

Excellence and Accountability Report

September 2003

NJIT

New Jersey Institute of Technology

A Public Research University

A. Statement of Accuracy and Completeness

The information contained in this report is, to the best of my knowledge, complete and accurate.

Robert A. Altenkirch

President

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Introduction

NJIT enrolled more than 8,828 students in 2002 and enrollments are continuing to increase. NJIT awards approximately 1,800 degrees annually from the baccalaureate through the Ph.D. in an array of engineering and technology disciplines, computer and information science, architecture, management, applied sciences, mathematics and biotechnology. The university offers Ph.D. programs in twenty professional areas, master's programs in forty specialties, and thirty six baccalaureate degree programs, conducts research with important commercial and public policy applications, and performs a broad spectrum of economic development and public service activities. NJIT has one of the most computing-intensive campuses in America. NJIT contributes significantly to New Jersey's economy and economic development. NJIT's students have provided 70,000 hours of community service over the past five years, and the university serves more than 4,500 elementary and secondary school students and teachers annually through an array of pre-college programs.

NJIT was founded in 1881 as Newark Technical School. Today, the university has six schools: Newark College of Engineering (1919), the New Jersey School of Architecture (1973), the College of Science and Liberal Arts (1982), the School of Management (1988), the Albert Dorman Honors College (1993), and the College of Computing Sciences (2001). From the outset of its history, NJIT has provided government, industry, and the larger community with a technologically educated workforce. Today's emphasis on graduate studies and research builds upon the fine undergraduate programs that have distinguished the institution since its earliest days. Currently, about one-third of NJIT's students are enrolled in master's and doctoral programs.

NJIT's evolution as a significant research university has been achieved through an aggressive faculty recruitment plan matched by an extensive building effort that doubled the size of the main campus over the past decade and added major research facilities for environmental engineering and science, advanced manufacturing, and microelectronics. Annual research expenditures are now approximately \$60 million. The strong applications orientation of the university's research program has allowed NJIT to respond to state, federal, and industrial initiatives, to help address pressing public policy issues, and stimulate economic growth. Research activities, often carried out by interdisciplinary teams of investigators, are focused especially on manufacturing systems, infrastructure, information technologies, environmental engineering and science, architecture and building science, and management. Major funding for instructional and research programs is obtained from leading corporations, foundations and government agencies including the National Science Foundation, the United States Department of Defense, the U.S. Environmental Protection Agency, the U.S. Department of Transportation, the New Jersey Commission on Science and Technology, the New Jersey Department of Environmental Protection and many others.

NJIT's 45 acre, computing-intensive, residential campus is located in the University Heights section of Newark, less than 10 miles from New York City and Newark International Airport. It is easily reached by interstate highways and public transportation. Graduate, undergraduate,

and continuing education classes are offered at the main campus, at the NJIT/Burlington County College Technology and Engineering Center (TEC), at extension sites at colleges and other locations throughout New Jersey and increasingly through a variety of electronically mediated distance learning formats.

NJIT Mission Statement

NJIT is a *public, urban research university*, committed to the *pursuit of excellence* ----

- in undergraduate, graduate, and continuing professional *education*, preparing students for productive careers and amplifying their potential for lifelong personal and professional growth;
- in the conduct of *research* in such multi-disciplinary areas as environmental engineering, materials science, manufacturing, productivity enhancement, transportation and infrastructure systems, infrastructure and communications technologies, and health sciences;
- in contributing to the state's *economic development* through partnerships and joint ventures with government and the business community and through the development of intellectual property;
- in *service* to both its local communities and the broader society of the state and nation by conducting public policy studies, making educational opportunities widely available, and initiating community-building projects.

NJIT *prepares its graduates* for positions of leadership as professionals and as citizens; *provides educational opportunities* for a broadly diverse student body; *responds to needs* of large and small businesses, state and local governmental agencies, and civic organizations; and *advances the uses of technology* as a means of improving the quality of life.

NJIT offers a *comprehensive array of programs* in engineering and engineering technology, computer science, architecture, applied sciences, mathematics, management, policy studies, materials science, and related disciplines throughout New Jersey and the nation.

As defined in The Statewide Plan for Higher Education (1981), the programmatic mission of NJIT is:

... to provide undergraduate and graduate education in architecture, engineering, engineering technology, applied sciences, management, and related professional fields, and doctoral education specifically, in engineering, the sciences, mathematics, management and related areas. The programs in architecture should be offered solely by NJIT in the public sector. In addition, the university should offer the opportunity for practitioners in the industrial community to pursue part-time evening degree programs from the baccalaureate through the master's to the doctoral degree. It should also play a leadership role in continuing professional education, providing courses ranging from state-of-the-art offerings in new fields to more formal certification programs for state or municipal licensure. NJIT's research programs, as well as its public service activities, should be primarily, but not exclusively, applications oriented.

Undergraduate Recruitment and Admissions Policies

As a public institution, NJIT strives to achieve three complementary and mutually reinforcing Goals through its undergraduate recruitment and admissions policies:

- To attract highly talented students who are fully prepared for the university's rigorous curricular demands and can satisfy the highest academic standards;
- To enroll students from population groups that are under-represented in the professions, while providing the extra academic support they may need; and
- To recruit and admit students who will successfully complete one of NJIT's curricula in numbers large enough to make a substantial contribution toward meeting state and national demands for technological and managerial professionals.

These three Goals are complementary and mutually reinforcing. They clearly reflect the responsibilities of a public institution with a public mission. And they are consistent with NJIT's long-range vision of joining the ranks of the nation's leading technological research universities.

There are four avenues to undergraduate admission:

- Admission to the Albert Dorman Honors College
- Regular admission
- Admission to the Educational Opportunity Program (EOP)
- Admission as a transfer student from another college or university

NJIT uses multiple methods to determine an applicant's admissibility. No single measure is sufficient to predict success. Therefore, all of the following are considered: high school transcripts and rank-in-class data; college or university transcripts where applicable; recommendations; SAT scores; interviews of candidates seeking admission to the Honors College or admission through the Educational Opportunity Program; and portfolios for candidates seeking admission to the School of Architecture.

The *Albert Dorman Honors College* program is designed to attract exceedingly able and highly motivated students to NJIT, to provide a rich and challenging educational experience, and to prepare them for positions of leadership. Some NJIT courses are open only to honors students, but most include both honors and non-honors students; by participating in classes and laboratories with others, the honors students raise the level of discourse in all of NJIT's curricula. The SAT profile of the honors students (required minimum composite score of 1250) falls within the range that many people believe is not served by New Jersey's institutions. Enrollment in the *Albert Dorman Honors College* increased from 209 scholars in Fall 1993 to 448 in Fall 1998. In Fall 1996, the Honors College opened a second branch at the Technology and Engineering Center in Mount Laurel (which enrolled freshmen for the first time in Fall 1996). The university's plans call for further significant expansion of the Honors College.

NJIT also has an outstanding *Educational Opportunity Program* (EOP) with an enrollment of 584 undergraduates in Fall 1998. It is a program of extraordinary importance to the state and nation because the people it typically serves are under-represented in the fields which NJIT prepares students to enter, and successful completion of an NJIT degree program generally leads to a productive career. The success of EOP graduates over a quarter century is further proof that multiple criteria should be used in determining who can benefit from the higher education experience. It should also be noted that the state, through its Educational Opportunity Fund, has by regulation required institutions to admit educationally and economically disadvantaged students in numbers equal to at least ten percent of the New Jersey high school graduates in each entering class. Because of NJIT's specialized mission and sense of commitment, NJIT has historically exceeded this percentage. NJIT firmly believes holding open this door to opportunity is one of the strengths of our state system of higher education.

NJIT is proud of the results achieved with its undergraduate recruitment and admissions policies. *Diversity* is a hallmark of the campus community. As the state's public technological research university, NJIT admits individuals who want to study in the fields it offers, regardless of personal background or family finances. NJIT selects those who indicate a strong desire to succeed. For those who do succeed, the experience is life transforming. We believe this is what a public university should be about in a democratic society.

Vision Statement

AS NJIT looks to the future, its overarching goals are to be a forward looking research university, operating at the boundary of change, leading the development of new programs and modes of delivery to meet the needs of constituents, and reaching new levels of institutional excellence in service to the people of our community, state, and nation.

The NJIT of the twenty-first century will be a globally-oriented research university widely known for its emphasis on the design, development, management, interpretation, and application of sustainable technology for the benefit of society. The concept of multi-lifecycle education will be an integrating theme for the university's programs.

NJIT's institutional culture will encourage and reward entrepreneurial initiatives on the part of students, faculty, and staff. Programs will place special emphasis on quality and productivity in the context of a global economy. Partnership with private corporations, public agencies, and other research universities, both here and abroad, will be a standard operating mode.

NJIT's campus community will reflect the complexity of a pluralistic society. Its diverse composition will enrich and enhance the educational and cultural dimensions of the entire learning experience.

NJIT's degree programs and curricula will prepare students to assume positions of leadership as professionals and entrepreneurs in a global economy. Its graduates will be

engineers, scientists, architects, technologists, managers, social scientists, and policy-makers with a broad understanding of economic, social, and organizational issues; with excellent communication skills as well as specialized technical competence; with the interpersonal skills needed to work well in teams; with social awareness, ethical values, and moral integrity as underpinnings for personal growth and responsible citizenship; and with a record of both practical work experience and community service as components of their education.

