

AC 2007-63: ACCELERATED DUAL GRADUATE DEGREE PROGRAMS

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Career goals of engineering students, enrollment needs of universities, and academic quality concerns of engineering faculty are often in conflict. The development, standards, and administration of dual graduate degree programs can positively address all three needs. One university's approach to dual graduate degree programs is described with reference to combined bachelor's and masters, bachelor's and doctoral, masters and masters, and graduate certificate and masters degree programs. These are arranged flexibly to meet multiple degree objectives that may combine multidisciplinary engineering degrees, engineering with management, engineering with architecture, and other combinations in the STEM disciplines.

Standards for admission and participation, retention, advancement to the graduate program, and quality control are described. Methods of recruitment and the impact on the diversity of the graduate student population are described over a 10-year period of accumulated data.

Introduction

The concept of dual degree programs, connected bachelor's and master's degree programs, has been available to students at New Jersey Institute of Technology since the early 1980's. Dual degree programs exist at other universities with programs linked to professional programs, such as law, being quite popular (Ref. 2). Others are often connections between undergraduate liberal arts programs and engineering programs (Ref. 3). The implementation of the concept at NJIT and the concept itself (now including PhD and MBA programs) has gone through several stages of development since that time, driven by a number of factors that reflect the transition of NJIT from a specialized, primarily undergraduate institution to a major public research university (Ref. 1) with over 40 Master's programs, 18 doctoral programs, and graduate enrollment approaching 3000. The initial concept was to allow undergraduates to proceed smoothly into the new Master's programs that were being developed, allowing enhancement of their professionally-based education and providing a vehicle for faculty and students to work on Master's level Projects and Theses. The primary draw for students was the ability to take two graduate courses, while still undergraduates, and have them count toward both the current undergraduate degree program and toward a following graduate degree program. That concept is still a major piece of the present configuration of one type of dual degree program at NJIT.

The BS/MS program, as it was called initially, was not centrally administered and effectively was an ad hoc arrangement for individual students and those programs who wished to promote it internally in a particular department. The program was linear in that students proceeded directly from a Bachelor's program directly into a similarly titled Master's program within the same

department. For several years, the program became linked to the cooperative education program chosen by graduates moving to the Master's program, particularly international students. That arrangement was the first one where marketing was a feature of the program operation but had the drawback of separation from academic oversight and quality control.

In the early 90s, a major change was made in the structure of graduate administration, with the establishment of an Assistant Vice President position to oversee graduate education policy, academic quality control, and financial support operations. That position was eventually retitled to Dean of Graduate Studies. A later change in the 90s shifted the administrative oversight of the BS/MS program to the Dean of Graduate Studies with marketing and promotion of the program to NJIT undergraduates becoming a joint effort of the Graduate Studies and the separate Graduate Admission Office (Ref. 4). This new partnership and the addition of key personnel resulted in an expansion of interest and participation of NJIT undergraduates in the program and in the important variations of the original and basic program.

Need and Opportunity

The Graduate Studies Office saw this program as vehicle to develop the university in a number of ways consistent with its mission and academic plans. The first opportunity was to increase enrollment in the NJIT Master's programs and to increase the number of NJIT's own alumni who chose NJIT graduate programs. That number was well under 10% for many years when the university only had limited graduate opportunities and no particular incentive for students to remain at NJIT. The program has become so successful that it has become a major component of the total graduate student population with many more of NJIT's own students or alumni involved in NJIT's graduate programs in some way. In 1991-1992, only one student was in the BS/MS program and continued into NJIT's graduate program. In Fall 2006, 121 students had completed their undergraduate degrees and moved into NJIT graduate programs via the BS/MS path alone.

The second opportunity was to enhance the quality of the students involved in both graduate and undergraduate education by raising standards for initial and continued participation to a 3.0 undergraduate GPA. This has also tended to keep our very best students in our graduate programs as shown by GPA data. Close to half of the participants had undergraduate GPAs of 3.5 to 4.0 (on the A =4.0 scale).

