



PROFESSIONAL EDUCATION

NEWSLETTER

FALL / WINTER 2011 : THE INNOVATION ISSUE

IN BRIEF

Advanced Study Program

The Advanced Study Program welcomed 30 students this fall from around the globe. ASP fellows come from as far away as Korea and Japan and from as close as Draper Labs which is across campus. ASP fellows are taking one or more courses in Math, Management, Chemistry, and Electrical Engineering, just to name a few.

Career Reengineering Program

In celebration of the 5th anniversary of the Career Reengineering Program, an alumni reunion was held in conjunction with the certificate awarding ceremony for the most recent class. Representatives from all 5 years came together for a wonderful evening where they reconnected with old friends and shared their personal stories of how the program had positively impacted their professional lives.

Short Programs

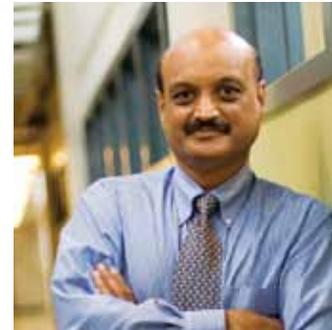
Close to 50 MIT faculty taught forty short courses on campus this summer. Enrollees came from over 50 countries and represented six continents. Among the new course topics introduced this year were building a radar, innovation in organizations, innovations in urban mobility and modern manufacturing. Returning courses covered topics spanning the life sciences, computing, systems engineering and energy. Given the success of project-based courses, we are looking to add more such courses to our roster for next year in cooperation with research teams at MIT Lincoln Laboratory.

DEAR FRIENDS,

This semester, we have enrolled a diverse set of U.S. and international professionals in our Advanced Study and Career Reengineering Programs. Some have PhDs, some have MBAs or other graduate degrees. Over the summer, more than 850 participants from more than 50 countries enrolled in our intensive Short Programs for engineering, science and technology professionals. Many of them had attained advanced degrees as well.

Clearly, in an increasingly competitive global economy, highly qualified professionals are seeking more advanced knowledge in their fields. Many hunger for knowledge in radically new areas that they and their employers would like to explore.

Responding to a frequent call for courses on innovation, we have introduced two new courses—Radical Innovation led by Mechanical Engineering Professor Sanjay Sarma and Innovations in Sustainable Urban Mobility from a research team at MIT’s Media Lab. Another popular course first offered a few years ago is Architecting the Future Enterprise, led by Engineering Systems Division Senior Lecturer Donna Rhodes.



Bhaskar Pant.
Photo by Stuart Darsch



Lapp Certificate recipients.

his peers a short course titled Leadership Skills for Engineering and Science Faculty in the summer. The popularity of this team-building skills course has caught the attention of other universities such as Harvard and Carnegie Mellon.

I invite you to read these stories, program updates, and the profile of Engineering Systems Professor Oli de Weck, a popular faculty contributor to MIT professional programs.

Best Regards,

Bhaskar Pant, Executive Director
MIT Professional Education
bpant@mit.edu



OLIVIER L. DE WECK

ENGINEERING SYSTEMS PROFESSOR

Olivier L. de Weck

Associate Professor

Aeronautics and Astronautics and Engineering Systems, Department of Aeronautics and Astronautics

Course Director

MIT Professional Education Short Programs: Product Platform and Product Family Design: From Strategy to Implementation

Term Director

BP Projects & Engineering Academy Executive Education Program

Photo by Stuart Darsch



Olivier L. de Weck, a native of Switzerland, fell in love with systems engineering during his mandatory military service, which he served keeping aircraft in the Swiss Air Force in top condition. To solve mechanical problems, he pored over schematic drawings. “You had to trace the flow of information and energy and really study it—that was beginning of my passion for systems engineering.”

He brings that passion to his MIT courses, research, and professional education work including teaching Short Programs and contributing to the BP custom executive education program.

De Weck kept his academic focus on aeronautics through his engineering studies at ETH in Zurich and working at aircraft companies in Switzerland and the U.S. When he applied to U.S. graduate programs, MIT stood out because of its systems focus.

