

PROPOSAL TO
THE SENATE COMMITTEE ON EDUCATIONAL POLICY

January 16, 2008
Revised November 12, 2008

TITLE:

Multi-Institutional Ph.D. Degree in Chemical Engineering with the National University of Singapore

SPONSOR:

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BRIEF DESCRIPTION:

For several years, the Department of Chemical and Biomolecular Engineering has operated a cooperatively administered Ph.D. program in Chemical Engineering with the National University of Singapore (NUS). The 2004 Memorandum of Agreement governing this program (entitled "Memorandum of Understanding," Appendix I), specifies that students receive a degree from only one institution and a certificate from the other institution. The arrangement has led to many successes as described below, but created some confusion about the true nature of the partnership, as well as a significant barrier to the recruitment of students and raising funds for continuing financial support.

As a temporary measure, this program has been modified this past year (with the approval of all appropriate campus administrative units) to operate as a cooperative degree in which two distinct PhD degrees are awarded simultaneously. While this approach has ameliorated some of the most pressing concerns, it does not resolve the root issue. Hence, we now wish to again transform the program into a multi-institutional graduate degree program, whereby students earn a single Ph.D. degree that bears the seal of both institutions. The proposed degree program will reflect the actual functioning of the partnership with NUS, and thereby provide a basis for long-term continuation. The program will continue to be administered cooperatively by the Departments of Chemical and Biomolecular Engineering at the UIUC and NUS. The multi-institutional Ph.D. will be the first of its kind for UIUC, and recognizes the current reality of the global nature of the field of chemical engineering and the need to educate students who think and function globally. The program accomplished this end by creating a truly international graduate experience, which enhances the missions for research and education of both the UIUC campus and the department.

The multi-institutional Ph.D. will build upon the successes of the M.S. program in Chemical Engineering between UIUC and NUS (initiated in 1998) and the Ph.D. program now functioning under the 2004 MOA, both of which have been cooperatively administered. The M.S. program integrated study and work experience in Singapore and the U.S., whereas the Ph.D. program integrates study and research. Both programs have succeeded in attracting high-quality students and substantial funding from governmental funding agencies. The faculty in the two departments have built excellent rapport over the past decade, and have recognized the opportunities present in the complementary expertise and research facilities

the two units bring to the table. The multi-institutional degree will continue to be implemented with a shared commitment to excellence in education and research, based on collaborative efforts where interests, capabilities and resources of each institution combine to offer unique and advantageous opportunities.

The Head of the Chemical and Biomolecular Engineering Department at UIUC will submit a brief report on the progress of the program to the Dean of the College of Liberal Arts and Sciences, with a copy to the Dean of the Graduate College, at the conclusion of every academic year. In addition, the Graduate College will conduct a review of the program at five-year intervals, normally coinciding with the five-year renewal cycle of the MOA. A copy of the report of the review committee will be submitted to the Provost and the Senate Educational Policy Committee for their consideration. The Dean of the Graduate College may initiate appropriate action including a review of the program by the Senate, if necessary, to address any concerns that may be noted as a result of the five-year review.

Continued collaboration with NUS coincides with current UIUC efforts and strategic vision to have a global presence in the Asia-Pacific region and to be an active participant in the globalization of education and research. When viewed as a "market opportunity," the existing program has already demonstrated significant capability for recruiting high-quality graduate students who otherwise would not have enrolled at UIUC. The ability to successfully recruit such students will be enhanced under the proposed program specifically because it represents a true multi-institutional degree that prospective students view as valuable for their career prospects. The proposed program will also offer an enhanced opportunity for both UIUC and NUS researchers to raise funds for their research, as the Singaporean governmental agency A*STAR has indicated a willingness to underwrite program costs including student stipend, tuition, research operating expenses and travel. The present funding agreement covers costs only for students who are citizens or permanent residents of Singapore. However, with a view toward reciprocity regarding the country of student origin, the Department of Chemical and Biomolecular Engineering has been actively seeking additional funding via corporate donation or endowment. Such a reciprocal admission arrangement has already been established for the M.S. program, which for over five years has been funded in significant measure by corporations and has admitted a total of about 45 students, with half originating from Singapore and the other half from the US.