NJIT's faculty, administrators, and staff will assist students to meet the university's rigorous academic standards, fully develop their talents, and make their education a life-transforming experience. All will view students' success as the measure of their own effectiveness.

II. Data for 2002-2003 by Category

II.A. Accreditation Status

II.A.1. Regional Accreditation

- The Middle States Association of Colleges and Schools (2002)

II.A.2. Specialized Accreditation

- American Assembly of the Collegiate Schools of Business (AACSB)
- Computer Accreditation Commission of the Accreditation Board for Engineering and Technology (CAC/ABET)
- Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET)
- National Architecture Accrediting Board (NAAB)
- National League of Nursing (NLN)
- Council for Education on Public Health (CEPH)
- Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET)

II.B. Characteristics of Undergraduate Students

II.B.1. Mean Math and Verbal SAT Scores

	Full-Time Students				Part-Time Students			
	Math	N	Verbal	N	Math	N	Verbal	N
Regular Admits	613.47	565	552.18	565				
EOF Admits	563.37	89	501.35	89	540.00	1	610.00	1
Special Admits	595.71	7	562.86	7				
All Admits	606.54	661	545.45	661	540.00	1	610.00	1
Missing Scores		2		2				

II.B.2. Percentages of Freshmen Needing Remediation in Reading/Writing, in Math Computation, and in Elementary Algebra

	% of All FTFTF Tested	% of All FTFTF Needing Remediation
Reading	100%	24%
Writing	100%	24%
Math Computation	100%	12%
Elementary Algebra	100%	46%

Note: all students needing reading remediation are also considered to need writing remediation.

II.B.3 Race/ Ethnicity, Gender, and Age

II.B.3.a. By Race/ Ethnicity

	White		Black		Hispanic		Asian		American Ind.		Alien		Race Unknown		Total	
	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct
Full-time	1,557	28.1%	471	8.5%	493	8.9%	1,172	21.1%	10	0.2%	1,217	21.9%	628	11.3%	5,548	100.0%
Part-time	1,046	31.9%	316	9.6%	306	9.3%	561	17.1%	7	0.2%	328	10.0%	716	21.8%	3,280	100.0%
Total	2,603	29.5%	787	8.9%	799	9.1%	1,733	19.6%	17	0.2%	1,545	17.5%	1,344	15.2%	8,828	100.0%

II.B.3.b. By Gender

	Full-time					Part-time					Total				
	Male	Pct	Female	Pct	Total	Male	Pct	Female	Pct	Total	Male	Pct	Female	Pct	Total
	4,273	77.02	1,275	22.98	5,548	2,455	74.85	825	25.15	3,280	6,728	76.21	2,100	23.79	8,828

II.B.3.c. By Age

		LT 18	18-19	20-21	22-24	25-29	30-34	35-39	40-49	50-64	65+	Unknown	Total
Full-time	Num	22	1,145	1,379	1,599	894	292	120	79	12	2	4	5,548
	Pct	0.4%	20.6%	24.9%	28.8%	16.1%	5.3%	2.2%	1.4%	0.2%	0.0%	0.1%	100%
Part-time	Num	34	45	182	585	908	587	389	432	95	1	22	3,280
	Pct	1.0%	1.4%	5.5%	17.8%	27.7%	17.9%	11.9%	13.2%	2.9%	0.0%	0.7%	100%
Total	Num	56	1,190	1,561	2,184	1,802	879	509	511	107	3	26	8,828
	Pct	0.6%	13.5%	17.7%	24.7%	20.4%	10.0%	5.8%	5.8%	1.2%	0.0%	0.3%	100%

II.B.4. Numbers of Students Receiving Financial Assistance Under Each State-funded Aid Program: Need-based and Merit-based, Grants and Loans.

	Recipients	Awards	Dollars(\$)	\$/Recipient	\$/Award
TAG	1,448	2,626	5,840,288	4,033.35	2224.02
EOF	397	739	392,105	987.67	530.59
Bloustein Scholars	124	243	121,500	979.84	500.00
Urban Scholars	107	204	102,000	953.27	500.00
NJCLASS Loans		148	959,820		6485.27
OSRP*		131	356,956		2724.85

* First disbursement of state share.

II.B.5. New Jersey State Residence

	State Residents	Non-State Residents	Total	% State Residents
	609	54	663	91.9

II.C. Degrees Conferred

II.C.1. By Ethnicity and Gender

II.C.1.a. By Ethnicity

White		Black		Hispanic		Asian		American Ind.		Alien		Race Unknown		Total	
Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct
292	32.96	86	9.71	65	7.34	242	27.31	2	0.23	86	9.71	113	12.75	886	100.0

II.C.1.b. By Gender

Men	Pct	Women	Pct	Total
688	77.65	198	22.35	886

II.C.2. By General Field of Study

IPEDS CIP Code Major Category	No.
Conservation & Renewable Natural Resources	10
Architecture & Related Programs	67
Business Management & Administrative Services	101
Computer and Information Sciences	242
Engineering	302
Engineering-Related Technologies	120
Health Professions and Related Sciences	4
English Language and Literature/Letters	6
Biological Sciences/Life Sciences	7
Mathematics	14
Multi/Interdisciplinary Studies	6
Physical Sciences	4
Social Sciences and History	3
Total	886

II.D. Student Outcomes

II.D.1. Graduation Rate

II.D.1.a. Six-Year Graduation Rate

Non-Resident		Black		Indian		Asian		Hispanic		White		Unknown		Total	
Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd	Cohort #	%_Grd
20	45.0	75	29.3	1	0.0	119	67.2	89	51.7	295	41.7	0	0.0	599	46.7

II.E. Faculty Characteristics

II.E.1. Full-time Faculty by Race/Ethnicity, Gender, and Tenure Status

	White		Black		Hispanic		Asian		American Ind.		Alien		Race Unknown		Total	
	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct	Num	Pct
	Tenure	168	73.7%	8	3.5%	3	1.3%	40	17.5%	1	0.4%	3	1.3%	5	2.2%	228
Female	25	83.3%	1	3.3%	1	3.3%	2	6.7%	0	0.0%	0	0.0%	1	3.3%	30	100%
Male	143	72.2%	7	3.5%	2	1.0%	38	19.2%	1	0.5%	3	1.5%	4	2.0%	198	100%
Without Tenure	106	58.6%	10	5.5%	1	0.6%	12	6.6%	0	0.0%	28	15.5%	24	13.3%	181	100%
Female	26	72.2%	4	11.1%	0	0.0%	3	8.3%	0	0.0%	1	2.8%	2	5.6%	36	100%
Male	80	55.2%	6	4.1%	1	0.7%	9	6.2%	0	0.0%	27	18.6%	22	15.2%	145	100%
Total	274	67.0%	18	4.4%	4	1.0%	52	12.7%	1	0.2%	31	7.6%	29	7.1%	409	100%
Female	51	77.3%	5	7.6%	1	1.5%	5	7.6%	0	0.0%	1	1.5%	3	4.5%	66	100%
Male	223	65.0%	13	3.8%	3	0.9%	47	13.7%	1	0.3%	30	8.7%	26	7.6%	343	100%

II.E.2. Percentage of Courses Taught by Full-time Faculty

Courses	F.T.	P.T.
2,900	69.4	30.6

F.T.: Full time faculty

P.T.: Part time faculty

II.F. Characteristics of the Trustees

II.F.1. Race/ Ethnicity and Gender

	B	AI/AN	A/PI	H	W	Total
Male	1	0	1	0	10	12
Female	0	0	0	0	1	1
Total	1	0	1	0	11	13

B : Black/African American, Non-Hispanic
AI/AN : American Indian/Alaskan Native
A/PI : Asian/Pacific Islander
NRA : Non-Resident Alien
H : Hispanic
W : White, Non-Hispanic
U : Unknown

II.F.2. Members of the Board of Trustees

- James A. Kennedy, Chair, Chairman and CEO (ret.), National Starch and Chemical Company
- John N. Bain, Esq. ' 53, Vice Chair, Carella, Byrne, Bain and Gilfillan
- Hamilton V. Bowser, Sr., ' 52, President, Evanbow Construction Company, Inc.
- W. Stanley Brown, Ph.D., President, Brown Global Enterprises, L.L.C.
- Peter A. Cistaro, '68, Vice President - Distribution, Public Service Electric and Gas Company
- Vincent L. DeCaprio, Ph.D. ' 72, President, Vyteris
- William Eventoff, Ph.D., President, ESTM Associates, Inc.
- Robert C. Ferris, Jr., Group Vice President and Director of Financial Communications Group, GCI Group
- Anthony J. Knapp Jr., Owner, Black Horse Inn
- Arun Netravali, Ph.D., Senior Scientist, Bell Laboratories Lucent Technologies
- Frank J. Ryan, Group Chairman (Ret.), Johnson & Johnson Co.
- Arthur F. Weinbach, Chairman and CEO, Automatic Data Processing, Inc
- Kathleen Wielkopolski, Vice Chair, Chief Financial Officer, The Gale Company

