

## **Bernard M. Gordon–MIT Engineering Leadership Program/ Undergraduate Practice Opportunities Program**

The [Bernard M. Gordon–MIT Engineering Leadership Program](#) (GEL) was launched in 2007 through a \$20 million pledge (with a matching component) from the Bernard M. Gordon Foundation. This was the largest gift made to MIT's School of Engineering for curriculum development. The program's mission is to educate and develop the character of outstanding MIT students as potential future leaders in the world of engineering practice and development, and to endeavor to transform engineering leadership in the nation, thereby significantly increasing product development capability.

This co-curricular one- or two-year program provides a select group of MIT engineering undergraduates with a challenging and supportive environment in which they develop leadership skills that help them to become highly effective leaders of engineering teams. Each year, approximately 170 rising juniors and seniors apply to the program. The first year, Gordon Engineering Leader Year One (GEL1), introduces students to engineering leadership experiences and development; approximately 140 students participate. For a smaller group of 30 to 35 students, Gordon Engineering Leader Year Two (GEL2) is an intensely personalized leadership development program that includes opportunities to practice leadership and for significant interactions with industry leaders, staff, and fellow students.

The [Undergraduate Practice Opportunities Program](#) (UPOP) predates the GEL program. It was launched in 2001 by Thomas Magnanti, who was then the dean of the School of Engineering. UPOP is a yearlong program that prepares MIT sophomores to enter and thrive in the professional world, through experiential learning, individual coaching, access to internships, and mentoring relationships with MIT alumni and industry partners. When the GEL program was formed, UPOP became a part of the program, forming a natural progression from UPOP in the sophomore year to GEL1 and GEL2 in the junior and senior years. Although UPOP is a welcome foundation for GEL, it is not a prerequisite.

### **Gordon–MIT Engineering Leadership Program**

Educating tomorrow's engineering leaders demands a new approach that encompasses students' professional, personal, and leadership progression in an environment that fosters the development of core values and which builds upon the strong technical fundamentals of the rigorous MIT education.

Students who participate in the GEL program develop their ability to apply technical training to the world of industry and research. The GEL program provides students opportunities to participate in leadership and innovation, character development, invention, and implementation. The program is delivered through a dedicated instructional staff whose work is supplemented by the study of other relevant subjects, industry collaborations, volunteer mentors, and "engineers in the room." The program also offers professional education opportunities for early and mid-career engineering professionals and for developing innovative design skills.

During AY2016, the program demonstrated increasing relevance both within and beyond the Institute, and made considerable progress toward the following goals.

*Goal: Educate and Prepare Potential Future Leaders of Engineering Innovation, Invention, and Implementation Efforts.*

Rising juniors and seniors from engineering and other departments are encouraged to apply to the first year of the program. UPOP serves as a viable entryway into the GEL program (in AY2016, 57% of incoming GELs came from UPOP), but students can also enter by having demonstrated equivalent experience in an engineering project in an academic or industrial setting. First-year students participate in a set of augmenting elective subjects and immersive learning experiences that, taken together, approximate the level of an MIT concentration.

For a select cohort of students who have successfully completed the first-year program requirements and choose to continue (30 to 35 students), GEL2 offers an array of highly personalized leadership development activities, featuring a high degree of interaction with industry leaders, faculty, and fellow students. The aggregate two-year program requirements approximate the level of an MIT minor.

In fall 2016, 133 students are expected to enter GEL1, up from an initial cohort of 17 in fall 2008. The majority of incoming students (GEL1 students) represent 11 departments across the Institute, including all of the engineering departments. Thirty-four students will advance to GEL2—the largest advancing cohort in the program’s history.

Incoming students in GEL1 will largely represent MIT’s School of Engineering (in proportion to department size), but there are also students from Courses 7, 8, and 18 who have expressed an interest in engineering. Because GEL program graduates are expected to work in industry with professionals from other disciplines, it is a priority to immerse GELs in such collaborative scenarios as early as possible.

Beyond the undergraduate program, the program’s faculty and staff have collaborated with MIT Professional Education to create and deliver courses on engineering leadership and innovation for early- and midcareer engineering professionals. During AY2016, there were 16 participants in the Engineering Leadership for Early Career Professionals, 14 in the Engineering Leadership for Mid-Career Professionals, and 51 in the Mastering Innovation and Design-Thinking course. These courses received positive feedback and contributed significant funds to the GEL operating budget.

