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II

THE ROLE OF EXTENSION PROGRAMS AT NJIT

Extension or off-campus offerings of undergraduate and graduate programs at NJIT seek to recognize and respond to the following factors:

1. The statewide responsibilities of NJIT.
2. The needs of the corporate and government sectors at sites remote from the Newark campus.
3. The limited dormitory capacity of the Newark campus and the fact that the audiences principally served by extension programming could not avail themselves of on-campus programs because of family and professional responsibilities.
4. The southward shift in state population.
5. The need to maximize use of existing facilities and to avoid new construction.

At the same time, it is recognized that extension programming presents a number of significant challenges:

1. The array of problems associated with managing across long lines of communication.
2. The need to make the most effective assignments of faculty and administrative staff already dealing with increased enrollments and expanded research and public service activities at the Newark campus.
3. The need to provide programs equivalent in quality to those offered at the Newark campus and the need to meet the tests of various external approvals required.

The expanded role of NJIT as related to extension programming is the subject of sections within the NJIT Master Plan and the Statewide Master Plan for Higher Education in New Jersey. So important was this role deemed to be that a Task Force was assembled to review and recommend on this matter.

The Task Force has reviewed the evolution of off-campus programs conducted by the Institute as well as the structures and systems developed to manage them. It has addressed the need for such programs, the occupational outlook for the near future, the shifts of population and employment in New Jersey and the availability of educational services to meet current and anticipated demand. It has studied the issues of faculty interaction, compensation, promotion and tenure, program planning and logistics, financial considerations, adequacy of resources, and assurance of quality.

The primary data for the demand aspect of these studies are found in published data and projections of the New Jersey Department of Labor and Industry. These provide employment forecasts to 1985, and project occupational needs by sub-areas within the state. Trends to 1990 and beyond from other sources substantiate the projections to 1985 and indicate strong demand for technological professionals.

The Task Force reviewed existing and planned extension programs in Computer Science, Engineering Technology, Industrial Engineering (Human Factors option), and Civil and Environmental Engineering.

THE EVOLVING HISTORY OF EXTENSION PROGRAMS AT NJIT

In the early 1970's, feasibility studies were conducted by NJIT relative to the need for a Master's Program in Computer Science in the Morris County area. At that time, reports indicated that less than one-half of the state's need for Master's degree graduates in Computer Science were being met, and that degree programs offered by Rutgers University (New Brunswick), Stevens Institute of Technology (Hoboken), and Fairleigh Dickinson University (Teaneck) as well as NJIT (Newark) did not serve adequately the large industrial-residential base in the greater Morris County area.

In 1974, an extension program was initiated on the campus of Drew University, with NJIT renting classroom space and utilizing the Drew University Library which maintains an NJIT reserve collection of books and periodicals in the field. To defray the added costs of the program, which included classroom rental and faculty travel expense, a surcharge was added to the usual tuition and general fee. Access to computer facilities was provided on the Drew campus through utilization of the New Jersey Educational Computer Network.

Since program inception, well over 200 students have taken courses at the Drew University extension site. A typical program includes three courses per semester, each meeting weekday evenings from 6:30 p.m. to 9:15 p.m. The average course enrollment in 1980-81 was 22 students.

In the mid 1970's, a strong interest in programs in Computer Science and Engineering in the Camden area was expressed by RCA. Company management pointed out that there was no existing program in engineering or computer science in southern New Jersey in contrast with the 21 engineering programs in central New Jersey. RCA also represented to the New Jersey State Department of Higher Education that there was a critically short supply of engineers and computer scientists in southern New Jersey, and a very high turnover in computer scientists due in part to limited educational opportunities for these professionals to keep up with the latest development in their field.

In 1979 a pilot program for a Master's Degree in Computer Science was established at the RCA facility in Moorestown. This was an evening program, approved by the New Jersey Department of Higher Education, and the Middle States Association of Colleges and Schools. No state aid was provided as the program was initially restricted to

personnel of RCA and associated companies. Tuition was thus higher than on-campus rates and was predicated upon recovery of costs.

