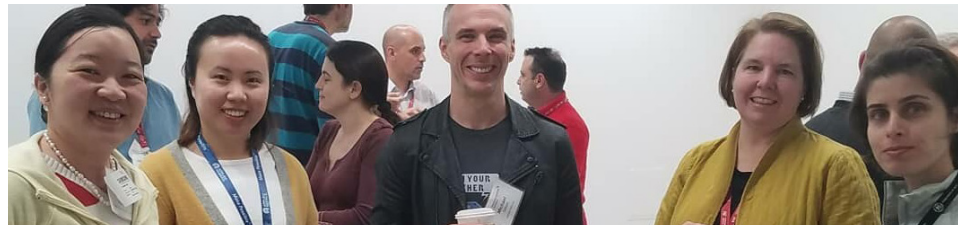
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YEAR-END 2018

Dear friends:

As we approach year end, we review in this newsletter the diverse and groundbreaking programs we have conducted over the past several months in serving industry professionals around the world.

We inaugurated our very first short course in Silicon Valley, featuring Professor Vivienne Sze (EECS) teaching the *Designing Efficient Deep Learning Systems*. The class was "sold out" well in advance and received great reviews from the attendees, triggering our determination to hold more Silicon Valley-oriented MIT professional courses on the West Coast in the future. We are grateful to the Samsung Research Center, which employs several MIT alums, for hosting us and allowing us to hold our inaugural class at their facility.

Elsewhere in this edition, you will learn about a customized course on "Smart Manufacturing" we successfully developed and conducted for a major metals engineering company. Of particular interest was the deployment of MIT student-designed data extrusion machines in the class for a true "mens et manus" (mind and hand) experience for the participants. Based on the success of this course, we intend to offer versions of it to other global manufacturers who want to modernize their processes.

As we look at the integration of digital delivery technologies into an increasing number of our programs, you will learn also about an online, collaborative course on "Leadership and Innovation" we launched recently, which has yielded very positive learning experience comments from the participants.

Finally, I invite you to read the other stories on our activities, including the ones profiling some of our faculty and students. Of particular interest may be the story of an MIT alum who has returned to the MIT campus several times to take professional courses, and who has just completed our online course on leadership and innovation – all toward his quest for lifelong learning!

Bhaskar Pant

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⊕ CUSTOM PROGRAMS

ARCONIC-MIT SMART MANUFACTURING LEADERSHIP EDUCATION PROGRAM

Boosts Operational-Technical Productivity in Factories

Sharing of knowledge in a collaborative, hands-on environment is a hallmark of MIT's "Mind and Hand" educational philosophy. The value of this approach was recently demonstrated by a team of School of Engineering faculty and grad students, who created a program in Smart Manufacturing for about three dozen operations and factory managers from lightweight metals giant Arconic.

The MIT Smart Manufacturing Leadership Program, developed in collaboration with MIT Professional Education, featured several webinars and a pair of four-day on-campus sessions. In addition to classroom training, the program provided hands-on practice with a custom tabletop fiber extrusion system, and a data-rich manufacturing-education hardware kit.

MIT's faculty director of the program was Brian W. Anthony, Director of Programs and Outreach for MIT.nano and a principal research scientist in the Department of Mechanical Engineering and the Institute for Medical Engineering and Science. He and his students have worked on the development of manufacturing-related educational methods, materials, and machines. "Arconic had many people with diverse education and experience, as well as deep expertise in individual areas, but wanted to develop their skills in connecting the full technology stack required to realize a Smart Manufacturing Enterprise. So, MIT's job was to provide a common technical language and technological framework to think about, model, and deploy Smart Manufacturing, both broadly and in the context of their business, and help support their plan for doing a lot of internal mentoring," explains Anthony.

"The class really tied the Smart Manufacturing structure together, starting with sensors, building to hardware systems and data analytics, and making connections into the overall framework," said Leslie Suffredini, an engineer who serves as operations manager at Arconic Engineered Structures in Cleveland. "We got a better understanding of what's needed for our facility and our business, and what it will take to implement Smart Manufacturing effectively. We just put up our first data visualization board; before only engineers would see that data, now everyone is looking at it."

Plans call for additional groups of Arconic manufacturing leaders to go through the course as the company pursues its strategy of deploying Smart Manufacturing as a foundation for using information and intelligence on the factory floor to maximize operational efficiency. ⤴

THE ART OF MASTERING INNOVATION AND DESIGN-THINKING

In a traditional lecture hall in MIT's Stata Center, over 30 students from around the world dug through a plastic tote bin in an attempt to find the perfect pipe cleaners and construction paper. At first glance, this sounded like a strange way to teach product design, but there was a method to this activity.