The third opportunity was to enhance the diversity of the graduate student population at NJIT to reflect the extraordinarily diverse undergraduate population at NJIT. Enrollment data for Fall 2006 shows that over 20% of NJIT undergraduates self-report ethnicity within the traditionally underrepresented population groups. If one were to include all minority groups at NJIT, it would appear that the traditional majority population group in the United States is a minority group at NJIT.

As is the case for most technological research universities, NJIT's graduate population, especially the full-time graduate population, has a large percentage of international students. With NJIT being the only public technological university in the New York/New Jersey metropolitan region, NJIT has proven to be an attractive location and gateway for international students and new immigrants. The BS/MS program was able to also increase the percentage of

the graduate population who are US citizens and Permanent Residents, addressing a concern occasionally voiced by state legislators about taxpayer based support for state colleges and universities.

The fourth opportunity was a way of creating interest by NJIT's own undergraduates in eventually pursuing a doctoral degree, at NJIT or elsewhere, by establishing a convenient first step for graduate education at home - most of our students are New Jersey residents - and a way of creating a BS/PhD path for a few students whose undergraduate GPAs suggested immediate entry into PhD programs rather than a first entry into a Master's program. The base level, consistent with NJIT doctoral admission standards was a GPA of 3.5 or better with GPAs of 3.8 or better preferred. About 20 NJIT students are now pursuing that path. The BS/PhD path has additional incentives that are discussed in more detail later.

A way of interesting both domestic and international Master's students, who were completing one Master's degree, and who might be locally employed, in further student and professional career enhancement at NJIT was by the establishment of the MS/MS program (and variations) that allowed dual use of graduate degree credits from a prior Master's degree to a second Master's degree. This option has also proven to be popular and has enhanced the graduate enrollment. This and the other programs have served well to create a stronger alumni group for NJIT whose basis was graduate education rather than the traditional undergraduate degree.

Setting Standards

The viability of these types of programs is greatly dependent on their creditability with faculty. Faculty involvement in setting the standards for the program is essential. Once the oversight structure in the equivalent of a graduate school office was established, the Graduate Dean at NJIT involved the major faculty graduate committee for the university, the Graduate Council, in a complete review of the standards for student participation and implementation. Variations on the original program were also brought to the faculty for review.

Since participation in the BS/MS program involves a significant cost (lost tuition income) to the university and savings for individual students, standards were set to assure that only those who should be supportable for merit-based awards for graduate study at a later time would be able to participate in the program. Therefore, only students whose undergraduate grade point averages exceeded 3.0 out of 4.0, had achieved junior status, and had completed 5 courses in their major, could be considered for participation. Both the undergraduate and graduate advisor had to approve the choice of graduate courses to take while still undergraduates. The graduate courses generally replaced undergraduate electives. Grades in all graduate courses had to be at B or better for later shift to the graduate record.

At one time, all students were asked to take the GRE as a condition of participation in the BS/MS program but this requirement was later dropped in favor of consistency with GRE requirements for admission to various graduate programs. At NJIT, all PhD program applicants, all students seeking assistantships or Fellowships as a graduate student, applicants to Master's programs that separately require GREs for admission evaluation, and all applicants whose last degree was from outside the United States are required to submit GRE scores. For the majority

of NJIT undergraduate BS/MS participants, consistency with the GRE policy overall meant that very few BS/MS participants were required to submit GRE scores.

The program was initially targeted toward full-time students but with so many undergraduate students working off-campus and recognizing the reality of professional careers, the program was expanded to include part-time students for all the various options. Tuition support for one semester from a grant program was also once used as an inducement for participation but that proved unnecessary and too expensive for continuation by the university as the program grew. The elimination of the one semester of tuition support had no impact on the growth and interest in the program.

Variations

Variations from the original BS/MS program included the BS/PhD program, the MS/MS program, programs involving the NJIT 5-year Bachelor of Architecture program (BArch), programs involving the NJIT MBA, and programs involving a program titled Master of Infrastructure Planning. NJIT undergraduate programs generally require (depending on major) anywhere from 123 to 130 credits for programs in Applied Sciences, Social Sciences, Management (AACSB accredited), and Liberal Arts; 128 to 135 credits for ABET accredited programs in Engineering, Engineering Technology, and Computer and Information Sciences; and 164 credits for the NAAB accredited program in Architecture. In general, for programs requiring much more than the typical number of credits for either the Bachelor's degree or the graduate degree, the number of dual use credits was increased to 12 graduate credits to be taken at the undergraduate level.