Students in this program must meet all of the requirements in the existing Ph.D. programs at both institutions. The present document describes the requirements applying to all students in the program. The proposed program envisions few, if any, operational changes from the presently existing PhD program. Although all students who have enrolled so far in the present PhD program have originated from Singapore, in principle students could originate from the US or other countries as well. Students in the existing and proposed program spend approximately equal proportions of their study at each university, taking courses and/or working on their research. In most cases it is expected that students will spend about two years at each institution. The project comprising the research component of the Ph.D. must be overseen cooperatively by faculty at UIUC and NUS. Courses taken at the partner university must be approved by the home university before they can be credited toward the fulfillment of degree requirements.

JUSTIFICATION:

Enhancing the current doctoral program to a multi-institutional doctoral degree is a logical progression and will bring several advantages over the current program by eliminating several dislocations:

1. The multi-institutional degree will recognize what already exists in practice. The present relationship has evolved and strengthened over time. Each department has evaluated the quality of the education in the partner's institution, gained their trust and has benefited from the success of the programs and collaborations. We are moving cautiously from a program resulting in the award of a single degree from the student's home institution (plus a certificate from the other institution), to a temporary arrangement in which both institutions award their own degrees, to the proposed program resulting in the award of a single degree that names both partnering institutions on the diploma and academic record (transcript). Currently nine (9) students are studying in the Ph.D. program, with six (6) UIUC faculty members and seven (7) NUS faculty involved. Obvious evidence of success of this program is that one of its students (Xing Yi Woo) has received a national award for her research: the Separations Division Award of the American Institute of Chemical Engineers. Students who enrolled early in the existing program are contributing to articles in top-flight research journals.
2. The naming of the existing entity as a "Joint Program" is causing significant misunderstanding that has had several negative consequences. As advertised, the plan of study is often interpreted as a collaboratively-awarded degree, but in actuality is not. This has caused the following problems:
 - a. The UIUC students (if they were enrolled) would now receive a formal UIUC Ph.D. diploma plus the certificate that is signed by both NUS and UIUC; however, the NUS students receive only the certificate that is approved to replace their formal diploma. Graduate student recruiting from the NUS side has suffered because students do not understand why they are treated differently and are skeptical of the significance of the certificate. They are also concerned that potential employers will not adequately recognize the program "certificate."
 - b. Potential funding agencies, especially within Singapore, have become quite concerned about the nature of the current program "certificate," and are reluctant to fund a program that does not result in the award of a formal multi-institutional degree.
 - c. Some prime members of the NUS research faculty have expressed reluctance to participate in the partnership because of the apparent asymmetry in how certificates/degrees are awarded. This reluctance inhibits the ability of the program to secure the best funding and students.

The science and technology of Chemical Engineering has tremendous global impact. The methodologies chemical engineers innovate for development of natural resources, environmental procedures, chemical processes and pharmaceuticals have profound implications on international trade and political policies. Those working to develop new chemical technologies must understand this international aspect of their profession. Finding solutions to technological problems and the development of new technologies to resolve social concerns are enabled by collaborations between individuals with different backgrounds

and perspectives. These fundamental drivers have led to our present proposal to establish a multi-institutional degree with NUS. The multi-institutional degree gives UIUC high visibility with a core set of corporations and agencies that employ our graduates and support the university. It will also educate a cohort of students who are exceptionally well prepared for dealing with cultural and economical issues of the global economy with an emphasis on the Pacific Rim.

The plan of study envisioned in this proposal builds on close ties between Chemical and Biomolecular Engineering at Illinois and Chemical and Biomolecular Engineering at NUS. These ties have been developed over the past decade through the M.S. and Ph.D. cooperative programs where students are educated equally by faculty at NUS and at UIUC. As is the case with students in the existing M.S. and Ph.D. programs; students in the multi-institutional-awarded Ph.D. program will be educated equally by faculty at both universities. Students will take courses at both universities and will carry out research plans overseen by a faculty member at UIUC and a faculty member at NUS. Official recognition of student participation will be noted on the transcript of students held at each institution resulting in a full record of the student's entire program of study being recorded at each university. The transcript will include a statement that the student has participated in a multi-institutional degree program of study of the UIUC and the NUS. Students satisfying the degree requirements will receive a multi-institutional diploma bearing the seals of each institution. Details of the program are given in Appendix II.

