

MITCET Proposal

GOAL: To create a full-circle global, educational experience that teaches the basics of engineering to a multinational student base, uniting these students through virtual technology, and providing an integrated system of feedback and mentorship among prior, current and future students. Success and results of the course will be visible to the public-at-large through a variety of outreach media, both locally and abroad. Success will be measured by impact on students by a functional, interactive site with daily posts by students in all locations, comparative analysis of geographic impact on engineering problems, and a tangible archive of lectures, public engagement, and student work.

THE COURSE: “3.003 Principles of Engineering Practice”, currently in its second year and supported by D’Arbeloff funds, will serve as the model course for a hierarchy of student offerings from Freshman to Graduate level, all centered around a common theme of joint global curricula, executed by joint global projects. We aim to expound on this highly successful project-based undergraduate course by establishing a global network of universities teaching identical curricula, simultaneously, each to a distinct classroom of students. The first year will be taught at MIT and the University of Tokyo. If successful, year two will introduce a location in Europe, likely the University of Ghent and/or Oxford University. The students at each location will communicate with each other through an infrastructure of technology-based media to solve assigned problems, to discuss and observe the similarities and differences of the geographically disparate locations, and to understand which aspects of engineering are ubiquitous and which are constrained or assuaged by site-specific attributes. The students will be divided into project groups, each made up of half MIT students and half U Tokyo students. The groups will work together using common information technology (similar to aspects of Stellar, Skype, etc.) to complete course assignments and learning. Summer cross-internships will follow the Spring course, and subsequently, a framework for lifelong involvement and communication as advanced students and mentors.

THE TECHNOLOGY: We seek to construct a technology infrastructure consisting of a website for administration, teaching, resources (both reference and computational simulation), mentor participation and video/text/forum for conferencing students and teachers. Students of each course will integrate with the technology daily as a central hub of interaction and project development. Course progress and project-based learning results will be posted and communicated through blogs, wikis, document uploads, lecture videos, and interactive media. We aim to also establish similar resources for the interaction, contribution, and communication with industrial mentors.

YEAR TWO: It is anticipated that Freshmen will take the initial course offering as a 9 unit 3.003J at their host institution in the Spring semester. Their first exchange travel will commence during the following summer session as part of Year 2. The Fall semester of Year 2 will feature Year 1 students mentoring of incoming students in a 4 unit global seminar. In brief, Year 1 will physically set up the relationship with the partner University of Tokyo, synchronize the curriculum within their platform, and build the common technology infrastructure that will host all communication. Year 1 will culminate with the completion of 3.003J in June 2010. If granted, Year 2 will see the students i) travel to Japan for a course-related internship, ii) return to MIT to participate in a global seminar offering as the next step in developing an integrated and active mentorship for Year 2 incoming students, and iii) the spring offering of 3.003J. Initially, the Fall seminar will link generations of students, and beyond Year 2 we anticipate a 3.004J, etc. offerings for sophomores, upperclassmen and graduate students to evolve.

It is our aim to ideally seek a subsequent iteration of funding, following two years of successful joint, global teaching. In this later iteration, we envision a stepped curriculum of courses, following the same themes of engineering principles, but with options stretching across departments while simultaneously potentially fulfilling degree requirements for departmental majors. Possible course offerings include environmental sustainability and engineering economics. It is at this level, where we aim to introduce a European location. Once a student has taken 3.003J at his or her host institution, the following class may be taken abroad. In other words, any student at any of the sites will have the choice of location and the option to study abroad. For the MIT students abroad, daily and/or weekly interaction

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with MIT will support a consistent collegial allegiance, thereby upholding the vigor and focus of his or her MIT academic path. Frequent monitoring, written and oral student reports and posting by faculty in addition to the mentor system will provide traveling students with a link and communication channel with their advisors. The MISTI office will provide training, advice, and a support network for MIT students going abroad. Incoming foreign students will be supported by funding from their respective institutions; and MIT administrative support will be shared through participation in the MPC/CMSE Summer Scholar program. In short, this system will offer a series of engineering courses from Freshman to Graduate, taught locally and globally, with joint curricula and joint international student groups interacting through an advanced technology infrastructure, and supported by a tight network of cross-year mentorship.

EXTERNAL VISIBILITY: A course portal will be visible to the MIT community and the wider public. This accessibility seeks to support public funding accountability in a broad sense, as well as enticing broader interest in the engineering sciences. In addition to its pedagogical goals, the course will also directly link the challenges of contemporary engineering with the public who share those same concerns elsewhere in the world. During Year 2, the results of the collaborative student projects will be curated into a didactic museum exhibit to be displayed on the ground floor of the MIT museum. This physical display will be integrated with the Fall seminar offering by a “Soapbox Series” of 4 public forum events that will engage the public through direct contact with engineering students by means of topical discourse. These forums will be broadcast live via webcast and will offer a publicly accessible video archive. In addition to the museum outreach, the course lectures will be webcast live and available on MIT World (see examples from last year: <http://mitworld.mit.edu/series/view/124>).

SIGNIFICANCE: The purpose of this program is to teach the universal principles of engineering practice. History has shown that these principles are necessarily global in both content and context; and that they are multidimensional with technology, economic, social and political aspects. One of the best parallels to our purpose was enumerated by Norman Augustine, former CEO: Lockheed Martin:

- Emphasize the basics.
- Develop team skills.
- Teach the political process.
- Develop communications skills.
- Place greater emphasis on “Systems Engineering”.
- Understand the internationalization of human activity.
- Open the doors wider to women and minorities.
- Commit to continuing education.

The success of this project is inculcation of the above attributes into generations of students who will lead in the solution of global infrastructure problems together. The program elements of joint projects, student exchange and industry mentoring that are facilitated by a common information technology infrastructure are a modest beginning to achievement of that success criterion.

PERSONNEL

PI: Lionel C. Kimerling, DMSE

Key Faculty: Anant Agarwal, EECS; Gene Fitzgerald, DMSE; Randolph Kirchain, ESD; Silvija Gradecak, DMSE; Fred Salvucci, ECE; William Uricchio, CMS; Chris Weaver, CMS

International Senior Personnel: Kazumi Wada, Dept. Head, Univ. of Tokyo

Program Director: Mindy Baughman

Support/Organizational Staff: Thomas Delaney, Writing Center; Lisa Page, DMSE

YEAR 1 MILESTONES

Summer 2009: Travel to University of Tokyo to set up program. Complete design phase of website with OCW, DUE’s OEIT, and IS&T.

November 2009: Complete Beta version of website.

January 2010: Go-live of tested full-version site.

June 2010: Complete model run of 3.003 as global course.

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FUNDING – YEAR 1

<u>Source</u>	<u>Expense</u>	<u>Target Amt</u>
DUE	Base funding – logistics of set-up	\$5,000
	Travel – 1 Japan site visit by Prog. Director	\$3,000
	20% Program Director salary + EB	\$17,000
	¾ month summer faculty salary + EB	\$12,000
OEIT	Core website framework – design and construction	\$15,000
OCW	Video conferencing	\$10,000
IS&T	In-kind technical support	
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		\$62,000