

Department of Electrical Engineering and Computer Science

The [Department of Electrical Engineering and Computer Science](#) (EECS) remains an international leader in electrical engineering, computer engineering, and computer science, setting standards both in research and in education. Over the past year, the new department leadership has developed a strategic and operational plan for EECS. Several new initiatives have been established to strengthen the core functions (research, teaching, and student mentoring) as well as global outreach.

New Department Leadership Group

Professor Anantha Chandrakasan, the Joseph F. and Nancy P. Keithley professor of electrical engineering, was appointed as the EECS department head by dean Ian Waitz. Professor Chandrakasan previously held the position of director of the MIT Microsystems Technology Laboratories (MTL).

Professor Chandrakasan assumed responsibilities as department head on July 1, 2011, and soon appointed the rest of the Department Leadership Group (DLG), listed below.

- Professors Munther Dahleh (Laboratory for Information and Decision Systems [LIDS]) and Bill Freeman (Computer Science and Artificial Intelligence Laboratory [CSAIL]) were selected to serve as associate department heads for three-year terms.
- Professors Saman Amarasinghe (CSAIL) and Jacob White (Research Laboratory of Electronics [RLE]) were appointed as co-education officers for three-year terms.
- Professor Dennis Freeman (RLE) was appointed as the undergraduate officer. Professor Freeman previously held the position of EECS education officer.
- Professor Leslie Kolodziejewski (RLE) continued in her role as EECS graduate officer.
- Professor Steven B. Leeb (RLE) was appointed as the EECS instructional labs officer.
- Agnes Chow continued in her role as administrative officer.
- Professor Frederick C. Hennie III serves as an EECS advisor.

2011–2012 Strategic and Operational Plan

In the summer of 2011, the department organized 14 task forces comprising EECS faculty members, students, and staff. The topics were synthesized primarily from faculty input. Each task force focused on a specific aspect of the department's activities and met extensively from July through December 2011. A total of 104 task force members (85 faculty members, nine students, and 10 staff members) contributed to drive the vision for the department. The committees conducted surveys of faculty and students, analyzed departmental and institutional data, and held discussions in meetings of

various stakeholder groups (e.g., area meetings, DLG meetings, laboratory meetings, student groups). The input to the process was highly inclusive of the EECS community. The outcome was a set of approximately 25 potential initiatives.

Through discussions with the EECS faculty and the new Undergraduate Student Advisory Group in EECS (USAGE), the department leadership prioritized the proposed initiatives. The department will pursue the high-priority initiatives immediately. Decisions were driven by available resources, faculty interest and support, and the level at which each initiative supported the department's and the Institute's broader priorities and goals. The strategic plan includes the following key elements:

- Introduce curriculum innovations, including a program in EECS oriented toward medical engineering, the incorporation of an advanced prototyping facility (the Engineering Design Studio), and the incorporation of an alumni network in teaching and mentoring.
- Provide a deep research experience (also called the "Super" UROP [Undergraduate Research Opportunities Program]) to a broader set of our undergraduate students.
- Focus on faculty excellence by strengthening current areas of education and research as well as expanding into new strategic areas. The department will create a networking event for women graduate students and postdocs interested in entering academia. Professor Polina Golland will coordinate this career development workshop.
- Present a unified view of EECS education and research through the new website and publications (*EECS Connector* and *EECS Reflector*).

Research

EECS research is carried out in a set of affiliated laboratories: the Computer Science and Artificial Intelligence Laboratory, the Research Laboratory of Electronics, the Microsystems Technology Laboratories, and the Laboratory for Information and Decision Systems. Details of research achievements within these units are described in their separate reports. EECS graduate students working in one of these labs are further assigned to a departmental research area that is responsible for monitoring their academic progress. These areas (and their respective chairs) are as follows:

Area I: Systems, Communication, Control, and Signal Processing
(professor Gregory Wornell)

Area II: Computer Science (professor Randall Davis)

Area III: Electronics, Computers, and Systems (professor David Perreault)

Area IV: Engineering Physics (professor Jeffrey Lang)

Area VII: Biomedical Science and Engineering
(professors Louis Braid and Collin Stultz, cochairs)

Support for Student Groups and Competitions

The department continues to support several active student groups at the graduate and undergraduate levels; many are involved in outreach endeavors. These student groups include [Eta Kappa Nu](#) at the undergraduate level, the [Graduate Student Association](#) (GSA) for graduate students, and [GW6](#) for graduate women students. These groups initiate a range of activities, many focused on mentoring and community building within the department. We continue to support the [EECS REFS program](#) (Resources for Easing Friction and Stress), a student-run mediation system for helping students deal with conflicts and other difficulties in their professional and personal lives.

The department also sponsors a wide selection of student-initiated activities that foster interest in the department. These activities include a set of extremely popular competitions run during Independent Activities Period, ranging from robot challenges to humanoid robots, web programming, and video game agent design.

Finally, the department supports several Institute-wide student groups that have substantial EECS student participation, including the National Society of Black Engineers, the Society of Hispanic Professional Engineers, the Black Women's Alliance Retreat, MasLab 6.186, the International Genetically Engineered Machine competition, the MIT RoboCup team, and the Solar Electric Vehicle Team.