As part of the MIT Professional Education Short Programs course, *Mastering Innovation & Design-Thinking*, participants partnered with one another to design each other's ideal shopping experience. Through lightning rounds of interviewing one another about shopping for something important (such as a car or major technology purchase), participants identified each other's shopping motivations and ideal outcomes.

What came from this fast-paced, hands-on exercise was a room filled with stores made out of cardboard, taped-together chronological flowcharts of a hypothetical purchasing process, and pipe cleaner VR glasses.

There was, of course, a reason for all of this. Blade Kotelly, senior lecturer at the Bernard M. Gordon-MIT Engineering Leadership Program and instructor for the course, believes that the art of design-thinking should emphasize starting with an analog prototype, even if it's just using pencil and paper (or, in this case, pipe cleaners and paper), to allow flexibility when working with people for the initial prototyping.

The dynamic structure of the course effectively balanced traditional lectures with quick group discussions, brainstorming ideas with a partner, and hands-on design using drawings, chalkboards, and other physical items. While many participants worked in digital fields, Kotelly brought the class back to the basics by encouraging traditional prototyping methods, promoting the idea of quick turnarounds, flexibility, and listening to their partner's needs and ideas in real-time.

Course participants were incredibly diverse, representing government, consulting firms, emerging companies, disrupting firms, pharmaceuticals, and more, and hailing from all over the U.S., Mexico, Peru, China, and beyond. "What

I thought was truly remarkable were the people in attendance," said Nicole Castillo, business analyst & IT product owner at Realogy in Highland Park, NJ. "While we were each there for various reasons, you could tell that everyone was open and willing to share their own experiences. I think the instructor was masterful in pulling those experiences out of us."

A common theme for those in attendance was to be innovative and disrupt. "'Innovate or die' in this market isn't just a catchy phrase. Every day, Latin America becomes more and more competitive. We have an obligation to evolve twice as fast as the rest of the world," said Ricardo Arbocco, CIO at America Movil Peru SAC in Lima, Peru. "This course is designed to help us think differently, to be more critical of the issues we have at hand, and to discriminate what's important and to focus on it, all so we can move faster in this dynamic environment." ✦

> " *This project was a perfect example of how to make sure your design will meet the needs of the user*
>
> —Ricardo Arbocco, CIO at America Movil Peru SAC

ANTHONY E. LUJAN, PHD

DIGITAL PLUS PROGRAMS ALUMNUS

The Intersection of Leadership & Innovation Course

Senior Manager, Innovation Collaborations, Varian Medical Systems

MIT Alum '90, Course 22 (Nuclear Engineering)

What courses have you taken from Professional Education, and why?

I've taken three Short Programs courses through MIT Professional Education: two radar courses and a machine learning course. I enjoyed the first radar course a lot and there were so many interesting topics available that I went back for more! In the future, I hope to be able to continue taking courses relevant to my career and interests.

Why did you decide to take The Intersection of Leadership & Innovation?

A year ago, our group became part of the newly formed Technology Innovation Office. The head of the office has a particular vision of innovation. I was (and still am) looking to grow my skill set, particularly around inspiring others to follow a vision. I saw this course and was immediately drawn to both the subject matter and the format. Given both my interest in growing my skill set and the mission of our team, I felt that this was a great opportunity to learn and hopefully apply the lessons back in my work life.

How does online learning compare to an in-classroom course?

I love in-classroom learning, but the format of this online course allowed people who may not speak up in class to participate in a new way. It never felt that the conversation in the course was dominated by one person (which can happen in an in-classroom setting, especially in a time limited setting). People could feel free to ask questions at any time, not just on the spot.

Have you been able to apply what you learned in the course to any aspects of your career or job? If so, what was the outcome?

I used my final video as the starting point for a new three-year plan for my work. I've received some positive feedback and it has certainly elicited a reaction from those who have heard it (which, in turn, has provoked additional conversation and guidance). More importantly, and I noted in the course, I also felt that I innovated myself, not just my views of work. That is, I opened my eyes to some new possibilities and challenged some long held assumptions.

As an MIT alum, why did you decide to return to MIT for a professional development course?

Many years ago I took the MIT-Harvard Joint Program on Negotiation. I still apply the lessons learned from that program, so when I started looking for some new educational experiences, I started with this MIT Professional Education program. Knowing how my MIT undergraduate experience impacted my learning, I had high hopes. During the kick-off of the course, we were promised an MIT experience of "drinking from the firehose" and absolutely achieved that. There is so much information in this course that learning will continue for a long time to come.

SINDRE OTTOEY

ADVANCED STUDY PROGRAM STUDENT

National Origin: Norway

Educational Background: Pursuing M.Sc. in Chemical Engineering at the Norwegian University of Science and Technology (NTNU)

Why did you want to take a course through the Advanced Study Program at MIT?