Three graduate courses were offered each semester. In 1981 the program was opened to the public. Tuition was set at the same rate as that paid in Newark, and facilities were expanded to include Moorestown High School. The RCA Computer facilities were open to all the students during the course hours as well as other evenings. Through 1981, over 125 students have taken courses at this extension center, with an average of over 20 students per course offering.

In 1979 in response to community college requests and the Statewide Master Plan recommendation in the area of Engineering Technology, NJIT began to offer upper division courses within baccalaureate degree programs in Manufacturing Engineering Technology and Construction/ Contracting Engineering Technology at Mercer County College, and Electrical Engineering Technology and Mechancial Engineering Technology at Camden County College. Commitments to offer complete programs have not as yet been made.

The extension programs at Mercer County College and Camden County College use the laboratory facilities and the libraries on the host campus which will be augmented by NJIT. Both county colleges offer technology programs leading to the Associate Degree, and there is no educational institution in the area providing course work for upper division programs in these fields of Engineering Technology. The technology extension program at Mercer County College has averaged 10 students per course, with one or two courses offered per semester. The extension program at Camden County College has evidenced a slow beginning with small registration of 7-8 students per course.

In 1973 NJIT entered into a contractual arrangement with the Signal Corps facility at Fort Monmouth for a doctoral program in Electronic

Communications at the Fort. The initial contract was for a period of three years. Enrollment plans were for 20 students per year for three years, tapering off to a steady rate of 10 new students per year. The program began in 1973 with 10 students, and then averaged only 4 new students a year over the next five years. Extensive recruiting efforts proved unsuccessful. In view of high cost, limited demand, and the reluctance of Fort Monmouth to underwrite the program, it was terminated in 1978. The four on-going sites have involved four full time and four part time NJIT faculty members in 1980-81.

POTENTIAL NEW PROGRAMS

At this time, NJIT is actively involved in negotiations with Stockton State College for a joint NJIT-Stockton program in Civil Engineering/Environmental Option (undergraduate degree), as well as a Master of Science Degree in Industrial Engineering with a specialty in Human Factors. The baccalaureate engineering degree would serve the areas in and surrounding Atlantic County and would rely significantly upon Stockton's faculty in the Sciences and Mathematics, and NJIT's faculty in Civil and Environmental Engineering. In addition to the factors of demand for engineers in southern New Jersey and the lack of a baccalaureate engineering program in the area, there are considerable undergraduate project and research opportunities in the area, especially in the field of Environmental Engineering.

The proposed M.S. program in Industrial Engineering would serve the Federal Aviation Authority complex a few miles from Stockton College, as well as other industry in the area and would involve Stockton faculty in Psychology and Statistics and the NJIT faculty in Organizational and Social Sciences, and Industrial Engineering.

JOINT PROGRAM - NJIT AND RUTGERS UNIVERSITY

In order to provide an undergraduate degree in Computer Science in the Camden area, NJIT and Rutgers University-Camden agreed in 1981 to work together to develop an undergraduate degree program with options in Business Management and scientific orientations. Rutgers will offer and administer the Business Management option and Rutgers and NJIT will jointly develop and teach the scientific option. Some new faculty will be appointed jointly to teach in the undergraduate program at Camden as well as NJIT's graduate program in nearby Moorestown. There will be a joint Rutgers-NJIT Committee to develop and administer the scientific option in the undergraduate Computer Science degree program. As part of this option design, off-campus offerings will be designed to accommodate other students in southern New Jersey where demand exists. In addition, a bridge program will be available for students desiring to enter the Computer Science field from the liberal arts and humanities and for those students requiring courses in programming and advanced mathematics for admission to the graduate program.

JOB FORECASTS AND EDUCATIONAL SUPPLY

OCCUPATIONAL OUTLOOK[1]

New Jersey's occupational outlook may be studied using actual data for 1974 and projected 1985 figures. Although the percentage change in all occupations over the 11 year period is expected to be an increase of 20 percent, certain fields will experience even greater increases as noted on the following table. Opportunities for computer specialists, for example are projected to increase by 45 percent.