The entrance requirements, degree requirements, committee structures, and thesis approval processes are fully compliant with existing UIUC policies. Students will be accepted into the multi-institutional degree program by a process requiring the agreement of both departments. Students will be co-advised by research-active faculty who have their primary appointments in the Department of Chemical and Biomolecular Engineering at Illinois and with the Department of Chemical and Biomolecular Engineering at NUS.

Up to now, participating faculty have demonstrated a continuing track record of publication in well-recognized technical journals and the ability to financially support a research group of nontrivial size. This established pattern will continue in the proposed program. The coursework to be taken by enrolled students will normally be taught by regular tenured or tenure-track faculty at the two universities, who may in some cases be aided by teaching assistants that are graduate students in their disciplines in keeping with the common practice in chemical engineering and related disciplines. Enrolled students will normally conduct their research within the laboratory and office space of their advisors, or in locations such as central facilities that are clearly required for performance of the work. The students will have full access to the library facilities of the university at which they are physically present. The handling of student grievances and discipline, if any, will follow procedures according to the practices of the campus where the student is resident.

Information about the partner institution NUS is a leading institution in Asia and the world. In 2004 it was ranked by the *London Times* at 18th in the world in overall scholarly quality, and 4th in Asia. The Department of Chemical and Biomolecular Engineering at NUS is a high-quality unit responsible for training professional chemical and biomolecular engineers in the Asia-Pacific region. The chemical industry plays a vital role in Singapore's economy, accounting for about half the total manufacturing output of the country. In fact, Singapore is the third-largest petroleum refining center in the world. Further rapid growth in the chemical industry can be expected because the Economic Development Board of

Singapore has implemented a strategy of developing an integrated petroleum and petrochemical hub. With the many exciting professional options available in the vibrant chemical industry, chemical engineering has become an attractive field of study, and the students entering the department represent the cream from Singapore's junior colleges. In 2004-2005, the Department of Chemical and Biomolecular Engineering at NUS awarded 245 bachelor's degrees, 100 M.Sc. degrees (by coursework, see Appendix III for requirements), 48 M. Eng. Degrees (by research) and 12 Ph.D. degrees. The teaching and research activities of the department span both traditional and emerging areas of interest to chemical engineers, including microelectronics processing, pharmaceuticals, and environmental science and engineering. The department also maintains strong links with industry through alumni, a student industrial attachment program, an adjunct teaching scheme, and collaborative research. The program offered by NUS conforms to standards and guidelines that are inherent to UIUC's mode of operation. Documentation that NUS conforms to critical standards and guidelines is attached as Appendix IV.

BUDGETARY AND STAFF IMPLICATIONS:

a. Additional staff and dollars needed.

As with traditional Ph.D. candidates in Chemical and Biomolecular Engineering, students pursuing the multi-institutional degree will receive a stipend sufficient to cover their expenses, including accommodation and travel between Urbana and Singapore. Financial support will come through standard mechanisms, including U.S. and Singapore government agency grants, teaching assistantships at NUS and/or UIUC (while in residence at the respective institution), and corporate research fellowships. There will be no additional staff needed or budgetary burdens at UIUC. Up until now, funding for the cooperatively administered PhD program has come primarily from Singapore's Agency for Science, Technology and Research (ASTAR). That financial support is anticipated to continue at an enhanced level as described in the attached memo from ASTAR. The support includes operating expenses for the student research. There are no provisions for faculty salaries; those salaries will continue to be paid in the standard way through faculty teaching and other research contracts the participating faculty may have secured.

b. Internal reallocations (changes in class size, teaching loads, student-faculty ratio, etc.)

The number of students participating will be five or fewer per year, and will not impact class size significantly.

c. Effect on course enrollments in other departments and explanations of discussions with representatives of those departments.

We expect negligible changes in graduate class enrollments due to the small number of participating students.

d. Impact on the University Library

The program size will be small, with no more than approximately five (5) students enrolled per year. The nature of the research projects will entail only standard access to books and journal articles; thus, the impact on the library will be minimal. An approval statement from the UIUC Librarian is now being sought.

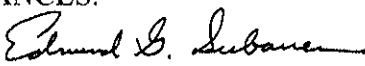
- e. Impact on computer use, laboratory use, equipment, etc.

Because of the small size of the program, impact on computer use, laboratory use, and equipment can be accommodated within the existing ChBE infrastructure. As long as the original program has existed, support funds have been available from the Singaporean Government (ASTAR) for the usual operating expenses associated with research of this type. We expect this arrangement to continue for the foreseeable future.

