

System Design and Management

MIT System Design and Management (SDM) is an engineering and management master of science program that combines an intensive, unified core course sequence with related courses from the MIT School of Engineering and the MIT Sloan School of Management. The program brings together innovative distance learning, flexible matriculation options, and an interdisciplinary perspective.

The SDM track focuses on teaching mid-career professionals to lead effectively and creatively by using systems thinking to solve large-scale, complex challenges in a variety of industries and professions. SDM completed its 22nd year of operation in 2017-2018. The Integrated Design and Management (IDM) track admitted its third cohort in fall 2017. The track is led by Matthew Kressy. See the “Integrated Design and Management” section below for more information.

Academics and Research

The SDM track continues to show a commitment to education and to research in systems thinking. On April 30-May 1, 2018, SDM hosted a two-day symposium co-sponsored by the Brightline Initiative on the theme, “Characterizing the Gap Between Strategy and Implementation.” The symposium included three keynote speakers, 23 oral presentations, a poster session with 14 posters, panel discussions, and small group workshops. The symposium was attended by more than 120 people and highlighted the program’s ongoing work in research and investigation.

SDM continues to improve the synchronous distance education capabilities for the integrated core class. SDM invested in technology upgrades in Room 1-390 to provide improved audio and visual quality for distance learners. The year-long SDM core course is now delivered via Zoom meeting software, allowing distance certificate and master’s students to attend the two lectures and two recitations each week together with on-campus students—participating collaboratively with the on-campus cohort. SDM also held a comprehensive review of the engineering depth course choices for the SDM degree during the academic year. The purpose of the study was to identify connections between the key concepts taught in the SDM core and further exploration through other graduate engineering courses at MIT. The list of engineering depth course options was refined to ensure that all depth courses have content that allows additional learning in areas introduced through the SDM core.

Academic Director Bryan Moser served as one of three co-instructors for a new course, *Designing the First Year at MIT*. More than 50 undergraduates participated in this course that utilized the systems thinking approaches taught through SDM as a method to approach reinventing the first-year experience for MIT students.

Communications, Industry Relations, and Outreach

The MIT SDM Systems Thinking Webinar Series continued into its ninth year, offering live and on-demand streaming of informational lectures to students, alumni, and the general public. SDM also published two issues of the *SDM Pulse*, a newsletter that collects writing by SDM students and alumni on solutions to complex problems using systems thinking.

Finally, SDM had a presence at the Grace Hopper Celebration of Women in Computing in Orlando, FL, as a form of outreach to prospective students and recruiters from industries.

This year, SDM introduced a new series of events aimed at highlighting the ongoing connection of the program with the realities of industry-based problems. The Systems Nights networking events were held in October 2017 and April 2018. Selected alumni gave brief “lightning talks” on how they integrate systems thinking into their work. More than 50 attended each evening event. Feedback for the events has been extremely positive and SDM plans to continue these events in the future.

SDM also had the opportunity to visit multiple companies on two separate trips to observe operations, talk with high-level executives, and introduce their perspectives in discussions. Innovation Discovery Japan (IDJ) was organized by SDM students Masahiro Yamada '16, Hiroyuki Ikukawa '17, Ayano Kagami '17, and Takuya Kashimura '17. A group of 26 MIT students from across the Institute (including 10 SDM students and the four organizers) traveled to three cities in Japan during the January Independent Activities Period to visit 20 companies ranging in size from small startups to global manufacturers. A second Tech Trek trip occurred during MIT spring break in March 2018. This annual SDM trek traveled to San Francisco and visited eight companies, including Tesla, GitHub, Google, and Playground Ventures. Thirty-four students and staff were able to speak with C-level executives, tour manufacturing facilities, and network with program alumni who shared their experiences in industry after graduation. This trip was also spearheaded by students. Co-chairs were Eric Xu '17 and Samuel Lee '17, working in conjunction with SDM staff.

Industry Partners and Graduate Certificate in Systems and Product Development

The MIT Graduate Certificate Program in Systems and Product Development is now in its 18th year, with a total of 494 students having completed the program to date. Students enrolled in the certificate program attend the SDM core course, synchronously at a distance, with the SDM master's degree students. They participate together in teams, study groups, and projects. The certificate program culminates in a capstone project that integrates the in-class learnings with real-world projects from sponsoring companies. Company sponsors have included John Deere, Lawrence Livermore National Laboratory, Cummins, Boeing, United Technologies Corporation, Draper Laboratory, Analog Devices, and Biomerieux, among others. John Deere has sponsored more than 170 students in either the master's or certificate program. Enrollment for the Certificate Program in AY2018 included 39 students sponsored by eight companies.

Student Awards

Ben Linville-Engler, SDM '16, received the MIT SDM Student Award for Leadership, Innovation, and Systems Thinking. The other finalists were Justin Burke and John Gilmore (both SDM '16).

