# Developing a Joint/Dual Program and Its Impact on Underrepresented Engineering Students

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## Abstract

The City College of New York, one of 17 public undergraduate colleges in The City University of New York (CUNY), is the only campus with a school of engineering. As an urban institution of higher learning, one of the School's missions is to provide education to a highly diverse student body, including traditionally underrepresented minorities, women, working adults, and immigrants in the greater New York metropolitan area. Also, as the only engineering school in the university, it provides for those students in the six CUNY community colleges a major opportunity to obtain a Bachelor of Engineering degree. The transition from a two-year program to a four-year program can sometimes be difficult for students, particularly those students from traditionally underrepresented groups. Robust and fluid articulation agreements between the two-year and four-year schools can go a long way to minimize the difficulties experienced by students when transferring to a senior college. This paper will focus on the process used by the School of Engineering at the City College of New York and Eugenio Maria de Hostos Community College to develop a new joint/dual program in Electrical Engineering. We will discuss the impact such collaborations have on students along with the advantages gain from these types of institutional relationships.

## I. Introduction

In the summer of 2002, Eugenio Maria de Hostos Community College (HCC) and the School of Engineering (SOE) of the City College of New York (CCNY) - both are schools of the City University of New York (CUNY) - collaborated to create a jointly registered, dual admission program in Electrical Engineering. While there are many articulation agreements between the 17 schools in the CUNY system, to the best of this author's knowledge, this is the first time that a joint program has been formed between a community college and the School of Engineering. The program was designed to meet the guidelines of the Accreditation Board for Engineering and Technology (ABET) and provide HCC students with the same curriculum of the first two years of the existing Bachelor of Engineering in Electrical Engineering (B.E.E.E) program required at CCNY. Students entering the program are admitted to both HCC and CCNY and for those students that successfully complete the Associate of Science (A.S.) degree in Electrical Engineering Science at HCC they are granted admission to the SOE of CCNY. The dual/joint program increases the opportunity for Hispanics, African Americans, nontraditional students and other under represented groups to obtain a bachelor's degree in engineering. This seamless transfer to the upper division of the baccalaureate program at CCNY will help to reduce the loss of these high-risk students that often fall through the cracks and never complete their education.

## II. Background

Hostos community college is located on East 149$^{th}$ St., in the South Bronx, one of the poorest congressional districts in the country. Its student populations is 98.1% people of color with approximately 80% Latinos and 29% African American and 77% women over the age of twenty-five. The College's mission is to provide "educational opportunities leading to socio-economic mobility for first and second generation Hispanics, African American and other residents of New York City who have encountered significant barriers to higher education." The School of Engineering of the City College of New York (CCNY) is on West 140$^{th}$ St. is a

short bus ride away from Hostos. The demographics of the undergraduate student population from Fall 1992-2001 is: 29.6% African American, 26.0% Hispanic and 13.5% Asian and for Fall 2001 women represented 20.1% of the college's engineering majors. The number of transfer students that elected to attend CCNY has increased from 753 Fall 1997 to 1167 Fall of 2003, a growth of 54.98%. As a percentage of the total undergraduate enrollment there has been an increase from 6.2% to 9.3% in five years. Transfer breakdown for CCNY is as follows: 13.2% from other four-year CUNY colleges; 27.4% from two-year CUNY colleges, 23.6% from non-CUNY four-year colleges; 8.9% from non-CUNY two-year colleges; 25.7% from foreign colleges and other sources. Of the students that transfer to CCNY, 21.5% are engineering majors. Of these engineering transfer 32.2% are Black; 26.9% are Hispanic, 28.2% are Asian; and 12.6% are white.

From the statistics above each school has a robust minority population and are diverse, particularly in the case of CCNY when you consider the significant white population.