II.F.3. Members of the Board of Overseers

For more than thirty-two years, the university's Foundation has contributed to the institution through the professional expertise of the NJIT Board of Overseers. Chartered as the Newark College of Engineering Research Foundation, its stated purpose includes the support and encouragement of research and the establishment of fellowships and lectureships. Its mission was later broadened to include fund raising

and support of all the academic programs at the university. The current members of the Board of Overseers are:

- Robert A. Altenkirch, Ph.D., Secretary of the Foundation, President, NJIT
- John H. Olson '61, '66, Chair, Fund Raising Committee, Managing Director (Ret.), Northeast Region, Morgan Stanley
- Randy Allen, Johnson School of Graduate Business, Cornell University
- Ernest Andalcio, Formerly of Pfizer, Inc.
- Gastone Bello, Ph.D., Executive Vice President, Technical Operations, U.S. Dermatologics Inc.
- Gabriel P. Caprio, President and Chief Executive Officer, Amalgamated Bank
- Raymond G. Chambers, Chairman, Amelior Foundation
- Dennis W. Choi, M.D., Ph.D., Executive Vice President, Neuroscience, Merck and Co., Inc.
- Norma J. Clayton '81, Vice President and General Mgr., Maintenance and Modification, Military Aerospace Support, The Boeing Company
- James J. Coleman Jr., Esq., Chairman, International Matex Tank Terminals
- Frederick D. D'Alessio '70, '77, President, Advanced Services (Ret.), Verizon Communications
- Vincent L. De Caprio '72, Ph.D., President, Vyteris
- Charles R. Dees, Jr., Ph.D., Vice President, University Advancement, NJIT
- Stephen DePalma PE '72, President and CEO, Schoor DePalma Inc.
- Pat DiFilippo, VP & General Manager, Turner Construction Company
- Albert A. Dorman, FAIA '45, Chairman (Ret.), AECOM
- Irwin Dorros, Ph.D., Consultant, Dorros Associates
- Jerome Drexler '55, Ph.D., Chairman & President, Drexler Technology Corporation
- David C. Garfield, President (Ret.), Ingersoll-Rand Company
- Emil C. Herkert PE, DEE Chair, Chairman and CEO, Hatch Mott MacDonald Infrastructure and Environment
- J. Robert Hillier, FAIA, Chairman, The Hillier Group
- Howard S. Jonas, Chairman and Secretary, IDT Corporation
- Raman Kapur, President, Warrick Pharmaceuticals, A division of Schering-Plough Corporation
- Robert M. Keane '81, President and COO, Cavalier Telephone
- Robert Koar, Sr. Vice President, Wachovia Bank, N.A.
- Stanley M. Kosierowski '74, President and CEO, PSEG Energy Technologies
- M. Brian Maher, Chairman and CEO, Maher Terminals, Inc.
- Henry A. Mauermeyer '72, '74, Senior Vice President for, Administration and Treasurer, NJIT
- Raymond J. McGowan '64, Executive Vice President (ret), ExxonMobil Chemical Company
- Joseph C. Muscari '68, Executive VP, Alcoa - Group President, Asia and Latin America, Alcoa Inc.
- John J. Nallin, Vice President, United Parcel Service, Inc.

- George M. Newcombe '69, Esq., Partner, Simpson Thacher & Bartlett
- Veronica G. Pellizzi '84, Senior Vice President – Enterprise Sales, Verizon Communications
- Robert D. Polucki, Esq., '66, Corporate Counsel and Secretary, Ricoh Corporation
- Arthur F. Powell, President, Powell Capital Markets, Inc.
- William H. Powell, Chairman, CEO, National Starch and Chemical Company
- Louis E. Prezeau, President & CEO, City National Bank of New Jersey
- Philip L. Rinaldi '68, Chairman of the Board, Salerno Plastics Corporation
- John W. Seazholtz '59, Chairman of the Board, Westell Technologies
- Laurence C. Seifert '63, Senior Vice President (ret.), Wireless Local Technology Group, AT&T Wireless Services
- Stephen M. Solomon, President and CEO, ABB Lummus Global
- Benedict J. Torcivia, Jr., Executive Vice President, Torcon, Inc.
- Martin Tuchman '62, Chairman, Interpool, Inc.
- William C. Van Buskirk, Ph.D., Provost and Sr. Vice President, For Academic Affairs, NJIT
- Robert C. Waggoner, President and CEO, Burrelle's Information Services
- Joseph T. Welch III '62, Division President (Ret.), BD
- Patrick Y. Yang, Ph.D., Vice President Materials Mgmt. and Mgmt. Eng., Merck and Co., Inc.

II.F.4. Boards of Visitors

Members of the advisory committees are chosen from business, industry, and government to advise the academic departments and the colleges on the current skills and knowledge areas needed in their respective organizations. This exchange of information ensures that NJIT graduates always demonstrate the cutting edge competencies needed in our economy. There are six Boards of Visitors and seventeen Boards of Advisors.

Boards of Visitors

- Albert Dorman Honors College
- College of Computing Sciences
- College of Science and Liberal Arts
- Newark College of Engineering
- School of Architecture
- School of Management

Boards of Advisors

- Biomedical Engineering

- Career Development Services
- Chemical Engineering
- Civil and Environmental Engineering
- Education Opportunity Program (EOP)
- Electrical and Computer Engineering
- Engineering Technology
 - Computer Technology
 - Construction Engineering Technology
 - Electrical and Computer Engineering Technology
 - Manufacturing Engineering Technology
 - Mechanical Engineering Technology
 - Surveying Engineering Technology

- Highlanders
- Humanities and Social Sciences
- Industrial and Manufacturing Engineering
- Material Science and Engineering Program
- Mathematical Sciences
- Mechanical Engineering
- Murray Center for Women in Technology
- Pre-College Programs
- Solar & Terrestrial Research
- The Otto York Center for Environmental Engineering & Science

II.G. Profile of the Institution

II.G.1. Degree Programs

NJIT currently offers 92 degree programs (34 bachelors degree programs, 39 masters programs, and 19 doctoral programs):

Bachelors Degrees (34 programs, CIP Code listed after program name)

Applied Mathematics ¹ (B.A.) 270301	Environmental Science ¹ (B.S.) 030102
Applied Physics ¹ (B.S.) 400899	Geoscience Engineering ¹ (B.S.) 141601
Architecture (B.Arch.) 040201	History ¹ (B.A.) 450801
Architecture (B.S.) 040201	Human Computer Interaction ¹ (B.S.) 110401
Biology ¹ (B.A.) 260101	Industrial Engineering (B.S.) 141701
Biology ¹ (B.S.) 260101	Information Systems (B.S.) 110401
Biomedical Engineering (B.S.) 140501	Information Systems ¹ (B.A.) 110401
Chemical Engineering (B.S.) 140701	Information Technology (B.S.) 119999
Chemistry (B.S.) 400501	Management (B.S.) 520201
Civil Engineering (B.S.) 140801	Manufacturing Engineering (B.S.) 141701
Computer Engineering (B.S.) 140901	Mathematical Sciences (B.S.) 270301
Computer Science (B.S.) 110101	Mechanical Engineering (B.S.) 141901
Computer Science ¹ (B.A.) 110101	Nursing ³ (B.S.N.) 511608
Electrical Engineering (B.S.) 141001	Professional & Technical Comm. (B.A.) 231101
Engineering Science (B.S.) 141301	Professional & Technical Comm. (B.S.) 231101
Engineering Technology (B.S.) 159999	Science/Technology & Society (B.S.) 301501
Environmental Eng. (B.S.) 141401	Science/Technology & Society ¹ (B.A.) 301501

There is now a Mathematical Sciences B.S. that will replace the Applied Mathematics B.S. and the Statistics and Actuarial Science B.S. No new students will be admitted to either the Applied Mathematics B.S. or the Statistics and Actuarial Science B.S; they will both be phased out as students currently in the programs complete.