Federico Calil, SDM '17, received a Robert B. Guenassia Award for 2018 from MIT's Office of Graduate Education. This award grants \$1,500 to a graduate student who has attended the École Centrale in France.

Three SDM students participated in the organization of the 16th annual Sloan Healthcare and BioInnovations Conference. Ben Linville-Engler '16 served as co-lead for the overall conference, Tim Chiang '16 served as lead for the Sloan Healthcare Innovation Prize competition, and Justin Burke '16 served on the sponsorship team that helped raise money for the contest.

Admissions

SDM's marketing and admissions teams continued to focus on reaching out and educating potential students and companies about SDM. The program uses a combination of in-person information evenings—which target local technical professionals, including MIT alumni and others interested in the program—and virtual information sessions. SDM held two virtual sessions in AY2018, enabling prospective students from around the world to attend live webcasts or view the recorded sessions on demand.

SDM also spent much of AY2018 transitioning to Slate, a new admissions software platform also used by MIT Sloan. Three staffers attended in-person training and conferences to learn how to best use the new platform, which will also allow for better tracking and retention of applicants at all stages.

Fifty-eight master's degree students entered the SDM program in August 2017. The majority of these students (83%) attend the program full-time on campus. The remainder is split between distance students (7%) and local commuters (10%). The distance and commuter students remain employed while pursuing the SDM degree. In addition to students from corporate backgrounds, there were seven students from the US military branches (Air Force, Army, Coast Guard, and Navy). The overall yield of admitted students has remained consistently above 80%.

Admissions and Student Statistics, AY2009—AY2018

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 1/2014 | 8/2014 | 2015 | 2016 | 2017 |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Applications | 108 | 141 | 117 | 190 | 256 | 222 | 111 | 248 | 296 | 175 | 170 |
| Company admits | 16 | 27 | 22 | 24 | 23 | 21 | 17 | 16 | 8 | 28 | 29 |
| Self-sponsored admits | 44 | 57 | 50 | 51 | 39 | 41 | 24 | 46 | 55 | 31 | 35 |
| Total admits | 60 | 84 | 72 | 75 | 62 | 62 | 73 | 82 | 69 | 70 | 64 |
| Enrolled current round | 53 | 63 | 52 | 53 | 56 | 46 | 41 | 61 | 63 | 59 | 58 |
| Total enrolled* | 52 | 64 | 54 | 71 | 62 | 62 | 42 | 62 | 63 | 59 | 58 |
| Research assistants | 4 | 0 | 14 | 12 | 12 | 6 | 7 | 10 | 6 | 15 | 19 |
| Distance education | 16 | 19 | 10 | 11 | 11 | 15 | 4 | 16 | 8 | 4 | 4 |

* Includes second major students

Faculty and Staff

SDM continues to be led by faculty co-directors Warren Seering and Steven Eppinger and executive director Joan Rubin. Bryan Moser was brought on as academic director and senior lecturer. Bryan has been a lecturer for the SDM integrated core since 2013 and serves as associate director of MIT's Strategic Engineering Research Group. He is also a project associate professor at the University of Tokyo and director of its Global Teamwork Lab.

SDM communications director Lois Slavin retired after 19 years of service to MIT. The program appreciates her dedication and her innovations in SDM's communications strategy. Naomi Gutierrez, who currently works in career development and alumni services for SDM, serves as an interim communications staffer.

Ryan Liebel joined SDM as a distance education specialist on a part-time (50%) basis. He has worked at MIT in various departments, specializing in audiovisual technology, and assists SDM with the delivery of its integrated core class to distance students and other assorted webcasts.

Master of Engineering Management Program Consortium

The Master of Engineering Management Programs Consortium (MEMPC) continues to provide benefits to SDM through the sharing of best practices in admissions, program content and administration, and alumni support. In addition to MIT (SDM), consortium members now include Cornell, Dartmouth, Duke, Johns Hopkins, Northwestern, Purdue, Tufts, and the University of Southern California. Regional alumni groups are active in Boston; New York City; Washington, DC; and Chicago. Rutu Manchiganti, SDM '10, was named as executive director of the consortium in spring 2018.

Integrated Design and Management

Students in SDM's Integrated Design and Management (IDM) track study the human-centered design process in a way that will support them as they strive to become the next generation of innovation luminaries. IDM combines a state-of-the-art studio environment with in-depth instruction in engineering and human-centered design. Lectures by successful thought leaders, entrepreneurs, and management professors round out the world-class curriculum.

IDM draws students with backgrounds in engineering, business, and design—the elemental components for achieving financially sustainable, feasible, and desirable solutions and products. More than just teaching fundamentals, the admissions team deliberately selects participants for their desire to have a meaningful impact on the world. The mission of the IDM program is to develop extraordinary leaders who will bring creativity, vision, and integrity to business and society.