For the MS/MS, students who had completed one NJIT Master's degree could use two courses (6 credits) from the first NJIT Master's degree toward a second Master's degree if the courses were approved by the second program advisor, were at B or better, and the first degree was completed not more than two years before initiation of the second degree program. Because the MBA program at 48 credits was a natural follower to the NJIT MS in Management, students proceeding into the MBA from the MS could use 18 credits toward the MBA and effectively could complete the MBA with only 30 credits additional. Allowances for a 12 credit dual-use were also permitted for combinations of various degrees with the Master of Architecture degree.

Recruiting

Each semester, the Graduate Admission and Graduate Studies offices at NJIT review lists of eligible juniors and invite them to information sessions about BS/MS, BS/PhD, and other variations. Other forms of advertising were through posters, e-mail letters, student newspaper ads, announcements at the monthly Graduate Council meetings, and contacts with undergraduate and graduate advisors. Following the information sessions, student would become participants in the program by meeting with their academic advisors and completing the forms to identify the courses that would be used at both the undergraduate and graduate levels.

Monitoring

The records processing for the students in the program provided a natural way of assuring academic standards for the program. Admission to BS/MS as an example does not mean that the undergraduate student is automatically admitted to a graduate program. The BS/MS admission is a first step that only allows undergraduates to take graduate courses for future use in a graduate program. Students had to have an undergraduate degree completed and had to file a formal application and be formally admitted to a graduate program in order for the courses to appear on their graduate records. The application filing allows the two goals (undergraduate degree and graduate degree) to be clearly delineated. Once admitted and enrolled in a graduate program, the graduate student then worked with the Graduate Studies Office and the Registrar, based on the prior signed BS/MS agreement to shift courses from the undergraduate transcript to the new graduate transcript without any billing complications.

Graduate study and undergraduate study at NJIT, like at most universities, have different billing structures and different definitions of full-time study and flat-rate arrangements. Courses shifted to the graduate record under an approved dual degree arrangement do not entail any new billing to the student. This is contrasted to excess courses that undergraduate students may take at the graduate level at NJIT outside the limits of the BS/MS arrangement, with permission. If these courses are shifted, the difference between graduate and undergraduate rates will be calculated by the Bursar and billed to the student. The number of these excess courses must also be carefully monitored since the university policy does limit the allowable number. Students without an undergraduate degree but taking more graduate courses than undergraduate courses in any semester may be perceived by the registrar, bursar, loan agencies, financial aid offices and others as being defacto graduate students. Students in this situation may find themselves having undergraduate financial aid cancelled and loans called in for repayment.

Only graduate course grades of B or better can be shifted and any loss of eligibility could be noted at the time of the shift. The MS/MS program also requires a new degree application but this variation is less formal and could be "back-fitted" for a prior Master's student without the formal approvals of two advisors as in the BS/MS. A key component of monitoring any of the dual degree programs is to have a logical system for admission and record-keeping and most importantly, having cooperation among knowledgeable staff in the departments, the admissions office, the registrar's office, and the graduate dean's office.

Impact

The development and promotion of dual graduate degree programs at NJIT has enhanced the enrollment, quality and diversity in graduate study at both the master's and doctoral level for one university that used to be almost totally dependent on local part-time working professionals and international students for its graduate population. To date, almost 1000 students at NJIT have participated in just one component of the various dual degree programs, the BS/MS program. The overall impact of student awareness of graduate programs at NJIT is now much greater than in the past and the total impact is much greater than the numbers seen only in BS/MS. For a university whose total enrollment in Fall 2006 was 8,209 students at all levels (inclusive of a graduate enrollment of 2,396), the addition of hundreds of students who might have considered

other options for graduate education or not considered graduate education at all, it is apparent how important these programs have been to the academic and financial health of the institution. The key for any institution seeking to develop these types of programs is quality control, careful processing, and appropriate marketing within the university. NJIT has now moved to develop accelerated dual-degree relationships with other colleges lacking graduate programs of their own.

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