

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

Launched in July 2007 through a \$20-million pledge (with a matching component) from the Bernard M. Gordon Foundation (the largest gift made to MIT's School of Engineering for curriculum development), the [Bernard M. Gordon–MIT Engineering Leadership Program](#) (ELP) was established 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.

The curriculum to meet ELP's mission is derived from the belief that engineering leadership can best be developed by timely and systematically linking the following components:

- Immersive experiences on and off campus in which students practice, observe, and discuss engineering leadership
- Courses that provide conceptual and analytical models and frameworks that support engineering leadership
- Reflection, evaluation, and feedback from peers, faculty, and experienced engineering industry mentors on lessons learned from leadership activities

Students participate in ELP to enrich their departmental education; ELP provides augmented opportunities in leadership and innovation, invention, and implementation. The program is delivered through an alliance of MIT departments, other MIT programs, industry, and alumni interacting synergistically with undergraduates and maturing engineers in professional master's degree programs.

During AY2012, the program made considerable progress toward its goals, as follows.

Goal: Prepare all MIT engineering students to be more inclined to contribute to engineering innovation, invention, and implementation efforts and to be more effective contributors to such efforts.

ELP continues to meet this goal by supporting and enriching departmental programs throughout the Institute as well as via the sophomore-year [Undergraduate Practice Opportunities Program](#) (UPOP). In the aggregate, 1150 students benefited from ELP activities in MIT's School of Engineering during AY2012.

During AY2012 ELP:

- Funded 10 leadership teaching assistants (TAs) in the following subjects: 2.009 Product Engineering Processes, 3.042 Materials Project Laboratory, 22.033 Nuclear Systems Design Project, 10.26 Chemical Engineering Projects Lab, 16.00 Introduction to Aerospace and Design, 16.831 Space Systems Engineering, 6.170

Software Studio, 20.020/20.385 Introduction to Biological Design/Understanding Current Research in Synthetic Biology, and 2.75/2.753 Precision Machine Design/Development of Mechanical Products

- These 10 TAs, plus additional unfunded TAs invited to attend, received “teach-the-teacher” training in leadership, project planning, and effective teamwork, and delivered that material to the approximately 440 students in the above subjects
- Offered a two-hour “project team success workshop” (project planning and introduction to effective teamwork); approximately 75 students attended
- Engaged throughout the summer and academic year with student project teams (e.g., Solar Car, Rocket Team, Design-Build-Fly), helping team leaders and members hone their team skills

During AY2012, UPOP reached a record full-capacity enrollment of almost 400 students in its yearlong program of fall and spring seminars, two sessions of a weeklong Independent Activities Period intensive boot camp, summer internships, and fall reflective sessions.

Goal: Educate and prepare the potential future leaders of engineering innovation, invention, and implementation efforts.

Students can participate in one or two years of ELP. Sophomores seeking to join ELP enter either through UPOP or by having demonstrated commensurate experience in an engineering project in an industrial or academic setting. The first year of ELP, Gordon Engineering Leader (GEL) Year One, is open to a competitively chosen cohort of MIT engineering juniors and/or seniors. During GEL Year One, 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 cohort of 20-30 GELs who successfully complete the first-year program requirements and elect to advance, GEL Year Two offers an array of intensely 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.

During AY2012, student applications to join ELP for the following year remained high, at 150 compared to 149 in AY2012 and 153 in AY2011. Program leadership anticipates that as ELP becomes more known among MIT undergraduates, applications (and demand) will continue to remain high.

ELP graduated 43 GELs in AY2012 (up from 30 in AY2011). The program accepted 122 students for the GEL Year One program in fall 2012, up from an initial cohort of 22 GELs in the fall 2008. GELs entering ELP in fall 2012 represent 15 departments across the Institute, including all of the School of Engineering departments.

Goal: Increase the focus of national engineering education on the development of leaders of engineering innovation, invention, and implementation.

During AY2012, ELP continued to advance COMPLETE (Community of Practice for Leadership Education for Twenty-first-century Engineers) by participating in an “engineering leadership” meeting at the University of California-San Diego’s Gordon Center. A founding member of this burgeoning group, ELP remains a primary driving force behind its agenda.

These meetings, which share best practices and advance the practice of engineering leadership, gathered representatives from 10 institutes in North America with engineering leadership programs. Creative and aggressive outreach efforts augmented the program’s visibility in numerous national and trade publications, reinforcing ELP’s position as the “thought leader” in engineering leadership.

Additionally, ELP faculty offered workshops at regional meetings of the American Society of Engineering Education on the role of experiential learning in leadership and innovation, and how it can be assessed.

ELP is expanding its offerings beyond the Institute to young engineering professionals in industry. A highlight of these plans is ELP’s collaboration with AMD of Sunnyvale, CA, to create a learning tool to empower the next generation of engineering leaders. The tool will utilize input from AMD personnel and projects to teach students about the challenges encountered by engineers working on highly complex products within a diverse, global team.

Accomplishments and Awards

- 43 GELs earned Program Completion Certificates in May 2012
- Placed more than 30 GELs in summer “InternshipPlus” experiences (InternshipPlus completion is required for students in the GEL Year Two program)
- GEL students earned national awards, including one Truman Scholarship and two Gates Millennium Scholarships
- Recruited 40 System Design and Management/Leaders for Global Operations mentors for senior GELs
- Added members to the Industry Advisory Board to improve the representation of women and other minorities (and thus better reflect the student composition of ELP)
- Held three Industry Advisory Board meetings to receive input from engineering industry leaders
- Developed new measures for the assessment of leadership education, aiding in the identification of areas of investment for improving the program, and for documenting the success of the program for external communities interested in adopting elements of the ELP model

- Hired a senior lecturer/short-subject program manager to help meet increased student enrollment and demand for workshops/teaching modules, and to prepare the groundwork to expand ELP offerings beyond the Institute
- Participated in “Science of Sports” day at Cambridge Science Festival
- Selected for inclusion in the National Academy of Engineering’s Real World Engineering Education publication, which selected 29 schools from 90 applications
- Planned, coordinated and executed successful MIT150 Open House activity
- Created entries in MIT’s online “Experts Guide” for faculty in a new category, “Engineering Leadership”

In addition, both UPOP and ELP earned funding in the form of grants from AMD; Lockheed-Martin of Bethesda, MD; Northrop Grumman of Falls Church, VA; and the U.S. Department of Energy (administered through Florida Power & Light of Juno Beach, FL), as well as from a pool of committed individual donors.

Future Plans

- Continue to work closely with Resource Development to follow up with potential program supporters to meet fund-matching goals (the program has a matching fund requirement; we are currently behind schedule in terms of meeting this obligation)
- Actively work to obtain permanent space for office and ELP staff
- Work to continue the growth of UPOP
- Continue to expand the number of GELs completing the GEL Year One and GEL Year Two programs
- Expand engagement with departments by funding more leadership TAs, offering more workshops, and creating and offering more project-based subjects
- Conceive, design, and conduct engineering leadership workshops for young engineers

Ed Crawley
Codirector
Ford Professor of Engineering

Joel Schindall
Codirector
Professor of the Practice, Electrical Engineering and Computer Science