## III. Curriculum

The joint/dual program requires that students first earn the Electrical Engineering A.S. degree. This part of the program is housed in the Mathematics Department at Hostos Community College. The program consists of courses required in the first two-year of the four-year engineering program at City College. After completing 60 credits of mathematics, science, general education and introductory engineering courses the student will have earned an A.S. degree in Electrical Engineering and then may transfer to the Electrical Engineering program at City College to complete the requirements for the B.E. in Electrical Engineering. On average the student can take 15 credits each semester to complete the bachelor program in nine semesters.

Shown below is the full curriculum for the joint/dual program. In designing this new program both schools worked diligently to make sure that it would meet the Accreditation Board of Engineering and Technology (ABET) 2000 criterion consisting of eleven (11) student learning outcomes and assessment

**Eugenio Maria de Hostos Community College**
**and**
**The City College**
March 10, 2003
**JOINT PROGRAM IN ELECTRICAL ENGINEERING**

**Hostos**

| First Year – Fall * | Credits | Spring | Credits |
|---|---|---|---|
| MAT 1642 Calculus | 4 | MAT 1644 Calculus II | 4 |
| ENG 1302 Expository Writing | 3 | English 1303 Literature and Composition | 3 |
| CHE 4002 General Chemistry I Lecture | 3 | Soc 1232 Introduction to Sociology | 3 |
| CHE 4102 General Chemistry I Lab | 1 | MAT 1698 Modern Programming | 3 |
| Psychology 1032 General Psych | 3 | Liberal Arts Elective† | 1 |
| | | ENGR 10100 Engineering Design I | **Waived** |
| Total | 14 | Total | 14 |
| | | | |
| Second Year – Fall | Credits | Spring | Credits |
| MAT 1646 Calculus III | 4 | MAT 1742 Ordinary Differential Equations | 3 |
| PHY 4502 General Physics I | 4 | ***ENGR 20400 - Electric Circuits | 3 |
| ***ENGR 10300 – Computer-Aided Analysis Tool for EE | 2 | MAT 1722 Linear Algebra with Vector Analysis | 3 |
| ** ENG 1340 Technical Writing | 3 | PHY 4504 General Physics II | 4 |
| VPA 3612 Fund of Public Speaking†† | 3 | Liberal Arts Elective | 3 |
| | | | |
| Total | 16 | Total | 16 |

## TOTAL HOSTOS CREDITS 60
## Associate in Science in Electrical Engineering Science (AS)

† Students who continue for a bachelor's degree at CCNY must complete 3 credits of history from the list below.

**Liberal Art Electives to be taken from:**
HIS 4668 Ancient, Medieval, and Early Modern European History, HIS 4670 Modern European History, HIS 4660 World History To 1500, HIS 4661 Modern World History, ECO 4645 Macro-Economics, ECO 4643 Micro-Economics, POL 4701 American Government, HUM 3021 Diversity and Pluralism in America, VPA 3502 Arts and Civilization I or VPA 3552 Music Appreciation.

**CCNY**

| Third Year – Fall | Credits | Spring | Credits |
|---|---|---|---|
| EE 2100 Switching Systems | 3 | EE 30600 Linear Systems II | 3 |
| EE 20500 Linear Systems I | 3 | EE 31100 Prob. & Random Proc. | 3 |
| EE 22100 EE Lab I | 1 | EE 32200 EE Lab II | 1 |
| EE 24100 Electronics | 3 | EE 33000 Electromagnetics | 3 |
| EE 25900 Programming for EE | 4 | Lecture Elective | 3 |
| | | EE 34200 Electronics II | 3 |
| Total | 14 | Total | 16 |
| | | | |
| Fourth Year – Fall | Credits | Spring | Credits |
| EE 31200 Communication Theory | 3 | EE 44100 Electronic Devices & Semiconductor Matls | 3 |
| EE 32300 EE Lab III | 1 | EE 44400 Digital Computer Systems | 3 |
| EE 33300 Ant., Microwaves & Fibers | 3 | Engr 230 Thermodynamics | 3 |
| EE 33900 Semiconductor Materials & Devices | 3 | Lecture Elective | 3 |
| EE 37100 Linear Feedback System | 3 | Lecture Elective | 3 |
| Lecture Elective | 3 | | |
| Total | 16 | Total | 15 |
| | | | |
| Fifth Year - Fall | | | |
| EE 42400 EE lab IV | 1 | | |
| Lecture Electives | 6 | | |
| Design Elective | 3 | | |
| Lab Elective | 1 | | |
| Practical Issues | 3 | | |
| Total | 14 | | |