As part of the strategic and operational planning process led by department head Chandrakasan in fall 2011, a new standing committee entirely comprising undergraduate and master of engineering (MEng) students was formed. The goal was to establish an ongoing dialogue with students to gauge the effectiveness (or lack thereof) of current programs and new initiatives. Committee members were selected from students who responded to an open call to participate. Over 20 students chose to be part of the new committee, appropriately called USAGE. Others participated in one of the task forces mentioned above. USAGE also included the undergraduate officer, professor Denny Freeman, and the undergraduate administrator, Anne Hunter. USAGE meets monthly with Chandrakasan and occasionally with other staff and faculty members as the month's discussion topic demands. As an example of their effectiveness, the insights the USAGE students shared were extremely valuable in building the new "Super" UROP to be launched in fall 2012.

Undergraduate Program

There were an average of 883 undergraduate majors in EECS during AY2011, representing more than a 15% increase over last year. Approximately 11% of our majors are in electrical science and engineering (6-1), 43% are in computer science and engineering (6-3), and 42% are in electrical engineering and computer science (6-2).

The remaining 4% of our majors are enrolled in computer science and molecular biology (6-7), which is our new joint program with the Department of Biology. Thirty students elected to major in 6-7 during the first year of the program (AY2010): 24 sophomores, 5 juniors, and 1 senior. This year, the program includes 25 sophomores, 24 juniors, and 3 seniors.

The percentage of women undergraduate majors rose to 31% in AY2009, compared with 24% in AY2005, and has held steady over the past three years.

The MEng program entered its 18th year with an average of 167 students.

Curriculum Developments

Growing Popularity

From 2009 to 2011, enrollment in EECS classes grew 5% annually, but in AY2011 enrollment in EECS surged, growing by more than 20%. For example, last year more than 500 MIT freshmen and sophomores took the robotics-based 6.01 Introduction to EECS class. 6.01 is now the largest class in the School of Engineering, and most MIT undergraduates eventually take it



Figure 1. Left: 80 students, 40 robots, 10 undergraduate lab assistants, four graduate teaching assistants, and two faculty members share one classroom during a weekly 6.01 design lab. Right: professor Leslie Kaelbling and chancellor Eric Grimson (back to camera) prepare 40 robot heads for the week's design problem. At MIT, even the chancellor is involved in classroom instruction.

Alumni Networks

For the hundreds of EECS students taking project-oriented classes (such as software engineering), insightful feedback on individual projects plays a central role in learning. In order to provide our students with more frequent high-quality feedback, and to give them diverse perspectives, we are experimenting with engaging our enormous network of alumni. In particular, for 6.005, our foundation-level software engineering course, and for 6.172, our advanced undergraduate subject in performance engineering of software systems, we recruited alumni from Cambridge-area companies who had substantial software development experience. Our alumni met with students for the kind of “code review” commonly done in industry. Student reactions indicated that alumni participation was both technically effective and professionally inspiring, as noted in a typical student comment: “They put things in perspective, know what is useful, and can [very quickly] answer some questions that would take a lot of research/time on our parts to answer.” We are currently examining how best to expand our network to include non-local alumni.

6.002x

A major effort by professor Anant Agarwal, along with professor Gerry Sussman, senior lecturer Chris Terman, Professor White, and many others, resulted in the extremely successful launch of 6.002x, MITx's (now edX's) first online class. Figure 2 shows screenshot examples of the scalable browser-based infrastructure developed for 6.002x. The circuit simulator allows students to use a simple schematic capture program to design and analyze circuits, and since the simulator runs directly in the browser, an unlimited number of students can be working simultaneously. The “slider” example allows students to “play” with the impact of modifying resistor values.

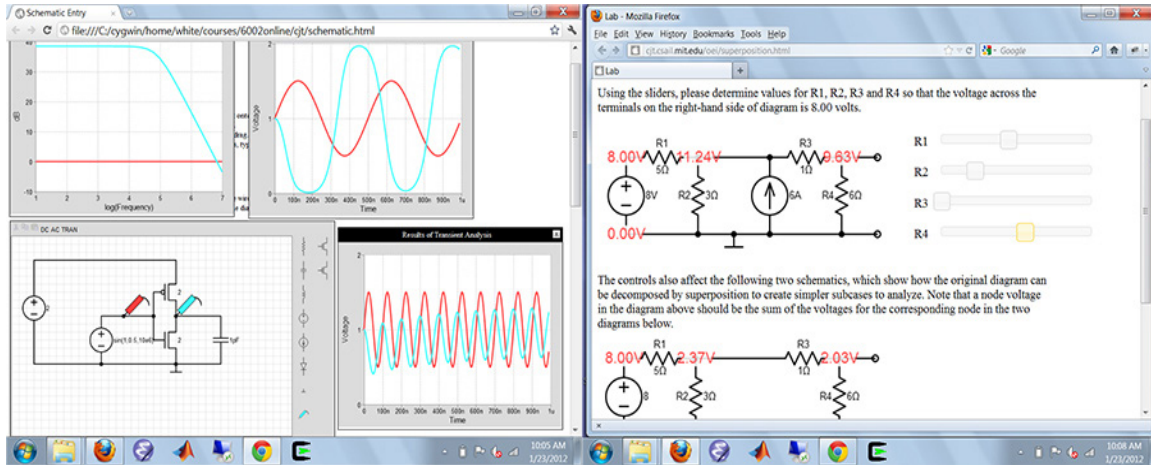


Figure 2. Left: 6.002x circuit simulator. Right: Sliders for circuit exploration.