I am currently pursuing a five-year integrated M.Sc. in Chemical Engineering at the Norwegian University of Science and Technology (NTNU), and have been planning to take a year abroad since I was a freshman there. I ended up applying to MIT because of the high academic standard, and ASP was the best way for me to enroll as a non-degree student and take credits here.

How is the overall learning experience at MIT and with your classmates?

The students, TAs, and professors are in general very dedicated in the work they do, and have inspired me to do the same. The classes have been challenging, but the learning outcome has also been great. You are forced to really understand the material to complete the homework and do well on tests. Although the environment can seem very competitive, collaboration with classmates has been a key factor to understand the material. I also like working on group projects here, everyone contributes and shares their knowledge.

How will your time on the ASP program influence what you are planning to do post-program?

Next year I will have to return to Norway and finish my Master's thesis, but my experience from ASP will definitely impact what I will do post-graduation. In particular, taking classes at the Department of Chemical Engineering has been an eye-opener to the vast amount of applicable areas chemical engineering can have, which has made me consider career opportunities in fields I had not thought about previously.

A Closer Look at The Intersection of Leadership & Innovation

Education shouldn't fall victim to barriers such as location, accessibility, and time commitment — especially when it comes to important skills needed to get ahead. In MIT Professional Education's *The Intersection of Leadership & Innovation (ILI)* eight-week on-line course, MIT's Dr. David Niño guided the participants virtually through ways to gain leadership momentum, pushing them to lead with more self-awareness and creativity.

The course incorporated just as many interpersonal dynamics as you would see inside a traditional classroom. The course team answered questions with real-time office hours and facilitated extensive online interaction between students. Users were encouraged to participate in forums, learning from one another, sharing their experiences, and answering each other's questions and concerns. "You feel you are in a live active course, part of a group, not like the usual self-study video lectures," said Olafur Andri Ragnarsson, a digital transformation consultant. "Getting feedback fast is great and makes the experience better."

The course focused on addressing the concerns of individuals and the real problems they and their companies were facing, specifically around the concept of innovation: What roadblocks were preventing desired growth? What development was needed within their team(s) to help promote innovation? How could they develop leadership skills to facilitate the desired growth?

"I will be less afraid to challenge assumptions and push for opportunities to both develop as a leader and to develop others as leaders," said Anthony Lujan, senior manager, technology innovation at Varian Medical Systems, after finishing the course.

For some students, the impact was immediate. They went straight into applying their newly-learned problem-solving skills to issues their organization was facing, teaching their colleagues what they learned from the course and pushing to implement new ideas. "I already see more buy-in from maintenance groups across the organization," said Edward Czarnecki, TPM PM Pillar National Lead at Clearwater Paper Corporation. "They already heard my vision statement during my last monthly call, and they all agreed that they understand it and why we need to do what we are doing."
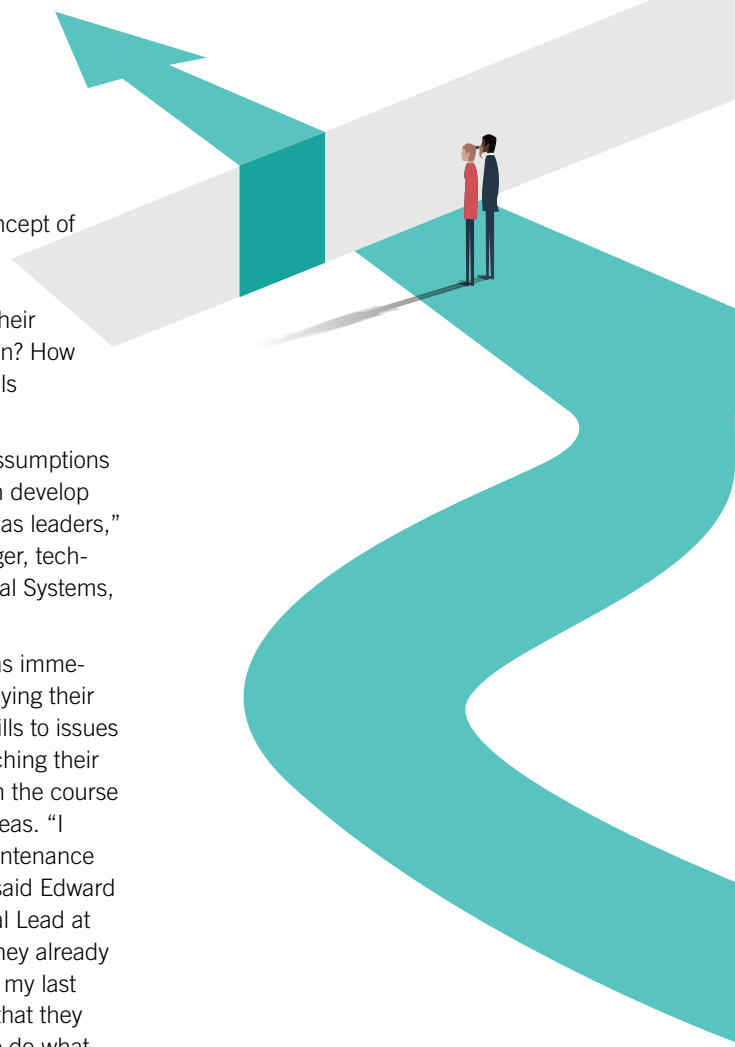
An International Experience: Brazilians Travel to MIT for a Lesson on Leading Innovation