[1]The most recent data available from the NJ Department of Labor and Industry include forecasts to 1985. Other sources substantiate the occupational outlooks for the 1980's and through 1990's.

STATE OF NEW JERSEY

Estimated Occupational Employment

1974 to 1985

	1974 No. of Jobs	1985 Projected No. of Jobs	% Change
All Occupations	3,015,000	3,627,800	20%
Computer Specialists	13,300	19,300	45%
Engineering Technicians and Science Technicians	43,800	58,300	33%
Professional, Technical	449,200	644,900	29%
Engineers	52,600	63,000	20%

POPULATION SHIFTS IN NEW JERSEY

Another significant factor is the changing population characteristics of New Jersey. People are moving out of the populous northern and central counties such as Bergen, Essex, Hudson, and Union. It is predicted that by 1985, although the state will experience an overall 9.3 % population growth (compared with 1970), these four northern counties will suffer a substantial decline in population. The counties with the greatest projected growth by 1985 will be the less populated Atlantic, Cape May, Ocean and Sussex counties (see table on the following page). The problem is that higher educational opportunities are quite limited (especially in the engineering and computer science fields) in those counties into which there is net in-migration.

RECENT HISTORY OF GRADUATES IN ENGINEERING, COMPUTER SCIENCE AND ENGINEERING TECHNOLOGY

While all indicators point toward a rising need for engineers

Projected Populations Shifts 1970-1985

County	% Population Change 1970-1985
Atlantic	+56.2%
Burlington	+31.5%
Bergen	-2.5%
Camden	+11.9%
Cape May	+90.3%
Cumberland	+20.2%
Essex	-13.4%
Gloucester	+28.4%
Hudson	-9.5%
Hunterdon	+30.3%
Mercer	+11.1%
Middlesex	+6.8%
Monmouth	+12.7%
Morris	+11.0%
Ocean	+96.1%
Passaic	+5.1%
Salem	+6.9%
Somerset	+15.3%
Sussex	+67.7%
Union	-7.2%
Warren	+21.2%

in the 1980's in New Jersey, engineering degrees comprised only 6.5% of the degrees awarded in the state during the 1978-79 school year. This measurement was 6.8% in 1972, declining to 5.09% in 1976, and since rising to its current 6.5%

Computer Science, one of the most rapidly expanding fields nationally, accounted for only 0.84% of the bachelor's degrees awarded in 1979 in New Jersey.

Engineering Technicians, another occupational group that should be in demand in the coming decade, will for the most part be educated in Associate Degree Programs offered by community colleges. This group represents 5.77% of all the Associate Degrees awarded in the state in 1979.

In 1979, 1645 engineering degrees were conferred in New Jersey representing 6.5% of the total of 25,242 degrees, with 82% of the engineering degrees awarded by four institutions: New Jersey Institute

of Technology, Rutgers University, Stevens Institute of Technology, and Princeton University.

New Jersey Institute of Technology graduated 579 engineers in 1979 representing 35.2% of the statewide total. Rutgers University College of Engineering awarded 370 degrees in engineering or 22.5%, Stevens Institute of Technology conferred 213 engineering degrees or 12.9%, representing 11.7% of all engineering degrees awarded for that year in New Jersey.

SUPPLY AND DEMAND: CAMDEN COUNTY AND MERCER COUNTY AREAS

One of the most rapidly expanding fields in the state is Computer Science. But while the computer science industry is expected to see a 45% growth between 1974 and 1985, or an increase of 6000 positions, the number of bachelor degrees awarded by the four-year institutions in the state will not meet the rapidly increasing demand.

In 1979, 25,242 degrees were awarded in New Jersey, but only 213, representing a mere 0.84%, were in the Computer Science field. Overall in New Jersey it is expected that between 1974 and 1985 there will be 720 job openings annually in the Computer Science area, a demand which far exceeds projected supply.

The undersupply of Computer Science specialists from New Jersey colleges and universities has been met in part by industry recruiting graduates from other states. However, these industries still indicate a high number of unfilled positions in Computer Science which has led to problems in industrial growth, development, and research efforts.