Medical Technology for Undergraduates

In response to the steady rise in undergraduate interest in life sciences and medicine, most engineering departments at MIT have developed biologically related degree offerings, though none of these offerings are focused on clinically related technology. In parallel, the interests of EECS faculty have shifted, and now more than a third of our department is significantly engaged in clinically related technology development. In response to this compelling coincidence of student interest, faculty focus, and relative institutional vacuum, we are developing an undergraduate major at the intersections of EECS and clinical medicine, denoted 6M. The first step of this development is a new introductory course in medical technology, 6.02M (Figure 3). 6.02M is intended to be a 6.01-style design-oriented class, suitable for freshmen and rising sophomores but based on examples drawn from clinical applications of technology. Professor and practicing cardiologist Collin Stultz and MRI-technology experts professor Elfar Adalsteinsson and Lawrence Wald (from the Massachusetts General Hospital–affiliated Martinos Center for Biomedical Imaging) are leading the development of 6.02M. The course is planned to launch in spring 2013.

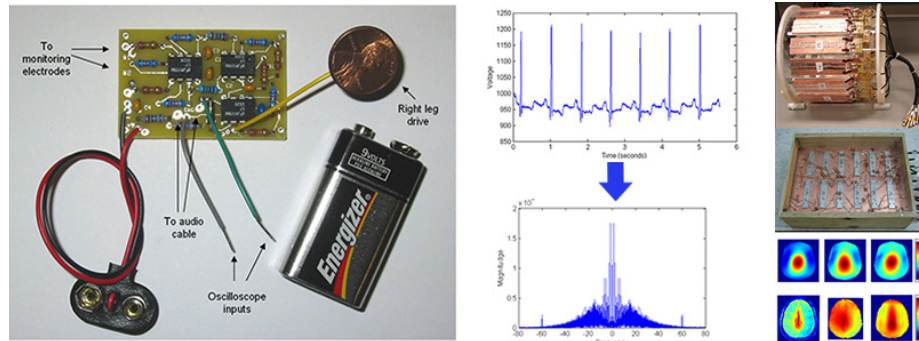


Figure 3. Students in 6.02M will learn about circuits, signal processing, noise, and the cardiovascular system by tackling challenges such as detecting heart problems from ECG data (left: candidate ECG hardware, middle: time and frequency domain data) and will learn about electromagnetic fields, Fourier transform techniques, computer vision, and magnetic resonance imaging by wrestling with issues of structure identification (top right: MRI field coil, bottom right: MRI images). A number of additional 6.02M topics are still under consideration.

Operational Changes

This past year we developed and deployed a web-based portal for course administration. The system, developed by Professor Amarasinghe, allows faculty to provide teaching preferences, allows education officers to make class assignments, and provides faculty and students with up-to-date information about course staffing as it evolves. We also incorporated an online teaching assistant (TA) selection process where students can apply and faculty can provide preferences. The faculty are directly involved and fully informed via the web portal. (The faculty assignment view is shown in Figure 4.)

Faculty Member	Course(s)	Status
Scott Aaronson	Lecturer in 6.845 Quantum Complexity Theory	Unassign
Harold Abelson	Lecturer in 6.805 Ethics & Law on Elect Frontier	Unassign
Elfar Adalsteinsson	Lecturer in 6 leave One Term Leave	Unassign
Elfar Adalsteinsson	Lecturer in 6.002x Circuits and Electronics (MTx)	Unassign
Elfar Adalsteinsson	Lecturer in 6.169 Theory and Application of Circuits and Electronics	Unassign
Elfar Adalsteinsson	Instructor in 6 UAT Preparation for UAP	Unassign
Elfar Adalsteinsson	In 6.S195 Special Laboratory Subject in EECS	Unassign
Arthur B. Pappas		
Han BalaKrishnan	Co-Lecturer in 6.02 Introduction to EECS II	Unassign
Marc A. Baldo	Lecturer in 6.701 Introduction to Nano Electronics	Unassign
Marc A. Baldo	Lecturer in 6.719 Nano Electronics	Unassign
Regina A. Barzilay	Lecturer in 6.854 Advanced Natural Language Processing	Unassign

Figure 4. The new EECS educational portal showing the faculty assignment view.

Over the coming year, we will make this portal a full-featured system by including tools for multiyear planning of teaching assignments, course textbook use reporting, and long-term planning of course development activities and TA evaluations.

Undergraduate Teaching Laboratories

The EECS undergraduate teaching laboratories serve as a pedagogical and physical focus where students across the Institute and beyond hone their craft as engineers and scientists. During the reporting period, the department laboratories supported existing programs and initiated new activities to bring hands-on, “mind and hand” experiences to students in and of the 21st century. The laboratories sustain and nurture a culture for builders of the MIT tradition, where no project is begun without thorough analysis and where no design is complete without physical demonstration as proof.

The department completed a renovation of part of the laboratory space in Room 38-500 to enhance flexibility and support of open “chalk-talk”-style teaching. This renovation, made possible through the generous donation of Dr. Frank Quick EE '69, SM '70, supports laboratory subjects and laboratory components of EECS core classes serving a broad constituency of undergraduate students from across the Institute. The laboratory subjects offer hands-on experience and education in a huge range of topic areas, including but not limited to energy conversion (e.g., 6.007, 6.131, 6.A47, 6.A48); digital design (e.g., 6.004, 6.111); embedded control (6.115); power electronics (6.131); robotics, motion, and task planning (6.01, 6.141, 6.142); silicon microfabrication (6.152J); analog design (6.101, 6.301, 6.302, 6.331); wireless communication (6.02, 6.102); optics and lasers (6.007, 6.161); and bioelectrical engineering (6.123J).