**TOTAL CCNY CREDITS 75**

**TOTAL DEGREE CREDITS 135**
**Bachelor of Engineering in Electrical Engineering - BE(EE)**

†† Students who complete VPA 3612 at Hostos, must take an additional three (2) credits of liberal arts at CCNY.

* Students needing remedial or compensatory courses will require additional credits for graduation.

** New course

*** Course will be co-listed. Students will be given a permit to attend CCNY until such time as there is sufficient enrollment to offer the course at Hostos.

All first-time freshmen must take SSD 1000: "Critical Skills for the 21st Century."

The College requires successful completion of the CUNY tests in reading, writing and mathematics; the College Proficiency Examination (CPE) and 16 CPI units as required (see College Catalog).

## IV. The Process

In creating any form of articulation between two dissimilar institutions – for example a community college and its four-year college counterpart - a clear common goal or objective must be established. In the case of Hostos Community College and the School of Engineering of the City College of New York, the main objective was to create a joint/dual program in Electrical Engineering that would provide a smooth and direct path to a Bachelor degree in Electrical Engineering for students who might otherwise fall to the academic wayside. Joint programs along with transfer agreements and articulation policies have become more and more complex with higher education wrapped in a web of federal and state agencies, accrediting bodies, administrators, faculty and staff[1]. Communication, trust, and mutual respect between institutions are paramount in developing a fluid system that allows students to progress from one higher education program to the next[2].

While the success of the actual joint/dual program between Hostos and City College, which began in the fall of 2003, still remains to be seen we do feel that the process used to develop it was extraordinarily fruitful. In this presentation we would like to share that experience in the hope that other institutions may find it useful.

The initial steps in creating the dual/joint program consisted of a number of lengthy telephone calls and campus visits by the Deans of each school. These discussions were open and honest and were a way for each school to get to know the other and find out what was most important to them. A team representing Hostos consisting of the Dean and Assistant Dean of the Office of Academic Affairs, and a similar team representing City College consisting of the Dean and Associate Dean of the School of Engineering drafted a proposal for the curriculum of the new joint/dual program. The two teams worked together to resolve potential administrative and curriculum issues such as course substitutions, course credits and contact hours. When it came time to decide on course content and the feasibility of the entire program, department chairs and faculty from each school became involved. Course syllabi were exchanged along with ideas about upcoming

changes in the curriculum. This important part of the process insured that the curriculum would be current and helped to establish a relationship between the two schools that extended beyond the office of the deans. It also strengthened the relationship between the two schools. While formal documentation of articulation agreements are important and necessary they are not sufficient. Probably what is most important is that a rapport be developed between the faculty and staff at both campuses. After several months of meetings and numerous versions of the original proposal the dual/joint Associate in Science (A.S.) in Electrical Engineering Science and Bachelor of Engineering in Electrical Engineering (B.E.) program was ratified by Hostos Community College, The City College of New York School of Engineering and the City University of New York.

## V. Conclusion

Today many students are attending two-year schools as the first step to obtaining a bachelor's degree. Transferring from a two-year program to a four-year program can be perilous particularly if there is little communication between the institutions. It is imperative that community colleges and universities collaborate to develop a seamless transfer process for these students.

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[1] Tobolowsky, B., "Improving Transfer and Articulation Policies", ERIC Digest (ED416934), 1998. Website URL [http://www.ericfacility.net/databases/ERIC], site accessed January 5, 2004.

[2] Morphew, C. C., Twombly, S. B., Wolf-Wendel, L. E., "Innovative Linkages: two urban community colleges and an elite private liberal arts college, Community College Review, Winter, 2001.

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