### **Program Expansion and Development**

The Gordon–MIT Engineering Leadership Program continues to be widely acknowledged by the Institute as a valuable asset for students and for developing potential future leaders in the world of engineering practice. This year, the [MIT Innovation Initiative](#) expressed its support for the program by including GEL program courses as part of the new Entrepreneurship and Innovation minor, which will be launched in fall 2016. As part of the requirements for the minor, students must complete an elective subject in each of three categories—entrepreneurship and innovation in

context, leadership of teams and organizations, and entrepreneurship and innovation (experiential). Completing the GEL1 program will satisfy the requirement under the category of leadership of teams and organizations. Program leadership anticipates that as MIT undergraduates become more aware of these offerings through the Entrepreneurship and Innovation Initiative, demand will continue to grow.

Another noteworthy opportunity for GEL to expand its impact at the Institute came as a result of the disbandment of MIT's Engineering Systems Division. Because GEL subjects were categorized under the Engineering Systems Division course numbering system, the program was faced with the challenge of finding a new department home and course numbers. GEL has gained widespread support and approval across MIT's School of Engineering for helping students in all engineering majors become more effective at leading engineering teams. With the support of the School, GEL therefore will become multidisciplinary (Courses 6 and 16) in fall 2016.

In response to the increased interest in helping to support MIT's graduate population, GEL is working toward creating a fully developed engineering leadership development program for graduate students. Dr. David Niño was tasked with overseeing the initiative and piloted GEL's first graduate course, ESD.S32 Leading Creative Teams, last spring. The course received overwhelmingly positive feedback from the 16 graduate students who completed it. In the coming year, GEL will continue to work toward expanding its course offerings and will offer this course again in fall 2016.

In support of our efforts to launch a graduate version of GEL, the Biological Engineering (BE) Communication Lab is being merged into GEL's organizational structure as a partner activity. The BE Communication Lab has grown increasingly successful over the past four years, with a strong impact on the graduate community. Biological Engineering and GEL share similar beliefs regarding the importance of students' ability to communicate effectively and coach others; the programs agree that these are foundational skills within leadership education. During AY2017, we plan to continue exploring these emerging synergies in hopes that graduate students will become more aware of the program and that demand for our graduate courses will grow.

### **Gordon–MIT Engineering Leadership Program Years One and Two: Continued Growth**

During AY2016, the GEL program sustained its growth trajectory. Student applications to GEL1 remained high and continued to trend upward, reflecting increased student demand for GEL offerings. Word of mouth among students continues to be an effective method of spreading program awareness, generating 43% of applications in AY2016 (the other leading source was UPOP [57% percent]). In AY2016, 164 students applied for admission to GEL1. Eighty-eight students earned Certificates of Completion from the Gel program in May 2016—23 from the twoyear program and 65 from the oneyear program.

*Goal: Increase the Focus of National Engineering Education on the Development of Leaders of Engineering Innovation, Invention, and Implementation.*

During AY2016, the GEL program continued to advance the Community of Practice for Leadership Education for Twenty-first Century Engineers (COMPLETE) by participating in its annual conference at Pennsylvania State University in November 2015. GEL representatives also participated in a COMPLETE meeting in New Orleans, LA, in June 2016. As a founding member of COMPLETE, the GEL program remains a driving force behind advancing the agenda for this growing group.

The ongoing COMPLETE meetings—the purpose of which is to share best practices and advance the practice of engineering leadership—gather representatives from more than a dozen institutes in North America with engineering leadership programs. Creative public relations efforts augmented the program’s visibility in numerous national and trade publications, reinforcing GEL’s position as the “thought leader” in engineering leadership.

As a widely recognized “thought leader” in the field of engineering leadership education, GEL in AY2016 hosted multiple visitors from other institutes who have established, or are seeking to establish, engineering leadership programs at their respective colleges or universities. This year’s university visitors included representatives from Southern Illinois University, St. Thomas University (Minnesota), the University of Texas at El Paso, and Western University (Canada).

In addition, GEL students in AY2016 contributed to the national discussion about the landscape of engineering education through participation at ethics and leadership conferences at the United States Military Academy, the United States Naval Academy, and the United States Air Force Academy.

The GEL program’s impact on engineering leadership has also grown to a national level through participation in the American Society of Engineering Educators (ASEE). In the past two years, GEL has played a pivotal role in developing the newest [LEAD Division of the ASEE](#), which is the ninth largest division in the ASEE, with more than 700 members who are educators of engineering leadership. Dr. David Niño is currently representing GEL. He serves as treasurer of the division and is also working closely with Northeastern and other allies to lead strategic planning.