Students from the Sloan School of Management and the Departments of Earth, Atmospheric, and Planetary Sciences (EAPS); Mechanical Engineering; Aeronautics and Astronautics; Physics; Mathematics; and others make significant use of EECS department laboratories. The department laboratory subjects also provide training and equipment that support projects in laboratory classes in other departments. For example, activities from EECS laboratory subjects have become the centerpiece for the degree-requirement subject 2.670 Mechanical Engineering Tools. During the reporting period EECS laboratories also provided demonstrations and activities for General Institute Requirement (GIR) subjects such as 18.03 Differential Equations, facilities for freshman seminars, and activities for outreach programs with international extent, including, for example, the Women’s Technology Program, the Center for Materials Science and Engineering educational outreach program, science weekends at the MIT Museum, the MIT 150 celebration, and innumerable outreach activities for local K–12 schools, teacher organizations, and organizations such as the Boy Scouts and Girl Scouts. Some of these activities are shown in the photos in Figure 5.



Figure 5. Left to right: a student in 6.111 working on an advanced video display; a freshman in the EECS UROP program supporting MIT 150; a 6.131 student testing her 1,000-watt go-cart drive; and students over Independent Activities Period building speakers with engineers from Bose Corporation and Course 6 lab instructors.

EECS launched a new initiative for the department laboratories to make a quantum leap in the efficacy and excitement afforded by combining hands-on building experiences with engineering science education. This initiative focused on a transformative change in parts of the laboratory spaces in Rooms 38-500 and 38-600 to create a new Engineering Design Studio (EDS). EDS will enable rapid prototyping and flexible manufacturing. The modifications of these lab spaces are enabled by a generous gift from Cypress Semiconductor Corporation. This new EDS facility will expose students to the possibilities inherent in state-of-the-art product manufacturing technology and will potentially support new exercises and activities in not only the department laboratories but also the EECS core undergraduate courses.

Graduate Program

In AY2011, EECS graduated students in September, February, and June. The total number of advanced degrees awarded were as follows: 115 master of engineering degrees, 65 master of science degrees, 97 doctor of philosophy degrees, and five electrical engineering degrees. Additionally, EECS awarded joint master of science degrees with the Technology and Policy Program (two degrees), the Leaders for Global Operations program (six degrees), the MIT Mechanical Engineering Department (two degrees), Health Sciences and Technology (one degree), and the Operations Research Center (one degree). In total, therefore, 294 students obtained an advanced degree from EECS for 2012.

The graduate program in EECS continues to attract excellent applicants desiring to conduct ground-breaking research supervised by our faculty and staff. During the 2012 admissions season, 2,971 applications were received from all parts of the world. Of those applications, 196 students (approximately 6.5% of applications), originating from 37 different countries, were admitted into our graduate program. In the fall 2012 semester, 116 applicants will join our graduate program and will begin their graduate research. In our incoming 2012 class, 22% of students are women and 16% are underrepresented minorities (URMs).

EECS has been working steadily and consistently to achieve a graduate student community that is diverse in gender, ethnicity, and race. We are very encouraged that our concerted effort is now showing a positive impact. The admitted graduate student population of women and URM students has increased markedly over time. Over the past 15 years, the population of women entering our graduate program has increased from 15% to 25%, and the population of underrepresented minority students has increased from 5% to 16%. EECS will continue to focus on achieving a diverse graduate student community.

For the past seven years, all new incoming EECS graduate women have been invited to attend a faculty-organized, weekly yearlong networking seminar series. This year, for the first time, we have created a similarly designed "Networking Seminar Series" to which all of the newly admitted URM graduate students have been invited to participate. In both series, many of the topics for discussion are identical, but the most important goal is to meet often in an informal, welcoming atmosphere where concerns can easily be addressed.

The EECS graduate office faculty and staff have contributed in significant ways for many years to MIT's Institute-wide recruiting effort to attract underrepresented minority students into science, technology, engineering, and mathematics (STEM) fields. Many of our EECS faculty host junior undergraduates (10 during summer 2011) in their labs through the MIT Summer Research Program (MSRP), run through the Office of the Dean for Graduate Education (ODGE). EECS faculty and staff regularly contributed to MIT's CONVERGE program from 2004 to 2010. Our EECS graduate administrator is MIT's representative/coordinator for the GEM (National Consortium for Graduate Degrees for Minorities in Engineering and Science) GRAD (Getting Ready for Advanced Degrees) Lab run through ODGE; in 2011 MIT and Harvard hosted the GRAD Lab event. Several of our newly admitted URM students participated in the MRSP and CONVERGE programs and are now embarking on their graduate research in EECS. We view our effort at building relationships with underrepresented minority students at the undergraduate level as a key ingredient in expanding the diversity of our graduate student body. In many different ways (including presentations and discussion panels and attendance at national meetings of the Society of Hispanic Engineers), we also strive to clarify the graduate application process.

EECS faculty members have also been proactive in gaining insight and greater awareness of the issues faced by faculty and students from underrepresented minority groups, by participating in the National Science Foundation (NSF) Workshop for Engineering Faculty on the Professional Development and Mentoring of Underrepresented Minority Graduate Engineering Students in May 2011. As an outcome of that workshop, a special seminar was hosted by EECS and the School of Engineering to educate faculty members about ways to recruit and retain URM faculty. EECS faculty members and graduate students attended a follow-on NSF workshop, "Professional Development for URM Master's and Doctoral Engineering Students and Their Faculty Advisors," in November 2011.

A faculty resolution approved at the May 2004 MIT faculty meeting presented the challenge of working "to increase the percentage of URM graduate students by roughly a factor of three within a decade." We note that 16% of our newly admitted class of 2012 graduate students are URM students, compared to only 2% a decade ago.