The need for Engineering Technology programs in the Camden and Mercer county areas may also be seen by comparing the job market for Engineering Technologists with the Associate Degrees and Baccalaureate

Degrees awarded in these fields. Statewide, industries employing Engineering Technologists are projected to create a 33.11% increase in demand, representing some 14,500 jobs by 1985. The annual job openings between 1974 and 1985 are expected to be 2240. In 1979, 558 Engineering Technology Associate Degrees were awarded in the State of New Jersey and a total of 303 Bachelor of Engineering Technology degrees: 73 BSET graduates from Trenton State, 140 BSET graduates from NJIT, and 90 from Fairleigh Dickinson University.

For the State of New Jersey, the demand created by 2240 annual job openings for engineering and science technicians compares with an annual supply (1979) of 861 graduates, predominantely with two year associate degrees. While NJIT can respond to the demand for BSET programs for students residing within its commuting area, and with limited dormitory space for some students beyond this area, it is also committed to help meet the demonstrable needs of students and industries by offering extension programs.

In the Camden labor market area, encompassing Camden, Burlington and Gloucester counties, three community colleges offer Associate Degrees in Engineering Technology. These include Camden Community College, Burlington Community College and Gloucester Community College.

The total number of Associate Degrees awarded in Engineering Technology within the Camden labor market area in 1979 totaled only 56, or 4.2% of all Associate Degrees conferred. If one compares this with the anticipated demand in that area, demand will apparently exceed supply. A 21.52% increase in demand by 1985, representing 850 jobs is projected for this labor market area. It is expected that there will be 160 job openings per year in this area, almost three times as many jobs as graduates.

In the Mercer County area a similar disparity between graduates in technology programs and demand for these graduates can be demonstrated. In Mercer County, Mercer Community College is the only college which confers an Associate Degree in Engineering Technology and Trenton State College the only institution offering the Bachelor's degree in this field. In 1979, Mercer Community College awarded 78 degrees in Engineering Technology, and Trenton State College awarded 73 BSET degrees. This supply of graduates must be compared with the significant growth in technology related industry between 1974 and 1985. This growth is projected to be 52.73%, representing 1450 jobs by 1985.

The potential market for educational expansion in these areas is great. In the Camden labor market area with an expected 160 job openings per year in Engineering Technology, and only 56 associate degrees awarded in this area in 1979, approximately 100 additional graduates will be needed every year, assuming no in-migration of graduates,or that in-and-out migration are balanced. In Mercer County, with 190 annual technology openings expected, and with a total of 151 associate and bachelor's degrees awarded, there will be an apparent deficit of some 40 graduates.

These statistics indicate that a significant market exists in both the Camden and Mercer County areas for expansion of technology programs. These figures are consistent with Statewide Master Plan which recommends that NJIT assume a role in filling this demand for graduates in future years.

PROGRAM PLANNING: LOGISTICS OF OPERATIONS

Extension programs currently operate with essentially the same faculty to student ratio, adjunct to full-time faculty ratio,

academic standards and administration as the Newark campus. Admission into a program is made pursuant to the same requirements, standards and procedures, with review and recommendation by the degree granting department. All off-campus students are mailed registration material, and registration may be by mail or in person at the extension site where NJIT staff are available to advise and register students. Course materials and books are supplied to the students through the bookstore on host campus sites or at registration at other sites.

Extension programs are the administrative responsibility of the Assistant Vice President for Extension Programs who reports to the Vice President for Academic Affairs. The Extension Program administration works closely with the Chairperson of the degree granting department and the Academic Dean in the planning and operation of the program. Responsibilities of the Office of Extension Programs include developing and administering programs in conjunction and cooperation with existing academic departments.

Detailed Responsibilities of the Office include the following:

1. Scheduling courses and planning course offerings several years in advance.
2. Obtaining classroom space as needed.
3. Coordinating newspaper publicity.
4. Assisting instructors in administrative matters.
5. Counseling and enrolling prospective students.
6. Assisting in admission procedures and transfer credit requests.
7. Collecting tuition and fees.
8. Selling texts and course materials.
9. Maintaining working copies of student records and enrollments for counseling and program planning.