GUIDELINES FOR UNDERGRADUATE EDUCATION:

Not Applicable

CLEARANCES:

	11/14/08
_____ Department/Unit Head	Date
_____ School Approval (if applicable)	Date
_____ Assoc. Dean, College of Liberal Arts and Sciences	Date
_____ Assoc. Dean, Graduate College	Date
_____ Assoc. Provost	Date

STATEMENT FOR PROGRAMS OF STUDY CATALOG:

The existing statement in the Programs of Study catalog is:

DOCTOR OF PHILOSOPHY

Requirements include 96 hours of graduate credit, satisfactory performance on qualifying and certification examinations, and a thesis. The credit requirement includes a minimum of four graduate-level courses in chemical engineering and a coherent program of four additional graduate level courses. The qualifying examination is a written test usually taken during the first year of study. The certification examination is an individual oral examination taken after the student has satisfied the course requirements that focuses on the student's proposed thesis research.

It is proposed that the following text be added at the end of the existing text.

Multi-institutional Ph.D. Degree with National University of Singapore

Students in this program will spend approximately equal proportions of their study at UIUC and at the National University of Singapore, taking courses and/or working on their research. The project comprising the research component of the Ph.D. will be cooperatively overseen by faculty at UIUC and NUS. Students pursuing the multi-institutional degree must meet all of the requirements of the existing Ph.D. programs at each of the two institutions. Courses taken at each university must be approved by the other university before they are taken in order to be credited toward degree requirements.

EFFECTIVE DATE:

Proposed: Upon approval

Appendices available for
review in the Senate Office.

University of Illinois
Policy for Consideration of Multi-Institutional Degrees

The Board of Trustees will consider for approval proposals for Multi-Institutional Degrees that reflect carefully constructed educational partnerships between the University of Illinois and other, highly-regarded, foreign institutions of higher learning. The terms of each partnership will be carefully defined by a memorandum of agreement.

A multi-institutional degree is a degree awarded by the University of Illinois and one or more partnering institutions to students who have completed a rigorous program of study that combines the research and educational resources of the University of Illinois with those of the distinguished, partner institution(s). A single degree will be awarded jointly by both the University of Illinois and the partner institution(s). The diploma will bear the seals and signatures from the University of Illinois and the partnering institution(s).

At this time, consideration is given to partnerships with foreign institutions for graduate programs. Partnerships with other institutions involving undergraduate programs may be considered in the future.

Consideration of the following characteristics, as examples, will be critical when reviewing a proposed partnership leading to the awarding of a multi-institutional degree:

- Quality and comparability of proposed, international partner institution(s) and program
- Institutional and program accreditation
- Modes of program delivery and student support
- Revenue stream and sustainability of proposed program
- If a new degree at one or both institutions, process and timeline for approval of program
- Timeliness and length of agreement
- Venues and modes for addressing conflicts or concerns

Additionally, the distribution of educational requirements must be agreed upon by all partner institutions, and the specific, degree fulfillment requirements for these students must be shared equitably by participating institutions. The program in the partner institution(s) must be appropriately distinguished as an academic program, and must provide distinctive resources that add significantly to the educational experience that cannot be provided by the University of Illinois program alone.

Each campus of the University of Illinois will develop guidelines for campus approval of Multi-Institutional Degrees that build on the traditional approval process to accommodate what is distinctive in their proposed multi-institutional degree programs.

Once approved within the university, multi-institutional degrees will be established between the university and the foreign institutional partner through the use of Memoranda of Agreement and fully elaborated Addenda addressing program organization and administration. Such documents constitute comprehensive contractual agreements which will capture in detail, the responsibilities

of each partner, consistent with established university procedures for major international agreements. As such, the proposed agreement will, in turn, undergo the complete campus and university review, applicable to all major contractual agreements with international institutional partners. Therefore, fully detailed agreements, themselves requiring signature on behalf of the Board of Trustees, will be executed before any multi-institutional degree programs can be in force and operational.

Programs will be expected to develop a rigorous review process to assess the success of the program and to define a clear termination and exit process that protects both students and the University in the event that the program does not meet expectations or either institution decides to alter or withdraw from the program or the partnership or withdraw. Each partnership should be reviewed annually with an option for renewal every three or five years. Proposals for changes to a multi-institutional degree, after its approval, will go through normal levels of review and approval.

DRAFT