6-A Master of Engineering Thesis Program

The department's 6-A Master of Engineering Thesis Program is in its 95th year. The program provides leading-edge technology opportunities with a full calendar year of tuition support from the company-funded 6-A Fellowship Program. The 6-A International Internship Program is in its seventh year, with one MEng student in Beijing at Microsoft Research Asia and one undergraduate student in Shanghai at Analog Devices. Thirty-five students applied to 6-A for summer 2012 positions at 15 participating companies. Twenty-one students were selected as members of the incoming 6-A class. Currently, there are 18 undergraduates and 17 MEng students in the program. Participating companies continue to offer challenging and well-mentored assignments. We hope that the improved thesis opportunities and funding will result in an increase in EECS student applicants to the 6-A Master of Engineering Thesis Program.

The J. Francis Reintjes Excellence in 6-A Industrial Practice Award was presented at the EECS spring awards ceremony in May to Travis Grusecki, an outstanding 6-A student whose assignment was at NetApp in Sunnyvale, CA. Travis demonstrated exceptional performance in his 6-A work assignments and completed a thesis titled “Improving Block Sharing in the Write Anywhere File Layout File System.” Travis has accepted an engineering position with the company.

Twitter and Maxim Integrated Products joined 6-A this year. Two MEng students worked at Twitter in San Francisco, CA during the summer and fall terms. One undergraduate student will be on a work assignment at Maxim in Sunnyvale, CA. There have been numerous inquiries from companies interested in the 6-A Program—an encouraging sign that we can obtain new members in the near future, as well as increase the number of applicants, positions, and participants in the 6-A Master of Engineering Thesis Program.

International Programs

The department is actively engaged in developing opportunities for global experiences for our students and faculty. Ongoing activities include a large number of EECS students participating in the MIT International Science and Technology Initiatives (MISTI), based in part on direct departmental support for MISTI. This year a record 113 EECS students engaged in summer MISTI internships—up from an average of 90 in previous years. Many of these internships are with corporate research and development labs and government research labs, allowing our students to put their education into practice globally. Professors Arvind and Charles Sodini coordinate the EECS international programs.

EECS students participate in a number of student-initiated international programs, such as the Accelerating Information Technology Innovation (AITI) program. Teaching introductory EECS subjects abroad has been a great success. It gives our students a way to experience foreign cultures that is difficult to achieve any other way. Such programs and activities are strongly supported by the department.

We have pioneered a program to enable faculty from international institutions (initially in China and Hong Kong) to spend time in our department observing our teaching methods and interacting with our faculty and students to learn best practices for effective educational delivery. We have added research interaction to these educational activities, giving the visitors a first-hand view of the department’s education through research. The program has been expanded to include faculty from the Masdar Institute of Science and Technology and will be used as a template for faculty coming from the Skolkovo Institute of Science and Technology.

Outreach

Women's Technology Program

2012 marks the 11th summer of the Women's Technology Program (WTP), which was founded in EECS in 2002. The WTP mission is to encourage high school girls with demonstrated math and science talent to pursue engineering and computer science by introducing them to these subjects in a hands-on, team-based format (Figure 6). WTP runs each year from the last week in June through the third week in July, straddling the MIT fiscal year.

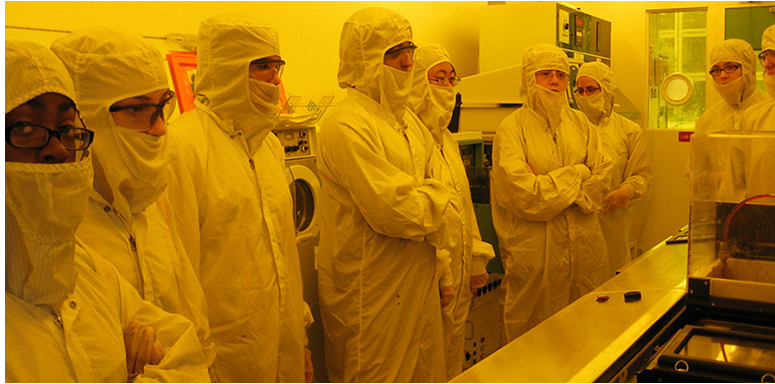


Figure 6. Women's Technology Program students in the MTL clean room.

WTP added a second curriculum track in mechanical engineering in 2006. Although the two curriculum tracks have separate classes, staffing, and budgets, they operate as one interdepartmental program. The WTP director (who sits in EECS) manages many administrative operations shared by the WTP-EECS and WTP-ME tracks, such as admissions, housing, dining, and a guest speaker series attended by all of the students.

For summer 2012, 60 students (40 for WTP-EECS and 20 for WTP-ME) were selected from an applicant pool of 270 female 11th-grade high school students from across the country. The WTP high school students are all top math and science performers who are not yet committed to pursuing engineering or computer science; WTP gives them an opportunity to learn more about their aptitude in these fields, shows them some of the exciting research being done here at MIT, and allows them to explore the MIT community. The WTP-EECS students take hands-on lab-based, college-level classes introducing them to electrical engineering, computer science, and discrete mathematics, all designed and taught by a dedicated staff of MIT graduate and undergraduate women students. This also provides a unique professional development experience for the MIT women students, encouraging them to pursue academic careers.

The entrance and exit surveys we administer to the WTP-EECS students demonstrate dramatic increases in their interest in the further study of engineering and computer science and in their confidence and ability to succeed in these fields. Over 90% indicate that their attitudes and perceptions of electrical engineering and computer science were more positive after attending WTP. We also track alumnae long term, and they give testimonials to the lasting impact of WTP-EECS on their current college pursuits and careers. Since 2002, more than 63% of the WTP-EECS alumnae have majored in a field of engineering or computer science (with another 22% in science or math).