In AY2018, the cohort increased to 22 students—six male and 16 female, with six in the business discipline and eight each in the engineering and design disciplines. IDM is in its fourth year and has matriculated four cohorts to date. IDM has most recently admitted 27 students for the cohort beginning in fall 2018, nine into each discipline—11 male and 16 female. IDM will be welcoming students from China, Iran, Spain, Nigeria, India, Mexico, Taiwan, Peru, and Indonesia.

IDM's core curriculum is known as the Integrated Design Lab. This studio-style course, located in MIT's D-Lab, consists of lectures, workshops, seminars, and teamwork. The class meets twice weekly for five hours per day. Its blended learning approach emphasizes the importance of "mind plus hand plus heart." Consistent with the SDM track, degree requirements for graduation also include engineering and management foundation courses and electives, along with a final project and complementary thesis.

IDM Events

IDM hosted its annual sales gala on December 14, 2017. During this event, student teams sold products that they had designed, built, and manufactured to a minimum quantity of 50. All teams successfully sold out their inventory and turned a profit. More than 100 people from MIT and industry attended.

In the spring term, IDM students and industry partners presented more than 20 potential product opportunities, from which eight working projects were selected and the final products were presented at a May 16, 2018 event.

In June 2018, IDM graduated 16 students.

IDM Outreach

IDM has been active in establishing community partnerships, building industry relationships, and engaging companies through annual events. In AY2018, program outreach included:

- Establishing community partnerships with Innovators for Purpose, the Appalachian Mountain Club, and Atlantis Charter School
- Building industry relationships with Flextronics, Dragon Innovation, The Avenue Concept, Avatech, Youth Cities, Rhoost, Ministry of Supply, OnShape, The Solo Project, Swisscom, Local Motors, Ericsson, Dragon Innovation, NASA, Altitude, and more
- Engaging companies through a design trek to Ralph Lauren, West Elm, and Pentagram in New York City

Integrated Design Innovation Consortium

IDM was instrumental in creating the Integrated Design Innovation (IDI) Consortium with co-founding members from Northwestern, the University of Pennsylvania, and Carnegie Mellon University, as well as strong interest from Harvard, Hong Kong Polytechnic University, Northumbria University, and many others.

IDI is a collaboration of graduate programs that integrate design, engineering, and business. The programs provide students with tools to make the world a better place, approaching complex problems with empathy, integrity, and optimism.

IDI programs do this by:

- Teaching students a human-centered design process for framing problems and generating creative, innovative solutions to social and business problems;
- Helping define what is desirable as technology advances make more things possible while employing new technologies to create compelling user experiences; and
- Exploring and defining what is healthy and fulfilling for the Earth and society.

As leaders of integrated design innovation academic programs, IDI members unite to share best practices and raise awareness of integrated design among prospective students, peer programs, project partners, and potential employers.

IDM Student Statistics

| Year | 2015 | 2016 | 2017 |
|------------------------|-----------|-----------|-----------|
| Applications | 41 | 102 | 161 |
| Company admits | 0 | 0 | 0 |
| Self-sponsored admits | 19 | 25 | 33 |
| Total admits | 19 | 25 | 33 |
| Enrolled current round | 18 | 21 | 22 |
| Total enrolled | 18 | 21 | 22 |
| Research assistants | 0 | 0 | 4 |
| Distance education | 0 | 0 | 0 |

IDM Student Awards

Juliet Wanyiri, IDM '17, received a Legatum Fellowship

Nidhi Sharma, IDM '17, received a Tata Fellowship

Saluka Amarasinghe '17 and Melody Mui '17 received a Judges' Prize and Audience Award at the MIT Entrepreneurship and Maker Skills Integrator (MEMSI) Showcase

Chinh Bui, IDM '18, received a Legatum Fellowship

Alumni Employment Report

IDM now has graduated two cohorts—a total of 39 alumni from 13 different countries. Of this number, 51% are women. Companies founded by IDM students include Waypoint (Sara Remsen, IDM '15), Kalani (Attia Qureshi, IDM '16), BloomerTech (Alicia Rodriguez Chong and Aceil Halaby, IDM '15), Skillist (Matthew Tucker, IDM '15), Atolla Skin Lab (Meghan Maupin, IDM '16), and Avir Technologies (Honey Bajaj, IDM '15).

About a third of IDM alumni have started their own companies upon graduation, a small percentage pursued continuing education, and the majority found employment with companies.

IDM Staff Changes

Following an extensive search, Antonio (Tony) Hu was hired as academic director. Another search resulted in the hiring of Janice Tsang, admissions coordinator.

Steven Eppinger

Co-director

General Motors Leaders for Global Operations

Professor of Management Science

Professor of Engineering Systems

Warren Seering
Co-director
Weber-Shaughness Professor of Mechanical Engineering
Professor of Engineering Systems

Joan Rubin
Executive Director

Matthew Kressy
Director, IDM