There are 4 options within Engineering Science (B.S.):

- Materials Science and Engineering
- Pre-medical
- Pre-dental
- Pre-optometry

There are 8 options within Engineering Technology (B.E.T.):

- Computer Technology (not ABET accredited)
- Construction Engineering Technology
- Construction Management Technology (not ABET accredited)
- Electrical and Computer Engineering Technology
- Manufacturing Engineering Technology
- Mechanical Engineering Technology
- Surveying Engineering Technology
- Telecommunications Management Technology

There are 3 options within Management (B.S.):

- E-Commerce
- Marketing
- Management Information Systems

There are 22 undergraduate minors offered (12-18 credits required for a minor):

Actuarial Science	History
Applied Mathematics	Information Systems
Applied Physics	Legal Studies
Biology	Literature
Chemistry	Management
Computer Engineering	Materials Engineering
Computer Science	Philosophy/Applied Ethics
Drama/Theatre	Professional Communications
Economics	Sports Management
Environmental Engineering	Statistics
Global Studies	Technology, Gender & Diversity

Masters Degrees (39 programs, CIP Code listed after program name)

Applied Chemistry (M.S.) 400501	History ¹ (M.A.) 450801
Applied Mathematics (M.S.) 270301	History ¹ (M.A.T.) 450801
Applied Physics ¹ (M.S.) 400899	Industrial Engineering (M.S.) 141701
Applied Science (M.S.) 409999	Information Systems (M.S.) 110401
Applied Statistics (M.S.) 270501	Infrastructure Planning (M.I.P.) 040301
Architectural Studies (M.S.) 040201	Interdisciplinary Studies (M.S.) 309999
Architecture (M.Arch.) 040201	Internet Engineering (M.S.) 149999
Biology ¹ (M.S.) 260101	Management (M.S.) 520201
Biomedical Engineering (M.S.) 140501	Management of Technology (M.B.A) 520299
Chemical Engineering (M.S.) 140701	Manufacturing Systems Engr. (M.S.) 141701
Civil Engineering (M.S.) 140801	Materials Science and Engineering (M.S.) 141801
Computational Biology ¹ (M.S.) 260699	Mechanical Engineering (M.S.) 141901
Computer Engineering (M.S.) 140901	Nursing-Nursing Informatics ² (M.S.N.) 511608
Computer Science (M.S.) 110101	Occ. Safety & Health Engineering (M.S.) 149999
Electrical Engineering (M.S.) 141001	Occ. Safety & Industrial Hygiene (M.S.) 150701
Engineering Management (M.S.) 143001	Professional & Technical Comm. (M.S.) 231101
Engineering Science (M.S.) 141301	Public Health ⁴ (M.P.H.) 512201
Environmental Engr. (M.S.) 1401401	Telecommunications (M.S.) 141001
Environmental Policy Studies (M.S.) 440501	Transportation (M.S.) 140804
Environmental Science ¹ (M.S.) 030102	

There are 4 options within Management (M.S.):

- Management Information Systems
- E-Commerce
- Organization Management
- Management of Technology (pending approval)

There are 6 areas of concentration within the M.B.A.:

- Management Information Systems
- Transportation/Logistics
- Operations Management
- Electronic Commerce
- Financial Management
- Infrastructure Management

Doctoral Degrees (19 programs, CIP Code listed after program name)

Applied Physics¹ (Ph.D.) 400899
Biology¹ (Ph.D.) 260101
Biomedical Engineering² (Ph.D.) 140501
Chemical Engineering (Ph.D.) 140701
Chemistry (Ph.D.) 400501
Civil Engineering (Ph.D.) 140801
Computer & Information Science (Ph.D.) 110101
Computer Engineering (Ph.D.) 140901
Computer Science (Ph.D.) 110701
Electrical Engineering (Ph.D.) 141001
Environmental Engineering (Ph.D.) 141401
Environmental Science¹ (Ph.D.) 030102
Industrial Engineering (Ph.D.) 141701
Information Systems (Ph.D.) 110401
Materials Science & Engineering (Ph.D.) 141801
Mathematical Sciences¹ (Ph.D.) 270101
Mechanical Engineering (Ph.D.) 141901
Transportation (Ph.D.) 140804
Urban Systems⁴ (Ph.D.) 459999

NJIT teaches, advises, and mentors doctoral students in one degree program where Rutgers University is the degree-granting institution:

- Management (*Ph.D.*) 520201

NOTES:

1. Joint degree program with Rutgers - The State University of New Jersey, Newark Campus
2. Joint degree program with The University of Medicine and Dentistry of New Jersey. Students in the Biomedical Informatics program have been advised to complete all of their NJIT requirements by December 2004. Students admitted prior to January 2002 will have until December 2006 (for the M.S. program) and December 2008 (for the Ph.D. program) to complete their degree requirements and will receive joint degrees when they choose to complete their degrees and change their majors at either NJIT or UMDNJ.
3. Offered only at the Technology and Engineering Center (TEC) in Mount Laurel, New Jersey as a joint degree program with the University of Medicine and Dentistry of New Jersey
4. Joint degree program with both The University of Medicine and Dentistry of New Jersey and Rutgers - The State University of New Jersey, Newark Campus.

NJIT's accelerated programs

NJIT offers or participates in 5 accelerated programs:

- B.S./M.S.
- B.Arch./M.S.
- B.S./D.M.D. with the University of Medicine and Dentistry of New Jersey
- B.S./M.D. with the University of Medicine and Dentistry of New Jersey
- B.S./M.D. with St. George's University School of Medicine
- B.S./O.D. with the State University of New York-New York School of Optometry
- B.S./D.D.S. with the New York University-College of Dentistry
- B.S./J.D. with Rutgers School of Law-Newark
- B.S./J.D. with Seton Hall University School of Law-Newark

NJIT's 2+2 and 3+2 programs

NJIT offers 2+2 programs through a joint admissions agreement with 10 county colleges:

- Bergen Community College
- Brookdale Community College
- Burlington County College
- Essex County College
- Hudson County Community College
- Mercer County College
- Middlesex County College
- Ocean County College
- Raritan Valley Community College
- Union County College

NJIT offers 3+2 programs through a joint admissions agreement with 4 colleges:

- Lincoln University in Pennsylvania
- Seton Hall University
- Stockton State College
- William Paterson University

NJIT's articulation arrangements

NJIT currently has articulation arrangements with the following 18 institutions:

- Bergen Community College
- Brookdale Community College
- Burlington County College
- Camden County College
- County College of Morris
- Cumberland County College
- Essex County College
- Hudson County Community College
- Mercer County College
- Middlesex County College
- Ocean County College
- Passaic County Community College
- Raritan Valley County College
- Union County College
- Lincoln University of Pennsylvania
- Seton Hall University
- Stockton State College
- William Peterson University

II.G.2. Continuing and Professional Education Activities at NJIT

NJIT's Division of Continuing Professional Education (CPE) is a coordinated unit focusing on the development, management, and execution of five major educational programs that fall into two major categories:

Academic Credit Learning (Degree and Certificate Programs)

- NJIT eLearning Program
- Graduate Certificate Program
- Extension Programs

Non-Credit Learning (Training and Certificate Programs)

- Corporate Training
- Professional Development and License Reviews

II.G.2.a. NJIT eLearning Program

NJIT offers seven complete undergraduate and graduate degree programs, seven graduate certificates completely online, eight graduate certificate partially via eLearning, and more than 218 individual eLearning college courses in an academic year. eLearning courses are available three times per year in the standard NJIT Fall and Spring semesters and in a ten-week Summer Session. NJIT eLearning courses consist of both an electronic lecture component conducted by an NJIT faculty member and an electronic discussion through which students conduct dialogue with their instructor and other classmates at any time of the day or night. Courses utilize computer conferencing platforms (e.g. WebCT, WebBoard), and multimedia methodologies delivered via CD-ROMS, streaming audio/video, and/or videotapes. Over the past five years, the number of eLearners and eLearning course enrollments have grown as much as 21% averaging 16% a year growth. During the 2001-2002 academic year, there were 4,041 eLearning students who totaled an eLearning enrollment of 5,445 in 218 eLearning academic credit courses during Fall and Spring semesters and Summer sessions. NJIT's has an inventory of over 200 courses produced in-house within twenty-three academic disciplines:

- Accounting
- Chemistry
- Chemical Engineering
- Computer Science
- Economics
- Electrical and Computing Engineering
- Electrical Engineering
- Engineering Management
- English
- Environmental Engineering
- Finance
- Human Resource Management
- Humanities and Social Sciences
- Industrial Engineering
- Industrial Management
- Information Systems
- Information Technology
- Literature
- Mathematics
- Management
- Management Information Systems
- Manufacturing Engineering
- Marketing

- Physics
- Professional and Technology Communication
- Science Technology & Society
- Social Science

Over 100 NJIT faculties have originated courseware for NJIT's eLearning Program.

Seven undergraduate and graduate degree programs are available through eLearning as well as, seven graduate certificates completely online and eight graduate certificate offered partially via eLearning:

Undergraduate Degrees via eLearning in whole or in part

- | | |
|---------------------------------|-------------|
| • Computer Science (B.S.) | 134 credits |
| • Information Systems (B.A.) | 129 credits |
| • Information Systems (B.S.) | 130 credits |
| • Information Technology (B.S.) | 127 credits |

Graduate Degrees via eLearning

- | | |
|-------------------------------------------------|------------|
| • Engineering Management (M.S.) | 30 credits |
| • Information Systems (M.S.) | 36 credits |
| • Professional & Technical Communication (M.S.) | 30 credits |

Graduate Certificates in whole or part via eLearning (each 12 credits)

- Bioinformatics
- Business Management Fundamentals
- Construction Management
- Information Assurance
- Information Systems Auditing
- Information Systems Design
- Information Systems Implementation
- Internet Applications Development
- Management of Technology
- Operations Productivity
- Pharmaceutical Management
- Practice of Technical Communications
- Project Management
- Telecommunications Networking
- Virtual Tools for Professional Communities

Regarding our reputation in the now expanding field of eLearning, NJIT has placed in the top 10 in "eLearning enrollments" among America's Best Online Graduate Degree Programs in the *U.S. News & World Report* magazine's surveys for 2001 and 2002.

NJIT was also ranked by *Yahoo! Internet Life* (1998 through 2002) as the nation's "Perennially Most Wired University", in part due to the large volume of distance learning activity.

In the last five years, the number of NJIT learners and eLearning course enrollments in academic programs has increased an average of 16% each year and over the last ten years has grown nearly 2600%. Last Academic Year there were 4,041 eLearners at NJIT participating in online courses.