“MIT really is a systems-thinking place,” he says. “Yes, you need to understand the scientific principles but you also need to consider real world environments and impact. That is really in the DNA of MIT.”

Today, he leads the MIT Strategic Engineering research group, which he describes as systems engineering with a twist—that twist is decision-making flexibility over time.

De Weck has developed methodologies to support decision-making in situations—such as planning the life cycles of airplanes—so engineering plans can be flexible over time. He and a colleague recently won an International Council on Systems Engineering (INCOSE) paper of the year award for a study on how Xerox could make decisions about adding new features to their large-scale digital printing systems. The company needed a method to weigh the benefits vs. the costs of integrating new features into an already complex system. “Their process resulted in specific recommendations that were implemented and very successful,” he said.

▾ **RESEARCH HIGHLIGHTS**

Systems engineering for changeability and commonality; space exploration logistics and resource management; lifecycle properties of systems; strategy, manufacturing and production

Associate Fellow of AIAA

Associate Editor for the *Journal of Spacecraft and Rockets*

Two best paper awards at the 2004 INCOSE Systems Engineering conference

AIAA Outstanding Service Award, 2007

Outstanding paper award from the journal *Systems Engineering*, 2007

▾ **EDUCATION**

Dipl. Ingenieur mA, Industrial Engineering, 1993, ETH Zurich, Switzerland

SM, 1999, Aeronautics and Astronautics, MIT

PhD, 2001, Aerospace Systems, MIT

De Weck has worked over the past six years with MIT Professional Education’s custom BP program and has taught short courses in the summer. De Weck’s Product Platform and Product Family Design course was developed for a professional audience and now MIT students are asking for their own version.

The successful course engages professionals in the frameworks, methodologies, and tools they can use to develop and manufacture a family of products derived from a common platform.

His MIT Professional Education engagements have benefitted him, de Weck says. “As a teacher, it has made me think more about hands-on learning and two-way communication. Executives like to be active and they have a lot to share,” he says. “It also

▾ **Learn more about Professor de Weck’s short course:**
shortprograms.mit.edu/esd.39



FACULTY SPOTLIGHT

OLIVIER L. DE WECK

ENGINEERING SYSTEMS PROFESSOR

made me think about the relevance to industry. Just theory alone will not fly—you need real examples and the level of expectation is quite high.”

Working with the BP Projects & Engineering Academy first as a faculty member and now as a term director in the program, has afforded de Weck the opportunity to meet with senior technical managers, the company, and the industry on an ongoing basis. And the benefits for the companies, which can create an influential internal community of advanced learners, are substantial too.

“The beauty of professional education right now is that you can create a small ecosystem around the topics—you have current classes and alumni,” de Weck says. “In 2012 we are planning to have a workshop on product family and platforms and we are inviting former participants back. And we are thinking about writing a book together with them. The potential is huge to create an ecosystem that is a win-win for everybody.” ▾

▾ MIT SERVICE

Robert Noyce Career Development Professor, 2002–2005

MIT's Frank E. Perkins Award for Excellence in Graduate Advising, 2006 Associate Head of the Engineering Systems Division, 2008–2011

Executive Director, MIT Production in the Innovation Economy (PIE) Commission, 2011–present

Co-Director Center for Complex Engineering Systems at KACST and MIT, 2011–present

Head, MIT Strategic Engineering Research Group
<http://strategic.mit.edu/index.php>

Principal Investigator, MIT Space Logistics Project: Interplanetary Supply Chain Management and Logistics Architecture <http://spacelogistics.mit.edu/>

▾ PERSONAL INTERESTS

Skiing, ice hockey, mountain hiking, traveling, history of exploration, futurology, and good food and wine.

LEARNING TO INNOVATE

PROFESSIONALS COME TO MIT

Where can industry professionals learn the key concepts and practices that make MIT synonymous with innovation? Bhaskar Pant, executive director of MIT Professional Education, says several short programs offered last summer for the first time are a good start.