Although it is not a stated goal, the WTP-EECS students also develop an interest in MIT. Of the 386 WTP-EECS alumnae since 2002, 165 (over 42%) have chosen to attend MIT; this includes 19 of the 40 summer 2011 students who will enter as MIT freshmen in fall 2012. WTP-EECS alumnae often pursue UROP or MEng thesis projects with MIT faculty who were WTP guest speakers in the summer they attended the program. This summer, five of the 12 WTP-EECS classroom tutors and residential assistants and one of the WTP-ME tutors are alumnae who attended WTP-EECS when they were in high school. The summer 2012 WTP students are currently rising high school seniors who will be applying to college this fall.

PRIMES

[MIT PRIMES](#) (Program for Research in Mathematics, Engineering and Science for High School Students) is a free, yearlong after-school research program serving high school students who live within driving distance from Boston. Program participants work with MIT researchers on exciting unsolved problems in mathematics, computer science, and computational biology. PRIMES was begun in October 2010 by Professor Pavel Etingof of the Mathematics Department. EECS initiated a computer science track in October 2011; professor Srinivasa Devadas served as the computer science coordinator for PRIMES in 2011–2012. Applications from high school students were received in October 2011; each application required solving math problems and completing a programming assignment. Students were notified of admission decisions in January 2012 and assigned a research project and a mentor.

In 2011–2012, PRIMES included 30 students (selected out of approximately 80 applicants) across the mathematics, computer science, and computational biology tracks. There were 10 students in the computer science program working on five different projects. These projects were suggested by professors Peter Szolovits, Seth Teller, Nick Roy (Aeronautics and Astronautics), Nancy Lynch, Armando Solar-Lezama, and Scott Aaronson. February through May 2012 was the active research period, during which the students worked on their projects under the guidance of a graduate student mentor. PRIMES students were expected to spend at least 10 hours per week working on their project and to meet with their mentors every week.

On May 20, 2012, the students presented their work to their parents, other PRIMES students, and professors involved with PRIMES at the second annual PRIMES conference. More details on the talks are available at the [PRIMES conference website](#)

(computer science section). In the summer and fall of 2012, students will continue to work on their projects and write a paper summarizing their results. These papers will be submitted to national science competitions for high school students, such as the Intel Science Talent Search, and/or sent to professional research journals for publication.

Faculty Notes

Faculty promotions (effective July 1, 2011):

Associate professor without tenure: Wojciech Matusik, Michael Watts

Associate professor with tenure: Elfar Adalsteinsson, Polina Golland, Manolis Kellis, Jing Kong, Collin Stultz, Antonio Torralba

Full professor: Erik Demaine, Piotr Indyk, Dina Katabi, David Perreault

Faculty on sabbatical leave:

Regina Barzilay	Fall 2011/spring 2012
David Gifford	Fall 2011/spring 2012
Tommi Jaakkola	Spring 2011/fall 2011
Samuel Madden	Spring 2011/fall 2011
Terry Orlando	Spring 2012/fall 2012
Joel Voldman	Spring 2012
Victor Zue	Fall 2011

Faculty on junior research leave:

Mehmet Yanik	Fall 2011
--------------	-----------

Faculty on family release:

Timothy Lu	Spring 2012
Asu Ozdaglar	Spring 2012
Tomas Palacios	Fall 2011

Faculty on leave:

Akintunde Akinwande (Leave with Pay-Intergovernmental Personnel Act)
Fall 2011/spring 2012

Rajeev Ram (Leave with Pay-Intergovernmental Personnel Act)
Fall 2011/spring 2012

Retired faculty:

Erich Ippen

The department notes with sadness the passing of David H. Staelin, 1938–2011. Professor Staelin '60, SM '61, ScD '65, was a member of the Department of Electrical Engineering and Computer Science and the Research Laboratory of Electronics.

Driven by a deeply felt sense of responsibility to MIT, the nation, and society as a whole, Professor Staelin dedicated his long career to basic science, technology development, service, education, and entrepreneurship. He was a dedicated teacher who helped educate generations of electrical engineers.

Professor Staelin joined the department in 1965, conducting research in radio astronomy, which expanded over time to include remote sensing for climate monitoring. He brought together a strong command of electromagnetics, signal processing methodology, and computation trends. In subsequent years, he turned his attention to important emerging problems that required the application of sophisticated signal processing and estimation theory.

As an active member of the MIT community, Professor Staelin served on numerous committees and took on important leadership roles. Later in his career, he served as assistant director of Lincoln Laboratory for 11 years (1990–2001). He also served as a member of the President's Information Technology Advisory Committee (2003–2005). Professor Staelin won the 2011 John Howard Dellinger Medal from the International Union of Radio Science (Union Radio-Scientifique Internationale).

Three new faculty members joined the department this year (Figure 7).



Figure 7. Professors Adam Chlipala, Yury Polyanskiy, and Nir Shavit.

Adam Chlipala joined MIT on July 1, 2011, as an assistant professor of electrical engineering and computer science and a member of CSAIL. He received his BS in computer science at Carnegie Mellon in 2003 and his PhD in computer science at UC Berkeley in 2007. Before starting at MIT, he was a postdoctoral fellow at Harvard. His research focuses on applications of formal logic to software development and analysis. One specialty area is building machine-checked mathematical proofs of correctness for programming tools such as compilers and runtime systems, and he has a general interest in the pragmatics of machine-checked mathematics. Adam also works in the design and implementation of functional programming languages, exemplified

by his new domain-specific programming language Ur/Web, which brings strong mathematical guarantees to the world of web applications. He received the James H. Ferry Award for his proposed research titled “Rigorous Mathematics Education with Instant, Automated Feedback.”