II.G.2.b. Graduate Certificate Program

Structural shifts in the economy have caused many individuals in technological and managerial specialties to feel insecurities about their jobs. Others see a reduction in opportunities for advancement in their current careers. For many, education is the key to career transition but earning a Master's degree is not always necessary or appropriate. The NJIT Graduate Certificate Program is designed to facilitate a return to formal advanced education for people whose schedules are too busy to enroll in a more traditional program.

Key features of the Graduate Certificate Program include the following: 12-credit Graduate Certificates are milestones in their own right or springboards to MS degrees at NJIT or elsewhere. Graduate Certificates are offered in fields of study designated by outside authorities as likely to offer the highest growth opportunities for employment. Program duration is one calendar year.

Study is possible through distance learning, which provides greater flexibility for the busy professional to study any time, anywhere. Entry is open to applicants with a BA/BS degree with a satisfactory grade point average.

The following is the list of the 17 current Graduate Certificates offered during Academic Year 03-04:

- Bioinformatics
- Business Management Fundamentals
- Construction Management
- Information Assurance
- Information Systems Auditing
- Information Systems Design
- Information Systems Implementation
- Internet Applications Development
- Management of Technology
- Operations Productivity
- Pharmaceutical Management
- Pharmaceutical Technology
- Practice of Technical Communications

- Project Management
- Sustainable Architecture
- Telecommunications Networking
- Virtual Tools for Professional Communities

The Graduate Certificate program had over five hundred enrollments in Fall, Spring and Summer of Academic Year 02-03 with the most popular certificates being those that are offered via distance learning.

II.G.2.c. Extension Programs

NJIT's Division of Continuing Professional Education provides access to their courses and programs to part-time, evening students who prefer to attend classes at locations throughout the state. The extension program began in 1974 when courses in Computer and Information Science were offered at Drew University.

During AY04, NJIT will offer courses at 12 extension sites throughout New Jersey including:

Public Extension Sites:

Atlantic County:

Atlantic Cape Community College in Mays Landing

- Computer Science (M.S.)
- Information Systems (M.S.)

Burlington County

NJIT @ Mt. Laurel

- Computer Science (M.S.)
- Engineering Management (M.S.)
- Information Systems (M.S.)

Mercer County

Department of Environmental Protection in Trenton

- Environmental Policy Studies (M.S.)
- Environmental Science (M.S.)

Department of Transportation in Trenton (Ewing)

- Transportation (M.S.)

Morris County

Drew University in Madison

- Computer Science (M.S.)
- Information Systems (M.S.)
- Management (M.B.A. & M.S.)

Ocean County

New Jersey Coastal Community at Camp Evans in Wall
Information Technology

Somerset County

Raritan Valley Community College in Somerville

- Management (M.B.A. & M.S.)
- Information Technology (B.S.)

II.G.2.d. Private Extension Sites

- Chubb in Morris County leading to a Master's of Business Administration and Master's of Management of Technology.
- Fort Monmouth in Monmouth County: Courses leading to Executive MS in Electronic Engineering and MS in Electrical Engineering.
- Howmedica in Bergen County leading to a Master's of Business Administration and Master's of Management of Technology.
- National Starch and Chemical Company in Somerset County: Courses leading to Graduate Certificate in Management of Technology, Graduate Certificate in Applied Chemistry, MS in Applied Chemistry, and MS in Management or MBA in Management of Technology.
- Telcordia in Somerset County leading to a Master's of Business Administration and Master's of Management of Technology.
- Wyeth in Pearl River, New York State leading to a Graduate Certificate in Pharmaceutical Management and Pharmaceutical Technology.

II.G.2.e. Customized Corporate Training

For fifty years, NJIT has been designing and conducting customized non-credit courses that meet technology-based organizations' needs for high-quality, lifelong workforce education. Representing the arm of NJIT that brings the university's areas of academic specialization into the workplace, this unit has developed particularly close relations with the NJ Department of Labor (DOL). The DOL's Office of Customized Training implements aspects of the NJ Workforce Development Partnership Program through which eligible New Jersey companies can receive state subsidization for sixty percent of the cost of initiating on-site training programs. Qualified educational providers (such as NJIT's Customized Corporate Training Program) oversee these programs. In FY 01-02 NJIT's Customized Corporate Training program executed training contracts with over 50 companies and trained over 3000 employees.

II.G.2.f. Professional Development and License Review

The Professional Development and License Review Program offers non-credit short courses, certificates, and license reviews. In FY 02-03 over 145 non-credit courses were offered.

In Academic Year 03-04 many new courses were added to the program, bringing the total number of courses offered to over 60 courses. Among the new offerings, a Certification in Open Source Unix was initiated. At this time, NJIT is the only University nationwide that offers this program and is endorsed to offer a professional development certificate in Open Source Operating Systems

Also added was an expansive Architecture Program for Review and Professional Development. NJIT is the only facility in New Jersey to offer this array of courses and NJIT is an approved provider in the American Institute of Architects' Continuing Education System.

The non-credit Professional Development program escalated in course demand and variety. Additional courses were added to the program and include:

Architecture

- Architecture Review Courses
- Design of Steel and Wood Structures
- Marketing/Communications for Design Firms

Cable Telecommunications Industry

- Introduction to the Cable Telecommunications Industry
- Cable Telecommunications Installation
- Digital and High Speed Data
- Customer Service
- Broadband Telephony

Cisco Networking Academy

- Preparing for the CISSP Credential

Computing and Technology

- A+ Certification
- .Net Comprehensive
- C Sharp Basics and Advanced C# programming
- Fireworks MX
- Windows Application Programming using Visual C#
- Web Application Development using Visual C#

- XML Comprehensive
- Voice XML
- Introduction to EDI – Electronic Data Interchange
- Advanced EDI Concepts

Open Source UNIX Operating Systems – NJIT is the only University nationwide that offers and is endorsed to offer a professional development certificate in Open Source Operating Systems

- Introduction to UNIX Free BSD
- UNIX Administration I
- UNIX BSD Administrator II

Oracle Database Technology

Safety and Environment

- Hazwoper Refresher
- Supervisor Training
- OSHA Hazwoper Training
- Certified Hazardous Materials Manager (CHMM)
- NJ's Underground Storage Tanks Regulations

Web Master

- Web Manager
- Web Developer
- Web Author
- Dreamweaver
- Flash
- Fireworks MX
- Programming for the Web
- Visual Basic Programming
- Multimedia:SMIL

II.G.3. Affordability

II.G.3.a. Cost of Attending NJIT

	In-State	Out-of-State
AY 2003-2004 Full-Time Undergraduate Student		
Tuition	\$7,332	\$12,700
Fees	\$1,168	\$1,168
Room (average)	\$5,494	\$5,494
Board (14 meal plan)	\$2,402	\$2,402
Total	\$16,396	\$21,764
AY 2003-2004 Full-Time Graduate Student		
	In-State	Out-of-State
Tuition	\$9,620	\$13,540
Fees	\$1,148	\$1,148
Room (average)	\$5,494	\$5,494
Board (14 meal plan)	\$2,402	\$2,402
Total	\$18,664	\$22,584

II.G.3.b. Financial Aid

Table II.G.3.b				
Student Financial Aid Profile				
(Excludes Graduate Fellowships Stipends)				
Academic Year 2002-2003				
Award Type	Total Awards	Amount Awarded	Percentage	
Federal Grants:				
Pell	1441	3,917,743		
SEOG	476	328,790		
Total	1917	4,246,533	9%	
State Grants and Scholarships:				
TAG	1,467	5,826,360		
EOF	406	404,397		
DSS	232	223,500		
NJ GEAR UP	2	4,500		
OSRP	132	509,937		
Total	2,239	6,968,694	14%	
Scholarships and Grants:				
NJIT – Institutional Undergrad.	2,532	6,245,714		
NJIT – Other	59	107,695		
Endowed	588	829,768		
Alumni	186	175,000		
Annual	229	484,817		
NJIT Graduate Tuition Remiss.	642	3,985,931		
NJIT Graduate Fees Remiss.	237	246,794		
NJIT Graduate Other	3	8,466		
Private Scholarships (external)	243	606,433		
Total	4,719	12,690,618	26%	
Work:				
FCWS	300	445,251		
IWS	960	2,422,174		
Stipend	543	5,888,160		
Total	1,803	8,755,585	18%	
Loans:				
Direct Subsidized	2,040	7,876,448		
Direct Unsubsidized	1,222	5,201,047		
Direct PLUS	212	1,158,078		
Perkins	269	414,202		
NJIT Loan	2	10,410		
NJCLASS	126	894,279		
Other Loan	87	749,169		
Total	3,958	16,303,633	33%	
GRAND TOTAL	14,636	48,965,063	100%	

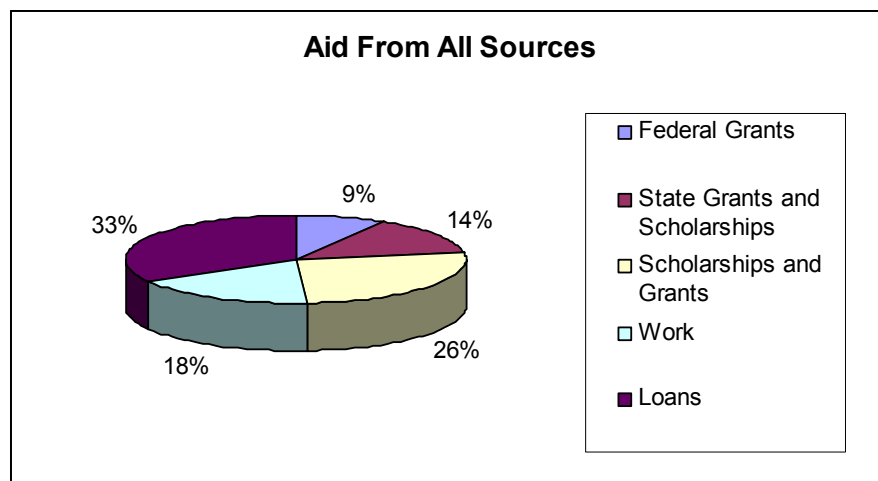


Figure II.G.3.b. Student Financial Aid from All Sources

II.G.3.c. Loans

The average loan debt at the time students receive their bachelors degree is currently less than \$10,000.