In support of the GEL program’s mission to disseminate “best practices” in engineering leadership education, program staff planned and led a discussion on “Developing Engineering Leaders Using a Reflective Autobiographical Exercise.” Staff also participated as one of four panelists in discussion of engineering leadership education university programs at the annual ASEE Conference in New Orleans, LA, in June 2016.

### **Relocation Update**

In fall 2015, the GEL offices moved to Room 35-433. The new office allows for more workspace for staff as well as providing more meeting areas for students.

### **Undergraduate Practice Opportunities Program**

The Undergraduate Practice Opportunities Program is a voluntary, yearlong, professional development program whose mission is to prepare sophomores to integrate successfully into and thrive in the professional world, and to be strong contributors to their

organizations. Each year, UPOP supports several hundred MIT sophomores. Applicants come from all Institute majors and represent almost half the sophomore class.

In AY2016, of the 506 students who applied, 465 applicants were admitted; 324 students completed the Team Training Workshop requirement (weeklong workshops over MIT's Independent Activities Period [IAP] in January) and 312 students completed all the requirements of the program. In other words, approximately one in three students of the MIT Class of 2018 can be expected to complete UPOP's full yearlong program, gaining skills essential to thriving in the professional world.

### **Student Program Growth**

UPOP began its first year of operation in AY2002 with approximately 73 students. Enrollment has grown steadily, with a marked increase since AY2007. This reflects a greater demand from MIT undergraduates for the unique programming provided by UPOP, which offers students abundant opportunities to practice and integrate the skills they will need for career success.

UPOP has also seen a steady increase in its retention rate from 49% to 60% (it had fluctuated over the past three years from 60% to 66%) since implementing some significant changes, starting in AY2013. With student development theory in mind, the program has placed greater emphasis on one-on-one advising and a personalized approach. Each student is assigned an advisor (one of UPOP's student program coordinators) with whom they must meet at least once, in addition to the program's open-door policy throughout the year for advising and coaching. UPOP's employer relations manager holds office hours for students' personalized internship-search coaching. An extensive "à la carte" menu of workshops and events allows students to tailor the program to fit their individual needs, interests, and goals.

Since AY2015, the addition of a three-day alternative version of UPOP's weeklong IAP Team Training Workshop has allowed more students to complete the program. UPOP works closely with the Alumni Association's Externship Program, with the MIT International Science and Technology Initiatives Program's Global Teaching Labs, and other campus programs and departments to ensure that students involved in those programs are able to participate in UPOP by attending the alternative session, which is held over Presidents' Day Weekend.

UPOP requirements include individual coaching sessions with UPOP staff, a weeklong Team Training Workshop that is delivered twice over IAP, plus a three-day alternative workshop over Presidents' Day Weekend. The workshop features experiential modules taught by MIT faculty and other industry professionals focusing on communication, decision making, and teamwork. In addition, students are required to attend topical seminars led by staff, industry professionals, and MIT alumni; secure a career-relevant summer practical experience; submit written reflective reports during their summer experience; and complete follow-up meetings with staff.

The UPOP curriculum expanded to offer more topical workshops in the fall and spring semesters, with greater opportunities to engage with MIT alumni and employers.

Continuing customized employer events allow students to learn more about the career opportunities available to them and to practice engaging with employers. These events also act as a source of revenue (see employer engagement and sponsorship). This year's regular review of the Team Training Workshop curriculum resulted in one new module, which introduces students to a framework for brainstorming and decision making using De Bono's Six Hats methodology. The new module, "Team Creativity," was developed by two MIT alumni who are UPOP mentors.

### **Summer 2016 Internships**

UPOP students are required to participate in a summer experience within an organization to help advance professional goals. The majority of UPOP students participated in industry internships both domestic and international, from large corporations to small start-ups, from corporate offices to research and government environments. Students also participated in research opportunities at other institutions, teaching and tutoring experiences, and volunteer activities. Some 67% of UPOP students participated in traditional industry internships, more than half of which were acquired through a UPOP-established employer connection.

- Total UPOP students: 312
- Total industry internships (domestic and international): 212
- Number of UPOP-specific or UPOP-connected internships: 115

The top summer intern employers in 2016 were Google (12 UPOP student interns), Northrop Grumman (12), Ab Initio (seven), Microsoft (six), Pioneer Natural Resources (five), Dassault Systèmes and Akamai Technologies (four each), and Lockheed Martin, Goldman Sachs, Intersystems and Bose (three each).