Yury Polyanskiy joined MIT on July 1, 2011, as an assistant professor of electrical engineering and computer science and a member of the Laboratory for Information and Decision Systems. He received an MS degree in applied mathematics and physics from the Moscow Institute of Physics and Technology in 2005 and a PhD in electrical engineering from Princeton University in 2010. During 2000–2005, he led development of embedded software in the Department of Surface Oilfield Equipment at Borets Company LLC. His research interests include information theory, error-correcting codes, wireless communication, and the theory of random processes. Yury won the 2011 Best Paper Award from the IEEE (Institute of Electrical and Electronics Engineers) Information Theory Society. He received the Best Student Paper Award at the 2008 and 2010 IEEE International Symposiums on Information Theory and a silver medal at the 30th International Physics Olympiad, held in Padova, Italy. He was supported in his final year of graduate studies through a Princeton University Honoric Dodds Fellowship (2009–2010).

Nir Shavit joined MIT on July 1, 2011, as a full professor of electrical engineering and computer science and a member of CSAIL. He received BSc and MSc degrees in computer science from Technion-Israel Institute of Technology in 1984 and 1986, respectively, and a PhD in computer science from the Hebrew University of Jerusalem in 1990. Nir is a coauthor of the book *The Art of Multiprocessor Programming* and won the 2004 Gödel Prize in theoretical computer science for his work on applying tools from algebraic topology to model shared-memory computability. He is a past program chair of the Association for Computing Machinery (ACM) Symposium on Principles of Distributed Computing and the ACM Symposium on Parallelism in Algorithms and Architectures. His current research covers techniques for designing scalable software for multiprocessors, in particular concurrent data structures for multicore machines.

The department hosted four visiting faculty this year: associate professor Khurram Afridi, Martin Luther King Jr. associate professor Paul Ampadu, associate professor Michael Collins, and assistant professor Hayden So.

Faculty Appointments

Career Development Professorship Appointments

Hadar Dana Moshkovitz was selected as the ITT career development professor in computer technology.

Konstantinos Daskalakis was selected as the X-Window Consortium career development professor.

Wojciech Matusik was appointed Esther and Harold E. Edgerton career development professor.

Michael Watts was selected as the KDD career development professor in communications and technology.

Senior Professorship Appointments

Professor Hari Balakrishnan was selected as the Fujitsu professor in electrical engineering and computer science.

Professor Frans Kaashoek was selected as the inaugural holder of the Charles A. Piper (1935) professorship.

Professor George Verghese was selected as the Henry Ellis Warren professor in electrical engineering.

Faculty Awards and Honors

Professor Aaronson was one of two young scientists to win NSF's Alan T. Waterman Award.

Professor Hal Abelson received two awards from the Association for Computing Machinery: he was named the recipient of the 2012 ACM SIGCSE Award for Outstanding Contributions to Computer Science Education and was subsequently honored with the Karl V. Karlstom Outstanding Educator Award for his contributions to computer science education.

Professor Agarwal was named the director of the new unit to advance MITx, as announced to the MIT community by (then) provost L. Rafael Reif. Professor Agarwal was subsequently named on May 2, 2012, as the first president of edX, the online education program to be offered jointly by Harvard University and MIT.

Professor Daniela Rus was selected as the director of CSAIL effective May 23, 2012, succeeding Professor Agarwal.

Professor Arvind was elected as a member of the American Academy of Arts and Sciences and won the IEEE Computer Society 2012 Harry H. Goode Award "for fundamental contributions to research in dataflow computing, memory models, and cache coherence protocols."

Professor Vladimir Bulović was named director of MIT's Microsystems Technology Laboratories.

Dr. David D. Clark was presented with the Oxford Internet Institute Lifetime Achievement Award in recognition of his intellectual and institutional contributions to the advancement of the Internet.

Professor Jesús del Alamo was selected by Intel for the 2012 Intel Outstanding Researcher Award in Emerging Research Devices for his “Feasibility Study of InGaAs-based Quantum-Well Field-Effect Transistors for Ultra High Speed, Low Power Logic Applications.”

Professor Jack Dennis was inducted into the Association for Computing Machinery Special Interest Group on Operating Systems Hall of Fame.

Professor emerita Mildred S. Dresselhaus was selected by President Obama for the Enrico Fermi Award. She was cited for “leadership in condensed matter physics, in energy and scientific policy, in service to the scientific community, and in mentoring women in the sciences.” She was subsequently awarded the Kavli Prize in Nanoscience “for her pioneering contributions to the study of phonons, electron-phonon interactions, and thermal transport in nanostructures.”

Professor Yoel Fink (joint professor of electrical engineering and computer science) was selected as director of the Research Laboratory of Electronics at MIT.

Professor Gifford was elected as a fellow by the Association for Computing Machinery, for “contributions to distributed systems, e-commerce and content distribution.”

Professor M. Frans Kaashoek was elected as a member of the American Academy of Arts and Sciences.

Professors Indyk and Katabi (and EECS graduate students Eric Price and Haitham Hassanieh) were recognized by *Technology Review* for creating one of the TR10—the top 10 emerging technology breakthroughs with the potential to transform the world.

Professor Leslie P. Kaelbling was selected as a 2012 MacVicar Faculty Fellow.

Professors Charles Leiserson and Ron Rivest (and EECS graduates Thomas Cormen and Cliff Stein) celebrated the sale of the 500,000th copy of their best-selling text published by MIT Press, *Introduction to Algorithms*, built on the class (6.046) of the same name.