II.H. Major Research and Public Service Activities

II.H.1. Developing Technologies for Defense and Homeland Security

Recognizing that technology is the best way to defend against bioterrorism, secure our borders and protect critical infrastructure such as power systems, bridges and airports, NJIT has established a new Homeland Security Technology Center, led by Donald H. Sebastian, vice president for research and development. The center coordinates defense-related projects in the university and forges partnerships with agencies like Picatinny Arsenal, the Center for Disease Control, the New Jersey Department of Health and Senior Services, the National Guard, and the New Jersey State Police for homeland security initiatives

NJIT has also formed a partnership with two software makers -- International Analytics, developer of CRISIS, and NCI, developer of Event Broker - as well as with New Jersey Network News, the state's public broadcasting network and emergency response carrier. The three aim to apply modeling and simulation systems that will support the state's homeland security.

The software systems use Global Information Systems (GIS)-based information to support simulations used to coordinate a response to a disaster. People who would benefit from these simulations include members of emergency response teams, hospital workers, public and private transportation administrators and others. The software gives New Jersey a system to prepare for anything from a natural disaster to a chemical, biological or radiological attack.

Toward Smart Coatings

Smart paints and coatings, enriched with nanomachines to perform functions like changing color or repairing corrosion, are the focus of a large-scale, multidisciplinary research project led by Daniel J. Watts, executive director of the York Center for Environmental Engineering and Science and Panasonic Chair in Sustainability. Funded by the U.S. Department of the Defense, the futuristic coatings are intended for use on military vehicles and weapons systems. The Army seeks technology that will:

- Sense deterioration or breaks in the surface or device cover by the coating and make repairs without any human intervention.
- Change color and patterns to create active camouflage by projecting the images of the surrounding area as collected through continuous videotaping. Such a property would render a truck or tank virtually invisible.
- Render pyrotechnics or explosives inactive while the coating remains on them.
- Selectively and easily remove coating with proper "orders."

A joint program with Clemson University and Picatinny Arsenal, the smart coatings project draws on NJIT's expertise in device physics, nanotechnology and MEMS, polymer engineering, chemistry and environmental engineering, and materials characterization. NJIT researchers have background in polymeric coatings, microsensor fabrication, large-area circuits, nanostructures and nanocomposites that provide a foundation for the development of this new generation of coatings.

Improving Critical Communications

Assessing and improving the way managers of New York City's infrastructures -- electric power, transportation and emergency services -- communicate with each other during emergencies is the goal of research by David Mendonca, assistant professor of information systems. In collaboration with W.A. Wallace and Joe Chow of Rensselaer Polytechnic Institute, he is studying how connections among various New York City critical infrastructure systems were restored in the months immediately after the World Trade Center attack. Part of a post-9/11 initiative by the National Science Foundation to collect data on the impact of and response to the attacks, Dr. Mendonca's group is one of only eight teams funded across the country.

The study looks at connections -- called interdependencies -- among critical infrastructures. The goals are to improve understanding of how these connections are managed and to provide a prototype decision support system for their management. The team has conducted interviews with personnel at such companies and organizations as the Jersey City Fire Department, Consolidated Edison and Verizon to identify how infrastructure interdependencies were restored and managed following the attack. These interviews will be used to develop optimization techniques to support managers in identifying and managing infrastructure interdependencies. Decision support will be provided by linking these techniques to a geographic information system.

Keeping the Internet Secure

Data watermarking, intrusion alarm systems and distortionless data hiding are some of the techniques under study at the Center for Wireless Networking and Internet Security. A partnership between NJIT's Department of Electrical and Computer Engineering and Princeton University, the new center is supported by a \$2.6 million R&D Excellence Grant from New Jersey Commission on Science and Technology. Among the projects are:

- A project to develop a dynamic watermarking and encryption method, led by Dr. Atam Dhawan, professor and chair of electrical and computer engineering and director of the center. Watermarking uses keys or codes, which permit users to access classified data. Dhawan's method breaks down the data into subsets. To download each subset, a user needs a watermark. Only authorized users--not hackers--will know the watermarks.
- A new distortionless marking technique based on the integer wavelet transform has been developed recently by a group headed by Yun Q. Shi, professor of electrical and computer engineering. The system can embed a larger amount of data up to 1 million bits into a medium-sized grayscale image.
- Methods to predict and intercept on-line intruders are the focus of Constantine Manikopoulos, associate professor of electrical and computer engineering. He is developing detection systems to recognize the onset of an attack, start the search for a remedy and provide an early alarm, quickly triggering a defensive shield.

Mobile ad hoc networking, in which there are no dedicated base stations and all nodes interact as peers for packet forwarding, is the focus of research by Assistant Professor Symeon Papavassiliou. The goal is to establish an "instant" communication infrastructure for military and civilian applications where both hosts and routers are mobile.

Mobility modeling and trajectory prediction techniques for wireless networks are under study by Assistant Professor Siran Tekinay, with the goal of reducing vulnerability to hostile threats.

Detecting Concealed Explosives

A team of researchers at NJIT is working to develop a technology capable of monitoring and detecting concealed explosives and biological agents that may pose a threat to people, buildings, mass transportation or other environments. With funding from the National Science Foundation and the Army Research Office, John Federici and Dale Gary, professors of physics, and Robert Barat, professor of chemical engineering, are exploring the use of terahertz (THz) electromagnetic radiation to detect and identify explosives and biological agents by means of a spectroscope. Picometrix, Inc., of Ann Arbor, Mich., a manufacturer of high-speed optical receivers and ultrafast instrumentation, is collaborating on the project.

Terahertz radiation occupies of the far-infrared region of the electromagnetic spectrum. What makes THz technology an attractive method of detection is its ability to detect biological agents and explosives through their characteristic transmission or reflectivity spectra in the Terahertz (THz) range. In essence, these materials appear as different "colors" to the THz radiation. Explosives and biological agents can be detected even if they are concealed in clothing, sealed packages, suitcases, since THz

radiation is readily transmitted through plastics, clothing, luggage, paper products, walls, and other non-metals.

Improving Face Recognition

A new technology that can verify a person's identity using facial images is the goal of research by Chengjun Liu, assistant professor of computer science. He has developed a face recognition system that improves on previous technology by taking into account such factors as lighting and facial expressions. The system has tested 100 percent effective in matching videotaped images to those stored in government databases by comparing 62 features or facial landmarks. Such a technology can be used as a security system with facial identification replacing a physical key or a password. An effective face recognition system could also assist law enforcement officials in locating fugitives by means of video cameras strategically placed in public places such as airports. Liu recently received funding from the Department of Defense to support his research as part of the government's effort for combating terrorism using face recognition technologies.

Analyzing Freight Movements

Developing a freight planning support system for northern New Jersey is the goal of research by George Fallat, deputy director of the International Intermodal Transportation Center. In addition to overall assessment of such factors as congestion, mobility and accessibility, the study will analyze the interruption in freight movement caused by the September 11, 2001 terrorist attack on the World Trade Center. This effort is supported by a grant through the North Jersey Transportation Planning Authority's Unified Planning Work Program. The study will include identification of existing and future freight movement, system redundancies and appropriate strategies for enhancing the increasing movement of goods throughout northern New Jersey.

The study aims to develop indicators of goods movement such as intermodal terminal landside access; terminal congestion; clusters of freight activity; key freight routes by mode; route restriction related to low bridge clearances, and ramp turning radii, steep climbing lanes, and others; key roadway segments with high truck related incidents; and other appropriate indicators. Drawing on relevant data sources and gathering new data where necessary, the project will use the indicators to assess the performance of freight movement in the region, forecast future conditions, identify current and future needs, and develop strategies to address these needs.

Identifying Harmful Biological Agents

The development of a portable MEMS (microelectromechanical systems) device as part of a biological detection system is the focus of a joint research project between NJIT and Sandia National Laboratories in Albuquerque, N.M., the government facility charged with developing technologies to support national security. The device -- known as a trigger -- is the key component in a system for the rapid and accurate identification of harmful biological agents in field and urban environments. The team includes Boris Khusid, associate professor of mechanical engineering, and his doctoral students in mechanical engineering, Nik Markarian, Mike Yeksel, and Dawn Bennett, from NJIT, and from Sandia, Paul Galambos, Conrad James and Murat Okandan.