10. Maintaining overall calendar of events, holidays and schedules.
11. Representing the Institute at off-campus sites including the Graduate Division, Division of Technology, Admissions, Registration and Bursar Offices, and the departments of instruction.
12. Maintaining a schedule at sites of office hours and visitations during normal working hours to deal with problems and concerns of enrolled students and to advise potential new students.
13. Assessing library and laboratory facilities and recommending augmentation where appropriate.
14. Assessing student satisfaction through outcomes studies.

To assist in the liaison and advisement in the Engineering Technology offerings, on-site coordinators have been assigned. These coordinators are full-time faculty members at Mercer and Camden Community Colleges who are actively engaged in teaching and advising in the NJIT Extension Program.

To illustrate the operations of the Extension Office in the planning and operation of the off-campus courses and programs, the following comments are offered based upon experience at two on-going sites, the collegiate site (at Drew University) and the industrial site (at RCA), both offering the Master of Science degree program in Computer Science.

The Office of Extension Programs, with primary input from the Department of Computer and Information Science, structures and develops course offerings for two years into the future, with scheduling on a semester basis. With the assistance of NJIT's Public Relations Office, flyers and brochures are prepared describing the program and courses, which are sent to each enrolled student as well as to all engineering or computer oriented firms in the area of the site, and upon request to prospective students. Newspaper publicity is also developed by the

Extension Office in concert with the Public Relations Office announcing the course and/or program offerings each semester.

The Extension Office in conjunction with the Computer Science Department, through the Chairman or Associate Chairman, informs and assists the faculty (NJIT, full time or adjunct) with respect to any special needs in the off-campus program, including audio-visual aids, reproduction of teaching materials, computer access account numbers for access to the computer.

The Computer Science Department, through its Chairman or Associate Chairman in conjunction with the Office of Extension Programs establishes a schedule for counseling prospective students throughout the semester and prior to registration for each semester.

Registration for already enrolled students may be by mail or in person on the off-campus site. For new students, registration is in person. At registration, the Chairman or Associate Chairman is available for counseling and assistance in course and program selection as is the Director of Graduate Studies, and the Director and Assistant Director of the Extension Program.

The registration and counseling advisement systems for off-campus programs at both the RCA and Drew University sites are equivalent to those at the home campus. The Graduate Office utilizes the same procedures and standards in reviewing applications and evaluating transfer credit requests.

A schedule of office hours is maintained at both sites by the Office of Extension Programs and the Computer Science Department to meet with students, for advisement, to disseminate information and address any problems. At RCA, this schedule is usually one day per two weeks and at Drew University, once a week, with announcements of the schedule published at least one month in advance.

A master record is maintained by the Extension Office indicating for each student, the historical sequence of courses completed by semester. This is utilized in course scheduling and advisement. The Graduate Office maintains the official record for every student.

At Drew University, texts for NJIT courses are sold through the Drew Bookstore while at RCA books are sold by the Extension Office staff at registration and at the first class meeting.

The Registrar communicates directly with each student in billing for tuition, general fees, and laboratory fees. The Office of Extension Programs also acts as a problem solver on financial matters for students where necessary.

For the courses at Drew, the Office of Extension Programs conducts a student survey, asking for comments on the program (how it satisfies their career goals, for example) as well as for evaluations of the courses and instruction.

RCA conducts an extensive student evaluation for each course and instructor, and shares its results with the NJIT staff. The results of these evaluations have assisted NJIT in the selection of faculty and in site selection and course scheduling.

The Chairman and Associate Chairman of the Computer Science Department evaluate the library and laboratory facilities to insure that the facilities are equivalent to those of the Newark campus and that the same class exercises, laboratories and assignments are used. For the Drew program, access to the state computer network is available, and at RCA an equivalent computer network is available. Both sites offer extensive technical libraries, and both belong to a collegiate inter-library loan system.