The Radical Innovation course taught by Mechanical Engineering Professor Sanjay Sarma, an entrepreneur and pioneer in modern RFID technology, addresses issues facing both established organizations and startups.

One concept he teaches is Creative Destruction, which is particularly appropriate for large firms. “The basic idea is that any company or enterprise where things are going great can slowly slip into maintenance mode and innovate less,” says Sarma, who co-founded the MIT Auto-ID Center. “The firm becomes ripe for attack by a small company that is willing to do things completely differently.”

Established companies need to rip through the complacency of success and recreate the conditions of innovation, he says. This is essential because so many small startups now also have access to the ingredients of innovation—people, opportunity, context, and technology. “In the past 10 years, the little guys have big guns in terms of technology and the gun factory is MIT.”

Sarma’s course teaches the fundamentals of intrapreneurship—establishing small, creative groups that can tap major resources but operate quickly without the weight of corporate hierarchy. These small groups also need to share in the financial rewards, he says.

Startup issues are addressed with practical advice about finances, marketing, and intellectual property drawn from running Sarma’s own software company, OATSystems.

“An idea is worth nothing—it is a tree in the forest,” Sarma says. “You make your idea a success by being the CEO of your idea and make it something that can survive in the marketplace with all the layers it needs to be viable.”

Another new course, Innovations in Sustainable Urban Mobility, was led by an MIT Media Lab team that examined new ideas about city living and transportation. Kent Larson, who directs the Changing Places research group, and Research Specialist Ryan Chin MA ’00, SM ’00, who has led development of lightweight electric vehicles such as MIT’s CityCar, RoboScooter, and GreenWheel Smart Bicycle, shared their work and conducted collaborative brainstorming sessions to test new ideas.

“There is an emerging consensus that a new model for urban mobility is needed to reduce congestion, pollution, and energy consumption,” Larson says. “We advocate an ecosystem of mass transit and

The CityCar is a foldable, electric, sharable, two-passenger vehicle for crowded cities designed by the Changing Places group at the MIT Media Lab.

Kent Larson
Director, Changing Places

Ryan Chin
Project Manager, Changing Places

CityCar concept
Design by William Lark, Jr.,
Changing Places,
MIT Media Lab

*Classroom photo
by Megan Davies*



networked, shared electronic and human-powered vehicles that are optimized for urban use. We believe that such a system can serve a population with fewer vehicles that use far less energy and that are more convenient, affordable, and pleasurable for urban dwellers.”

Chin says their concept of innovation combines technology, policy, behavior change, and economics. They took the MIT campus as their laboratory with students using a computer model to work on ways to reduce CO₂ emissions through transportation choices such as ride sharing.

▼ **Learn more about our Innovation short courses**

Radical Innovation: shortprograms.mit.edu/pi.33

Urban Mobility: shortprograms.mit.edu/pi.966

Architecting the Future Enterprise: shortprograms.mit.edu/pi.28

LEARNING TO INNOVATE

PROFESSIONALS COME TO MIT

MIT Professional Education students will get a glimpse of the product development innovation cycle that the Media Lab uses to engage sponsors, says Chin. Participants ranged from employees of Best Buy, which is starting a transportation division, to a city planner from Bangladesh, auto suppliers from Detroit, and architects from South America.

Another course, *From Technology to Innovation: Putting Ideas to Work*, led by Center for International Studies Research Associate Sanford L. Weiner, focuses on the organizational change required for successful implementation of technology-driven innovations.

“This course went to the heart of creating innovation within organizations,” says a participant from GE Global Research. “Any institution would benefit from a thorough understanding of the complexities involved; they are presented in this program by experts who have witnessed and managed these complexities first-hand.”

Architecting the Future Enterprise, another popular course first offered a few years ago, is taught by Donna Rhodes, senior lecturer in the MIT Engineering Systems Division. This course is based on a decade of research that has examined enterprises as systems in themselves.

“Innovation is commonly thought of as creating new and novel products and services within an enterprise. Our course brings innovation into the conversation on how to design enterprises themselves,” Rhodes notes. “In an enterprise or any complex system, opportunities for innovation are often found at the interfaces. We teach practical methods to uncover these innovation opportunities, in the context of thinking about the whole enterprise and where it sits in the world at large.”