The new approach of the team is the use of electro-hydrodynamic phenomena in a suspension subject to electric fields to control and manipulate microscopic particles in flowing fluids for the segregation and concentration of biological material in microfluidics. Other potential applications of electro-micro-technologies include tiny separation devices for a wide variety of systems for environment monitoring, health care, and medical diagnostics. The electro-microfluidics are currently being tested at NJIT and Sandia.

Thwarting Skyjackers with Biometrics

A grip detection system developed in NJIT's personalized weapons project could also be effective in preventing skyjackers from taking control of aircraft. The research team is developing a prototype "smart gun" using silicon-based piezo-electric pressure sensors embedded in the gun grip. The system can identify the user based on the unique "signature" of the individual hand during the first instant of trigger pull. On-board decision electronics and micro-mechanical systems-based actuators then react to either enable or block the firing mechanism.

Biometrics expert, Michael Recce, professor of information systems, has also applied for a patent to adapt his hand grip technology for use by airplane pilots. Since operation of modern aircraft frequently shifts between the pilot and ground controllers, Recce reasoned that the installation of his grip sensors in the cockpit controls could be achieved with relative ease because only the authenticated grips of the pilot or copilot could be programmed to operate the plane. When the pilot releases his or her grip, control of the plane would revert to the ground.

II.H.2. Improving the Quality of Life

Biomedical engineering and the applied life sciences are the most rapidly growing areas of concentration at NJIT. Engineering approaches, computational modeling and mathematical analysis must be brought to bear on medical science to transform scientific knowledge into practical uses.

Understanding Collagen

Collagen research is a new emphasis of the Medical Device Concept Laboratory (MDCL), directed by Michael Jaffe, research professor of biomedical engineering and chemistry. MDCL projects focus on reconstituted collagen fiber formation, collagen characterization -- both as a "material" and as tissue engineering substrate, collagen mechanical properties and transport of small molecules through skin. One project of special interest is a collaboration among Treena Arinzeh, NJIT assistant professor of biomedical engineering, and Sam Hessami (ob/gyn) and Fred Silver (pathology) of UMDNJ, aimed at understanding the collagenous failure that leads to uterine prolapse, a major problem in women's health.

In another new thrust, MDCL will be part of a NASA sponsored multi-university consortium led by Professor Ilhan Aksay of the Ceramic Materials Lab at Princeton University that will use biomimetic concepts and material science to develop bird-inspired aircraft wings that change shape in response to changing atmospheric conditions.

The Medical Device Concept Laboratory is the technology transfer arm of the New Jersey Center for Biomaterials (NJCB), for which it plays a key role as the fabrication and biorelevant characterization resource. NJCB is a joint center of Rutgers University, NJIT, the University of Medicine and Dentistry of New Jersey, and Princeton University, supported by the New Jersey Commission on Science and Technology. The lab recently entered a collaboration with the Polymer Processing Institute at NJIT to help industry solve problems in biopolymers, medical devices and pharmaceutical packaging.

Improving Microscopy

Mathematical and experimental modeling of immunocolloid labeling techniques for electron microscopy is the focus of research by Christopher S. Raymond, assistant professor of mathematical sciences. The goal is to develop a new labeling technology that will allow investigators to rapidly and reliably identify and localize multiple molecular species in a single specimen.

Immunocolloid labeling is a technique for high resolution studies of biological structure and ultrastructure. Nanoscale metal particles joined to antibodies or other biomolecules scatter electrons efficiently allowing the biomolecules to be discerned under an electron microscope. Immunocolloid labeling has been used for a wide variety of purposes, including the detection of certain viruses and bacteria and direct observation of the development of blood clots. In research funded by the NIH, Dr. Raymond aims to gain a better understanding of the labeling process to optimize the choice of experimental conditions and maximize the efficiency and accuracy of labeling.

Regrowing Bones

Treena Livingston Arinze, assistant professor of biomedical engineering, is using adult stem cells in combination with scaffolds of calcium phosphates to repair and regrow bone. Arinze performed animal studies on rats with bone defects; she also did cell-culture studies. Both showed that the biomaterials stimulated stem cells, producing new bone tissue and fully repairing the rats' bones. After 12 weeks, their bones were regenerated, with full restoration of the mechanical properties of their long bones. Her findings were published in the *Journal of Biomedical Materials Research*.

Her studies could lead to medical breakthroughs that would help a host of patients. Stem cell implantation, for instance, could help cancer patients who've had large tumors removed from bone. In many such surgeries, patients lose their limbs. But if her method of implanting stem cells mixed with biomaterials is shown to induce bone repair, amputation may not be necessary.

Stem cells could also help patients suffering from osteoporosis, whose fractured bones can be regenerated by the cells. Dr. Arinze's research has also shown that adult stem cells taken from one patient can be successfully implanted in another. Researchers at first thought such a transfer might be rejected. Dr. Arinze is also testing biomaterials that, in combination with adult stem cells, might repair cartilage, tendon and neuronal tissues.

Combating Eye Disease

NJIT biomedical researchers are collaborating with physicians as well as private companies to develop new medical devices to combat eye diseases through the New Jersey Vision Technology Center. Led by Richard Greene, Becton-Dickinson professor of biomedical engineering, the center was established with a one-year seed grant from the New Jersey Commission on Science and Technology.

In addition to improving the diagnosis and management of diseases such as glaucoma and diabetes, the center aims to spur economic development in the state's biotechnology industry, by developing useful medical devices with promising

commercial prospects. Current projects include a device to allow simplified eye pressure testing for glaucoma patients, and another to measure blood sugar. In each of the center's research projects, scientists and clinicians work closely with a New Jersey firm whose R&D staff help to turn prototypes into products.

The Vision Center is also funded by grants from the National Medical Technology Testbed (Department of the Army) the Gustavus and Louise Pfeiffer Research Foundation, of Denville, N.J., as well as by funds from Becton Dickinson, Inc, and Lucent Technologies. The center team includes Gordon Thomas, Avid Kamgar and Tara Alvarez at NJIT, and Dr. Robert Fechtner of UMDNJ-New Jersey Medical School.

Understanding Neural Networks

A better understanding of the cellular mechanisms that allow a neural network to produce stable behavior while retaining the flexibility to respond to the disruptions produced by growth, learning, sensory input and injury is the focus of research by Jorge Golowasch, associate professor of mathematical sciences and biology. In a five-year project funded by the National Institutes of Mental Health, he is investigating a mechanism known as activity-dependent regulation of voltage-sensitive ionic currents which he believes may underlie the expression of these two seemingly paradoxical aspects of neuronal activity, namely flexibility and stability. Ionic currents produce the electrical changes that characterize neuronal activity, and individual neurons and neural networks carry signals throughout the nervous system that are responsible for the generation of behavior. This mechanism is potentially of great importance as it may underlie a new form of learning and memory via its stabilizing effect on neural network activity.

Dr. Golowasch is also part of multi-institutional team funded by the NSF to construct a computational model of the pyloric neural network, part of a larger complex called the stomatogastric ganglion, which generates rhythmic activity in the gut of crustaceans. The neuron activity in this simple system offers insights into more complex nervous systems, and studies of it have been done in many different laboratories. Dr. Golowasch's group will coordinate the efforts of these various investigations to construct a definitive model of the system

Designing Computer Therapies

Research involving human-computer interaction is the specialty of Marilyn Tremaine, professor of information systems. She developed an audio browser that allows information access for blind users. Users provide input to the browser by stroking their fingers on a touch pad. The browser responds with spoken output based on the particular cell touched by the user. The device allows users to search an address book, a collection of music or read a downloaded copy of the current news.

Another project, in collaboration with Michael Recce, professor of biomedical engineering, Alma Merians of UMDNJ, and Grigore Burdea and Howard Poizner of Rutgers, developed a Virtual Reality system for rehabilitating hand function in stroke patients. The PC-based desktop system uses two hand input devices, a CyberGlove and a RMI force feedback glove, to allow the user to interact with one of four rehabilitation exercises. Specific exercises work on each of the specific parameters of hand movement -- range of motion, speed of motion, fractionation (the ability to move individual fingers separately) or strength. The patient receives performance-based target levels that adapt between sessions in order to induce the user to improve.

Another team, including Dr. Tremaine, Dr. Burdea of Rutgers and Judy Deutsch at UMDNJ, developed a virtual reality ankle and foot rehabilitation program. Patients steer virtual planes and boats through bad weather and over waves using a force feedback driving pedal requiring various ankle and feet rotations that serve as rehabilitative practice for the user.

Understanding Intracellular Interactions

Interactions among neuropeptides and microglial cells in the brain are the research focus of G. Miller Jonakait, dean of the College of Science and Liberal Arts and professor of biological sciences. With grant support from the National Science Foundation, she is looking at how neurons and glia interact both in the normal brain and in the damaged or diseased brain.