The off-campus program is evaluated on a regular five year basis as part of the overall NJIT evaluation process. There is also an annual evaluation by the Dean as part of the administrative review process of Department Chairpersons.

RECRUITMENT OF STUDENTS

Off-campus course offerings are called to the attention of potential students through press releases, flyers, and similar approaches. Flyers and posters are distributed to industry within the commuting area of the off-campus site as noted in the preceding section. Appropriate industrial contacts are made through use of industrial directories detailing type of business of the firm and number of employees. Presentations are also given to local Chambers of Commerce and at industrial sites in the area.

FINANCIAL CONSIDERATIONS

The intent of NJIT's extension programs is to satisfy the needs of students and of industry while assuring fidelity to high standards. It is not intended that extension programs produce a net financial return.

For off-campus programs open to the general public, the tuition and fee structure is similar to that of the Newark campus. For an off-campus program the general fee covers the special administrative costs of operating the program (such as travel costs) while the same fee for the home campus student includes student services and athletic activities. For off-campus courses specific to one industry and not open to the general public, tuition levels are increased to cover the total cost of instruction and administration of that course.

PROGRAM ACCOUNTABILITY

Extension programs must be approved by the New Jersey State Department of Higher Education, which in its review process circulates the program planning documents to all colleges and universities in New Jersey. The Department also monitors operating programs. A Fall, 1981 Board of Higher Education resolution requires annual reporting of all off-campus programs.

Extension programs are also often reviewed by the industries served by the program. The NJIT Office of Extension Programs also conducts assessments of each course through student evaluations.

Finally, accreditation agencies, regional and professional, review a variety of areas of concern such as curriculum, support facilities, faculty composition, and administration of the extension programs.

IMPACT ON NEWARK CAMPUS

Extension programs are designed to complement rather than compete with programs on the Newark campus. Extension courses are offered in the evening to serve students and industry beyond the commuting area of the Newark campus.

FACULTY ROLE IN EXTENSION PROGRAMS

At this time, the principal Institute extension programs involve Computer Science. These are located where there is strong industrial demand for such programs, in Morris and Camden counties.

NJIT, as is true of most similar institutions, is feeling some pressure with respect to faculty resources, especially in Engineering and Computer Science. The Department of Computer and Information Science

is seeking to add at least three full-time faculty to an existing department of twelve full-time faculty. With a talented and committed faculty core, some of whom are relatively young and untenured, the appropriate allocation of individual and Department's resources is a critical question. Can teaching, research, and advisement, as well as teaching off-campus be part of a successful program, and will teaching off-campus be recognized when individual faculty members are considered for promotion or tenure? To date, faculty off-campus involvement and participation has been voluntary, with the department carrying the responsibility for staffing the program. Faculty thus far have been compensated for travel expenses for their off-campus teaching, but receive the same course credit for off-campus teaching, as on the main campus. The off-campus faculty members frequently play a more active role as an adviser of their students than is true of their counterpart on the home campus. As an on-site representative of NJIT, this advisement prior to class is a vital part of the faculty member's interaction with the students.

Where a department is expanding, as is the case with Computer and Information Sciences, it may be feasible to engage additional faculty members whose primary teaching responsibilities are in extension programs. The faculty member might reside in relatively close proximity to the off-campus site, and be on the home campus, say two days a week. In this way the extension programs would have a core faculty, experienced and dedicated to the off-campus activities. With a recognition of the importance of the off-campus programs, and an understanding of the mandate of NJIT in this area, this could be a model to plan for in the future.

To assist with the administration of the off-campus program, another alternative would be to provide an administrative assistant to those

departments most heavily involved in off-campus programs. This individual would provide assistance in the functioning and operation of the extension programs.

Serious concerns relative to extensive programs center upon continued interest and commitment of the faculty, and a reward and compensation policy which will offer incentives for off-campus teaching. Administration of the off-campus programs must be efficient, and recruitment of new students must conscientous.

There is a demonstrated need for programs of quality in southern and western New Jersey to meet increasing demands in computer science, technology and engineering. The degree of success of NJIT in meeting this demand will be a function of the commitment to such programs by its administration and faculty.