Pant says the new short programs are a good start on helping corporations, large organizations, as well as startups worldwide—a majority of participants come from outside the U.S.—learn how to apply critical lessons about innovation to their fields and circumstances.

“MIT is equated with innovation,” Pant says. “People see all that is happening at MIT and they ask how can I learn this? This is a need we had to fulfill—this hunger in industry.”

ACADEMICS LEARN TO BUILD GREAT TEAMS OF DIVERSE PEOPLE



Photo by Stuart Darsch

RESEARCH HIGHLIGHTS

Prof. Leiserson's research centers on developing theoretical principles of parallel and distributed computing. He pioneered the development of Very-Large-Scale Integration (VLSI) and his recent research focuses on the emerging field of dynamic multithreaded computing. In his current work, he and his SuperTech research group have created the Cilk multithreaded programming language, which vastly simplifies multiprocessor programming. *Introduction to Algorithms*, his co-authored, award-winning textbook, is the most cited work in computer science and just passed the half million sales mark.

EDUCATION

PhD, Carnegie Mellon University, Computer Science, 1981

BS, Yale University, Computer Science and Mathematics, 1975

MIT SERVICE

Teaching since 1981

UPOP engineering chair, 2001 – present

Computer science program chair for the Singapore-MIT Alliance – past

Margaret MacVicar Faculty Fellow, 2007 – present

Supervised more than 20 PhD students and 50 master's and bachelor's students

OpenCourseWare — facilitated video features and underwriting committee member

Successful academics usually get their jobs based on specialized expertise, not their management ability. Yet professors taking Professor Charles Leiserson's short program are finding that learning how to build and lead a successful team can improve their teaching and their productivity. This knowledge is particularly important for technical people because many contemporary problems—both in industry and research—are so complex that they require teams to solve.

Leiserson's summer course, Leadership Skills for Engineering and Science Faculty, first took shape at Akamai Technologies more than a decade ago. He took a leave from MIT to serve as the startup's director of system architecture, gathered a team, and went to work. Unfortunately, he notes, when these bright people got together, "We were pretty dysfunctional as a team."

For help, the company tapped Boston-area consultant Chuck McVinney, who specializes in building successful, creative teams. After a couple of workshops, Leiserson's group was transformed. "I was amazed at how effectively we were working together with just a minimal amount of input," he says.

When he returned to MIT, Leiserson began using these skills, first offering workshops to students in the Undergraduate Practice Opportunities Program and then to MIT faculty. Now he and McVinney teach the course each summer on campus and they have offered customized versions at Harvard, Carnegie Mellon, and the National University of Singapore.

What do academics learn in his course? For starters, they work on group culture, team leadership, conflict resolution, motivation, learning styles, and listening skills. One example is teaching mental diversity to science and engineering faculty. "To communicate effectively with someone who thinks differently from you, you need to speak their language," he says. "Technical researchers often talk 'nerd talk' when advocating to nontechnical people, which is like speaking a foreign language to them."

Faculty are unlikely to have this training when they start their academic careers, says Anna Mahr, MIT Professional Education Associate Director for Short Programs. "They are expected to pick up leadership skills—but it can be a long and painful process. In this course, there is an 'aha moment' when you realize people are different and you have to act accordingly. To have a successful team, you need to know what works for others as well as what works for you."

Leiserson continues to teach the course through MIT Professional Education as a service to his fellow academics and because it has improved his own teaching, he says. For example, he applies one of the course concepts, situational leadership, to his daily work. Faculty may routinely apply one or two of the leadership methods—directing, coaching, participating, and delegating—but they can be more effective teachers if they can draw on all four, depending on circumstances.

Leiserson has taught MIT Professional Education courses in his academic field, parallel computing, in the past and he offers multicore programming, a field he is pioneering, as a custom program. His work has many real-world applications. While a corporate fellow at Thinking Machines Corporation, he designed and led the implementation of the network architecture for the Connection Machine Model CM-5 Supercomputer. He was founder and chief technology officer of Cilk Arts, Inc., a start-up that was acquired by Intel in 2009.