"People at MIT work with great vision of the world. I came here to learn with them – to make innovation happen in my city and in my country," said Alline Jajah.

Jajah was among the more than two dozen working professionals who traveled from Brazil to Cambridge last summer as part of an international academic program run by Fundacao Getulio Vargas (FGV), a well-known business school in Latin-America. Each year, FGV offers students and alumni the opportunity to study abroad. More than 20 foreign schools are included in the program, including Stanford, University of Hong Kong, and Steinbeis in Germany. However, this was the first time MIT was included on the list.

> **" Nowadays, all companies have to lead and be innovative. It's very important**
>
> *—Juliano Perlin, commercial manager*

MIT's debut course — which was led by MIT senior lecturer David Niño, titled *Leading Innovative Teams* — was a huge draw. "Nowadays, all companies have to lead and be innovative. It's very important," said Juliano Perlin, a commercial manager at one of Brazil's largest container ports.

"We learned things like how to listen and talk with people without confronting them, how to understand different points of view in your team, strategies for evaluating your team, and how to put it all into practice," said Jajah, who runs a digital marketing firm in Brazil.

Participants — some of whom relied on portable translators to access the content — took part in small group exercises, role-played, practiced giving and receiving feedback, and worked through case studies. They also toured the campus, which organizers said had a surprising impact.

"I think we gained a greater appreciation for learning communities – we don't have this in Brazil. We don't see so many people dealing with science, knowledge, and development. I think seeing all those pieces come together will make many participants rethink how education contributes to economic development in a country," said Pedro Carvalho de Mello, coordinator of international academic programs at FGV.

That focus on innovation is likely to continue, as plans are now in the works for a 2018 FGV course led by researchers at the MIT Mobile Experience Lab. Overall, in the past five years, Brazil has had the highest number of Short Programs registrations of any country outside the U.S. — demonstrating a tremendous interest in professional education opportunities such as these. ⬱

DR. BRUCE CAMERON
Director, MIT System Architecture Lab

Short Programs Course
Principles and Models for System Architecture
Co-Instructors
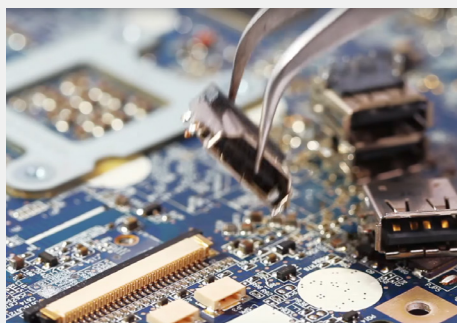Prof. Edward Crawley, Dr. Dov Dori

Why did you decide to teach a systems engineering course for professionals?
We started teaching this course because we found that industry practices were not well-codified inside companies today. There is a lot of experience with systems engineering out there, but that knowledge often lives in silos. Creating this course gave us a chance to bring that experience base together into a coherent format. This course is a lot of fun for faculty to teach. We love hearing about the complex products participants are working on, and this course gives us an opportunity to work with participants on addressing those challenges using system engineering tools.

What will participants learn in the course?
We're very focused on what the big questions around architecture are. In that context, we spend a lot of time working through how we enumerate the functions of the system, how we identify the form of the system, and then how do we map the two together as a representation of architecture. Over the course of a week, we work from the decisions that define architecture to how we describe the architecture of a system, and what we might do downstream from that from a systems engineering perspective. We cover topics around what the relationship between strategy and marketing is to the architecture we're developing, how we might represent the interfaces of the system, as well as a project that ends up spanning the whole week whereby participants bring their problems to MIT. Together, we end up building out representations of the systems that they are interested in studying.

What kind of people typically participate in your course?
In terms of audience for the class, we often see senior engineers who are working the front end of development because they are tasked with defining the architecture for new systems in their jobs. We see a lot of R&D managers and program executives from a product development perspective. We've also seen some folks from the project management perspective and from a manufacturing perspective who are interested in seeing what's happening on the other side of the fence and how they can learn more about what architecture is and what systems engineering is. ⬱