### **Employer Engagement and Sponsorship**

In AY2016, UPOP again attracted a large pool of actively engaged volunteers, sponsors, and internship employers. More than 100 companies posted UPOP-specific job opportunities for sophomores and more than 125 companies registered for the Team Training Camps' capstone events—the January networking luncheons. In addition to UPOP's traditional offerings of company field trips and educational events, the program also hosted 14 corporate-sponsored events.

UPOP began an industry fundraising initiative in AY2014, raising \$48,000 from industry sponsorships that year. In AY2015, UPOP raised \$100,436, and in AY2016 the program raised \$121,250.

### **MIT Alumni and Mentor Support and Involvement**

UPOP expanded the mentorship program within the Team Training Workshop weeks during IAP and Presidents' Day Weekend, where MIT alumni and other industry professionals volunteer to participate in the workshops as mentors for a team of seven to eight students. Mentors are essential for teaching curriculum content and guiding student discussions. Of the 56 mentors who participated in AY2016, 42 were repeat participants from past years and 14 were new. Additionally, as part of the series "UPOP

Presents,” several alumni delivered topical seminars for the MIT community during IAP and the spring semester. Subjects included copyright and trademark law, the New Horizons interplanetary mission, private equity, and entrepreneurship.

Sixty-three MIT alumni participated as industry guests at events within the yearlong curriculum. UPOP engages with more than 400 community members through a monthly newsletter that provides updates and highlights of the program.

To continue advancing the goals of UPOP through mentor and alumni involvement, in 2014 the program established a UPOP Advisory Board that meets each July. The board is composed of 20 or more MIT alumni. In July 2015, board members formed subcommittees that worked actively throughout AY2016 on fundraising, outreach, and best practices.

### **Program Alumni**

Twenty-one juniors or seniors who were UPOP alumni participated as peer advisors in the fall semester’s “Popcorn Friday – Ask an Alum” series. UPOP continued its series of “Industry Rotations” presentations in the spring semester, inviting UPOP alumni and early-career MIT alumni to engage current UPOP students in discussions about their career paths. UPOP alumni continue to be involved as industry volunteers, employers of interns, and sponsors on behalf of their organizations. In AY2016, 32 UPOP alumni participated in the program as industry volunteers.

### **Program Expansion and Collaboration**

UPOP collaborated with the new School of Engineering Sandbox Innovation Fund Program by planning and executing a daylong workshop for program participants on effective pitch presentations and teamwork. UPOP presenters and staff delivered three of the workshop’s modules.

UPOP is collaborating with Professor Warren Seering of Mechanical Engineering to contribute to a study on career paths of MIT alumni and industry professionals. UPOP students contribute to the study by reporting, during their summer work experiences, on their informational interviews with MIT alums and industry professionals

UPOP participated in the annual Innovation Initiative conference. A UPOP graduate was a speaker at the conference, and UPOP’s employer relations program manager participated on a panel.

### **Staff**

The program has five full-time staff members reporting to Professor Joel Schindall, director of UPOP and ELP: two student program coordinators, an employer relations program manager, a mentor liaison and outreach coordinator, and a communications and operations coordinator. In June 2015, one of the two student program coordinators left the program; UPOP seeks to fill the position by fall 2016.

## **Accomplishments and Awards**

The combined GEL and UPOP programs impacted more than 1,000 students throughout the year. The programs received corporate funding in the form of grants and company sponsorships as well as funding from a pool of committed individual donors, including program alumni.

### **Gordon Engineering Leadership Program**

- One hundred sixty-four MIT undergraduates applied to join GEL1 in fall 2016; 133 students, representing 11 MIT departments (including all departments in the School of Engineering), will enter GEL1 in fall 2016.
- Eighty-eight GEL students earned Program Completion Certificates in May 2016.
- GEL coordinated with MIT Professional Education to offer three professional education courses to 81 participants.
- GEL offered its first graduate course, with 17 students enrolled, in spring 2016.
- GEL subjects can be used to fulfill elective credit toward the Entrepreneurship and Innovation minor starting in fall 2016.
- GEL held two Industry Advisory Board meetings to receive input from engineering leaders.
- GEL has played a pivotal role in developing the newest LEAD Division of the ASEE, which is the fastest-growing division in the nation with more than 700 members.
- GEL led and participated in a panel discussion at the ASEE Conference in New Orleans, LA, in June 2016.
- The GEL program's offices moved to Room 35-433, which includes more workspace for program staff and meeting areas for students.
- In recognition of her outstanding contributions to the program, Administrative Assistant Amy SheaSlattery was awarded an MIT Excellence Award in spring 2016.