Professor Barbara Liskov was selected for the Katayanagi Prize for Research Excellence in 2011. She received two other honors in AY2011. As a 2012 inductee into the National Inventors Hall of Fame, Professor Liskov was cited “for her contributions to programming languages and system design.” She was also elected as a member of the National Academy of Sciences.

Professor Tomás Lozano-Pérez was selected as an IEEE Fellow in 2012. He was cited for “contributions to robot motion planning.”

Professor Lu won the National Institutes of Health Director’s New Innovator Award. Professor Lu was also awarded the MIT Henry L. and Grace Doherty professorship in ocean utilization.

Professor Lynch was selected by the Association for Computing Machinery as the 2012–2013 Athena Lecturer.

Professor Matusik was selected as a Sloan Research Fellow and also won the 2012 DARPA (Defense Advanced Research Projects Agency) Young Faculty Award.

Professor Palacios was selected for the Presidential Early Career Award for Scientists and Engineers (PECASE 2011).

Professor Pablo Parrilo was the recipient of the 2011 Antonio Ruberti Outstanding Young Researcher Award, given by the IEEE Control Systems Society. He was cited for “fundamental contributions to optimization theory and its applications.”

Professor Li-Shiuan Peh was named a distinguished scientist by the Association for Computing Machinery.

Professor Rahul Sarpeshkar was chosen to attend the National Academy of Engineering’s 17th US Frontiers of Engineering symposium.

Professor Dana Weinstein was selected for the National Science Foundation Early Career Award.

Professor Yanik received the National Institutes of Health Director’s Pioneer Award.

Teaching and Service Awards

The following faculty and staff received awards at the annual EECS spring awards ceremony held in May.

Professors John Guttag and Hari Balakrishnan were winners of the 2012 Jamieson Prize for excellence in teaching.

Professor Kong was presented the Best Instructor Award by Eta Kappa Nu.

Professor Russell L. Tedrake received the Ruth and Joel Spira Award for distinguished teaching.

Professor Weinstein was awarded the Jerome Saltzer Award for outstanding recitation teaching in undergraduate core subjects.

Professor Duane S. Boning was presented the Best Advisor Award by IEEE.

Professor Orlando received the GSA Graduate Counselor Award.

Agnes Chow was presented the Richard J. Caloggero Award for dedicated service to the department.

Tony Eng, senior lecturer, received the Department Head Special Recognition Award.

Student Awards

The following awards were presented to EECS students during the May spring awards ceremony.

Carlton E. Tucker Teaching Award: Adam J. Hartz

Harold L. Hazen Teaching Award: Phillip M. Nadeau

Frederick C. Hennie III Teaching Awards: Austin Clements, Anirudh Sivaraman, and Joseph D. Steinmeyer

Robert A. Fano UROP Award for Outstanding UROP in EECS: Brian R. Sennett

J.C.R. Licklider UROP Prize for Outstanding UROP in Networking or Human-Computer Interaction: Ivan A. Sergeev

Anna Pogosyants UROP Prize: Panupong Pasupat

Northern Telecom/BNR Project Award for Outstanding 6.111 Laboratory Project: Jose Cruz Serralles and Logan P. Williams (fall 2011) for the project "Recursive Augmented Reality"

George C. Newton UG Lab Prize: Scott M. Bezek and Rui Luo for the project "Improv Tetris"

David A. Chanen Writing Award for the best paper in the subject 6.033: Kenny H. Lam

Charles & Jennifer Johnson CS MEng Thesis Prize: Timothy R. Schoen for "Constraint-Aware Distributed Robotic Assembly and Disassembly"

David Adler Memorial EE MEng Thesis Prize:

First place: Frank M. Yaul for "A Flexible Underwater Pressure Sensor Array for Artificial Lateral Line Applications"

Second place: Jonathan P. Mailoa for "Anti-Reflection Zinc Oxide Nanocones for Higher Efficiency Thin-Film Silicon Solar Cells"

Morris Joseph Levin Award for Best Master Works Thesis Presentation:

Adrian V. Dalca for "Segmentation of Nerve Bundles and Ganglia in Spine MRI Using Practical Filters"

Gauri Joshi for "On Playback Delay in Streaming Communication"

Yi Chang Shih for "Laser Speckle Photography for Surface Tampering Detection"

Frank M. Yaul for "A Flexible Underwater Pressure Sensor Array Using a Conductive Elastomer Strain Gauge"

J. Francis Reintjes Excellence in 6-A Industrial Practice Award: Travis R. Grusecki, NetApp, Sunnyvale, CA

William A. Martin Memorial CS SM Thesis Prize:

First place: Gauri Joshi for "On Playback Delay in Streaming Communication"

Second place: Zeyuan Zhu for "Mechanism Design with Approximate Types"

Ernst A. Guillemin EE SM Thesis Award:

First place: Guillaume Lestoquoy for “Resolving Optic Illumination Distributions Along an Axially Symmetric Photodetecting Fiber”

Second place: Chen Sun for “Design Space Exploration of Photonic Interconnects”

Jin-Au Kong Outstanding Doctoral Thesis Prize:

Venkat Chandrasekaran for “Convex Optimization Methods for Graphs and Statistical Modeling”

Shu-Wei Huang for “High Energy Sub-Cycle Optical Waveform Synthesizer”

George M. Sprowls CS Thesis Awards:

Michael S. Bernstein for “Crowd-Powered Systems”

Satchithananthavale R.K. Branavan for “Grounding Linguistic Analysis in Control Applications”

Anantha P. Chandrakasan

Department Head

Joseph F. and Nancy P. Keithley Professor of Electrical Engineering