In his spare time, Leiserson stays active with biking, skiing, and swimming. And, as a self-described nerd, he likes techno-toys and reading material like *Scientific America*—which awakened his interest in mathematics and computers when he began reading it in middle school. ▾

▾ **Learn more about Professor Leiserson's short course:**
shortprograms.mit.edu/pi.61



LAPP GROUP REWARDS INNOVATORS WITH MIT STUDIES

COMING UP

Short Programs

- ▶ Check online in December for the 2012 schedule, which includes new project-based courses.
- ▶ Description, dates, and more at shortprograms.mit.edu

Advanced Study Program

- ▶ **Attend an information session:**
On Campus:
Nov 10 and Dec 13
Online:
Nov 10 & Dec 7
- ▶ Details/RSVP at advancedstudy.mit.edu

Career Reengineering Program

- ▶ Our current class of 10 fellows will shortly begin looking for internships. If you or someone you know is in a position to provide an internship please contact dlevenso@mit.edu

When a European company decided a few years ago to encourage innovation through an annual award, the winners received prizes such as a Smart Car or a trip around the world. This past year, the prize for the two Lapp Group employees who won the award was an educational experience—the opportunity to study at MIT for two weeks. And it was the opportunity of a lifetime.

“I think it is every engineer’s dream to study at MIT! The opportunity to visit and to study at MIT was one of the greatest moments in my career as an engineer,” says Daniel Mueller, who with colleague Rolf Drotleff won the Eddie Lapp Award with an improvement to an item made by the Lapp Group, a global manufacturer of high-tech cables, industrial connectors, and accessories with world headquarters in Stuttgart, Germany.

Mueller and Drotleff chose two courses: one, From Technology to Innovation: Putting Ideas to Work, because their daily work involves creating new products and two, LAI Lean Academies: Enterprise, Healthcare, and Product Development, because the company is implementing lean strategies in research areas.

“Before I came to Boston and the MIT, I was convinced that lean is only something for production facilities. Now I know that it is also a very good and important thing in development departments,” says Drotleff. The course broadened his ideas in other ways as well. “I am in active discussions with my colleagues in order to convince them that innovation is a process. It is not enough to ‘give birth’ to an idea, you have to transform it into a product and take care to make it a successful product on the market.”

Siegbert Lapp, company co-owner and the award sponsor, said the MIT prize benefits individuals and the company. “I selected a stay at MIT to be the prize for my best researchers this year because MIT stands for innovation and progress and has done so for the last 150 years. If one is at the forefront of the adventure of research, the air becomes very thin on what one can offer to such minds. The company of like minds is certainly something that is most rewarding. The variety of programs offered

at MIT allows for a wide scope of further knowledge to be acquired, new interests to be conjured up, and discoveries to be made.”

What surprised the German inventors about MIT? “The learning methods and the personal experience shared by the instructors,” says Drotleff, “and the excellent atmosphere between participants and instructors and among participants, but most of all, the participation part of the lean course. It simply was ‘learning by doing.’”

Earll Murman, the Ford Professor of Engineering Emeritus who teaches in the lean course, says the course promotes fresh thinking about innovation.

“Innovation is usually associated with new technology, but innovation should also be associated with holistic approaches to product development, service delivery, and other areas,” Murman says. “For example, it was counter intuitive to Western thinking that a focus on product or service quality could simultaneously reduce its cost. Yet this has been a major innovation in company performance.”

Lapp, Drotleff, and Mueller agreed that the opportunity to meet MIT faculty and participants from all over the world who are themselves experts in their fields has lasting value.

“I had expected to find a big and modern technical university, and I found more than that—outstanding teachers, excellent support, and wonderful colleagues,” says Mueller. “I am in touch with the faculty and with some course colleagues and I hope I will be back someday. With the new insights about innovation and lean, I want to make our organization even more successful.” ▼

For more information on our programs, visit
<http://professionaleducation.mit.edu>

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