### **Undergraduate Practice Opportunities Program**

- The UPOP team of five full-time staff members was awarded the 2016 School of Engineering Team Award for Excellence on May 25, 2016.
- In August 2015, UPOP launched a new cloud-based responsive website that allows the program to engage with its constituents in a more robust way.
- Five hundred and six MIT sophomores (class of 2018) applied to UPOP in fall 2015. Three hundred and forty-eight Class of 2017 students graduated from UPOP in September 2015.
- UPOP expanded its outreach on campus by collaborating with other departments and programs, including the Innovation Initiative, the new School of Engineering

Sandbox Innovation Fund Program, and the Department of Mechanical Engineering.

- UPOP’s corporate sponsorship program raised \$121,250 in AY2016, an increase of 21% over the previous year.
- A total of 68 individual donors contributed more than \$360,000 to the program in AY2016.
- UPOP’s original endowment fund goal of \$5 million has been met with two significant recent pledges from MIT alumni.
- UPOP participated in this year’s Senior Gift Challenge because of a UPOP mentor’s matching gift.
- As a result of UPOP nominations, UPOP mentors received two Institute awards in AY2016; veteran mentors received the Great Dome award, and two mentors who had initiated a grassroots funding campaign for UPOP received the Henry B. Kane ’24 Award.
- UPOP’s January Team Training Workshops were featured in a video posted on MIT News and on the School of Engineering website.
- UPOP’s efforts to increase diversity among its mentor pool to reflect the UPOP student population more accurately resulted in four new mentors who are persons of color and three new mentors who are women.

### **Future Plans**

- Expand outreach and increase awareness of GEL and UPOP programs among prospective MIT students.
- Continue to perform educational assessments related to the overall efficacy of GEL and UPOP.
- Continue to explore and discover synergies that exist and will benefit growth and development of all three programs under the GEL program’s organizational structure.

### **Gordon Engineering Leadership Program**

- Expand outreach and increase awareness of the GEL program among MIT alumni in an effort to increase MIT alumni engagement with the program.
- Continue to work closely and actively with the Office of Resource Development to solicit potential program supporters to meet fundmatching goals (the program has a matching fund requirement).
- Work on a strategic plan for the development of a GEL graduate program.
- Hire a new leadership coach to help meet the demand and grow the graduate program in AY2016.

- Diversify GEL’s mentor roster to be more representative of the current engineering majors in the program.
- Increase outreach and awareness of MIT Professional Education courses to determine what the appropriate vehicle is for expansion (e.g., more residential or online course offerings, presentations or workshops for selected companies).
- Explore new opportunities for collaboration with the MIT departments where GEL can lend its expertise in engineering leadership to help channel new innovations.
- Continue to have GEL lead strategic planning (with Northeastern University and other allies) for newly established LEAD division of the ASEE.
- Expand GEL’s industry outreach efforts and develop and implement a corporate sponsorship program.

### **Undergraduate Practice Opportunities Program**

- Expand outreach and increase awareness of UPOP (a program for sophomores) among the incoming freshmen, their parents, the MIT Office of Admissions and orientation staff, and educational counselors.
- Expand outreach and increase awareness of UPOP through engagement with the Alumni Leadership Conference and the Corporation Development Committee.
- Diversify UPOP’s mentor roster to be more representative of the diversity of students in the UPOP program.
- Explore the expansion of UPOP to a graduate student population.
- Expand opportunities for mentor and alumni engagement through vehicles such as the “UPOP Presents” seminars.
- Explore the expansion of UPOP through delivering aspects of the program to other programs within the MIT community and to outside organizations.
- Continue fundraising efforts with corporate sponsorships and MIT alumni donors.
- Collaborate with the MIT annual fund to launch a targeted fundraising outreach campaign to the UPOP alumni base (almost 3,000 members).
- Continue to recruit and retain a significant percentage of MIT sophomores.
- Continue to review and refine the yearlong and team training workshop curricula to best prepare MIT sophomores for the transition from the world of academia to the world of work.
- Continue to expand the roster of employers who engage with and hire UPOP students.

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