Neuropeptides are small molecules that are released by neurons, the cells that carry messages in the nervous system. Glial cells are thought to support neuronal function. Microglia, in particular, are the cells responsible for the brain's intrinsic immune system, and are capable of a pro-inflammatory response to infection, neurodegenerative disease, or central nervous system trauma. They can also serve as resident antigen-presenting cells and may produce growth factors that promote survival and/or differentiation of immature neurons. Several specific neuropeptides seem to play a role in regulating microglial responsiveness, particularly in dampening the inflammatory response. Dr. Jonakait is exploring this neuronal/glial cross-talk hoping to understand the ways in which neurons affect glia and glia affect neurons.

II.H.3. Growing New Industries from Emerging Technologies

Advances in such areas as microelectromechanical systems (MEMS), optoelectronics, nanotechnology, materials science, and polymer technology have opened up new technological applications that in turn are creating new industries.

Advancing Nanotechnology

NJIT took a leading role in the creation of the New Jersey Nanotechnology Consortium (NJNC). Under the leadership of Donald Sebastian, vice president for research and development, the university was the first academic institution to partner with Lucent Technologies and the State of New Jersey in an initiative designed to bring the state into the forefront of the burgeoning "small tech" (MEMS and nanotechnology) industries. Central to the consortium is the establishment of Lucent's world class Nanofabrication Laboratory as a non-profit R&D facility. The center's goals are to conduct research, develop and prototype devices and systems, stimulate new business and growth, commercialize nanotechnology concepts and train more nanotech scientists and specialists.

Observing Solar Flares

A better understanding of the solar flares that can interfere with wireless communication and damage satellites in Earth's orbit is the focus of research by Dale Gary, professor of physics. A specialist in radio solar physics, he is leading a design study for the Frequency Agile Solar Radiotelescope (FASR). The project, supported by the National Science Foundation, will construct a new radio telescope capable of making high-resolution images of the solar corona. The telescope, which will consist of 100 receiving dishes, will allow scientists to make direct measurements of the coronal magnetic fields.

FASR will allow researchers to study the birth of coronal mass ejections, violent phenomena associated with the Sun's magnetic fields that can cause sudden, intense fluctuations in the solar wind and serious consequences on Earth. The high-energy particles that characterize these ejections have the potential to destroy satellites. The satellites in turn may impact television viewing, pagers, cellular phones and other wireless devices. With the ability to observe these phenomena, especially those on the near face of the sun that most affect Earth, researchers will be able to provide better information on the space environment to airlines, power companies and satellite operators. Eventually, solar researchers may be able to predict the severity of such incidents and when they will occur.

The FASR study is a joint project of NJIT, the National Radio Astronomy Observatory (NRAO), University of Maryland and the University of California at

Berkeley. The project was recently ranked number one in importance by the influential NRC Solar and Space Physics Survey Committee of the National Academy of Sciences.

Creating Functional Nanostructures

Functional nanostructures for novel electron devices are the focus of the Integrated Nanostructures Laboratory, headed by Leonid Tsybeskov, associate professor of electrical and computer engineering. In one project supported by the National Science Foundation, the team is investigating links between structural and optical properties in three-dimensional nanostructures made of silicon and germanium, the most common materials for semiconductors. Visible photo luminescence from Si nanocrystals and different forms of organization in Ge nanocrystals grown on a Si substrate are recent discoveries, and Dr. Tsybeskov is exploring the feasibility of novel devices that make use of efficient light emission in these nanostructures. Hewlett-Packard and IBM are partners on the project.

The team is also continuing its work on silicon quantum dots -- molecule-sized crystals of silicon that could allow a new generation of computer chips just a few atoms across in size. Dr. Tsybeskov's group has invented a novel fabrication technique for these silicon nanostructures and demonstrated how these structures can be used in non-volatile memories and other electronic devices. Supported by the National Science Foundation and the French National Center for Scientific Research, the research is continuing with in an international collaboration with the Material Technology Laboratory at Motorola, the Institute for Electronic and Microelectronic Research in Lille, France, and the University of Rochester.

Electrohydrodynamics at Zero Gravity

A research project conducted aboard a NASA low-gravity research vehicle is providing new information for NJIT's electrohydrodynamics research group. The research team, which included Boris Khusid, associate professor of mechanical engineering, his two doctoral students, Nik Markarian and Mike Yeksel, and partners from CCNY and NASA, successfully conducted experiments on electrohydrodynamics at "zero" gravity. The experiments took place aboard a NASA KC-135 low gravity research aircraft at NASA Glenn Research Center in Cleveland. The KC-135 is used to fly parabolas to create 20-25 seconds of weightlessness, so that researchers can investigate the effects of zero gravity.

The experiments, which took two years to set up, recorded the kinetics of the field-induced dielectrophoresis and segregation of heavy particles and bubbles, which cannot be done in ground-based experiments due to gravity. The team found a difference in behavior of suspensions subject to a zero-average gravity force, positive

dielectrophoresis and heterogeneous aggregation in high-gradient AC electric fields, and an instantaneous zero-gravity force.

Investigating Nanostructured Particles

New techniques for processing nanostructured powders are the research focus of Robert Pfeffer, distinguished professor of chemical engineering. Although the unique properties of nanostructured materials can greatly benefit many industries, such as, food, pharmaceutical, petroleum, chemical, agricultural and ceramics, little attention has been paid to flow around nanoparticles and flow in nanodomains. With funding from the National Science Foundation, Dr. Pfeffer's research team at the New Jersey Center for Engineered Particulates, together with researchers from the Illinois Institute of Technology, is seeking to solve the challenging problem of understanding the physics of fluidization and transport of nanoparticles. The goal is to be able to process nanoparticles to produce nanomixtures and nanocomposites with tailored properties.

The research, which is a combination of experiments, modeling and computer simulations, and the development of innovative applications, is expected to have a large impact on how nanostructured powder materials will be processed in the future. The team's preliminary research has already resulted in several unique processes by which nanopowders are uniformly fluidized as stable porous agglomerates with practically no elutriation and without the presence of cracks, channels or rat-holes, typically observed when fluidizing fine cohesive particles. NJIT is currently in the process of filing for a patent for this novel technology.

Making Silicon Devices More Reliable

Better ways to protect silicon semiconductors from contamination and increase their electrical stability are the focus of research by Durga Misra, professor of electrical and computer engineering and director of NJIT's Device and Materials Characterization Laboratory. With funding from the National Science Foundation, he is investigating an innovative method of introducing deuterium ions into the layer of silicon that typically interfaces with a "gate" layer of silicon oxide. Deuterium improves the electrical characteristics of the transistor by means of the "hot electron" effect in this region of the device. The research at NJIT shows that it is possible to introduce deuterium into the silicon through implantation at an earlier stage of transistor fabrication with far less, if any, damage. The implantation dose and energy can be optimized for greater electrical efficiency. Misra is also looking into applying these findings to silicon nanocrystals used for optoelectronic devices.

Analyzing Nanoscale Particles

A new facility capable of characterizing particles at the nano and submicron level will support NJIT's research in advanced materials including engineered particulates, nano particles and nano-composites, carbon nano-tubes, nano devices, microelectronics, MEMS, opto-electronic, superconductors, bio-minerals, and bio-materials. With major funding from the National Science Foundation and New Jersey Commission on Higher Education, the New Jersey Center for Engineered Particulates (NJCEP), directed by Rajesh Davé, professor of mechanical engineering, has established a state-of-the-art Electron Microscopy facility. The center, furnished with equipment valued at over \$2 million, allows for nanoscale analysis and x-ray spectroscopy with an in-column energy filtering Transmission Electron Microscope (TEM), Field Emission Scanning Electron Microscope (FESEM), and a whole suite of sample preparation devices. The unusual combination of TEM and FESEM instrumentation supports sophisticated materials research, including the tailored particulate materials designed by the New Jersey Center for Engineered Particulates with unique properties for many potential applications in a variety of industries including pharmaceuticals, food, cosmetics, ceramics, electronics and specialty chemicals.

Developing Miniature Labs

Developing microchip technology for miniature chemical and biological laboratories and reactors is a major goal of the New Jersey Center for Micro-Flow Control, led by Nadine Aubry, F. Leslie and Mildred Jacobus Distinguished Professor and chair of mechanical engineering. Using MEMS fabrication techniques and nanotechnology, the research team is working to create tiny labs on microchips for use in minute chemical synthesis, drug delivery, cell separation and manipulation, DNA and protein analysis, and other applications. Dr. Aubry projects that these tiny labs will be able to identify and combat bacteria, viruses, spores and cancerous cells in the bloodstream, as well as to counter the effects of biological warfare agents.

A major challenge is to control fluid flows to pump, mix and separate the fluids involved. Dr. Aubry's research activities concentrate precisely on these areas: transporting fluids in microliter and nanoliters quantities; mixing two tiny fluid streams; and separating fluids as well as the materials they carry such as cells and molecules. While the Center is exploring various ways to control minute fluid flows, a promising technique is the use of micro/nano electrodes and magnets, rather than moving mechanical parts that may not be reliable at small scale or complex geometries that may not be easy to manufacture.

Evaluating Brownfields

Sites in Newark, Carlstadt, Carteret and Elizabeth were the focus of in-depth case studies by the Brownfields Economic Development project. The project, directed by George Fallat, deputy director of the National Center for Transportation and Industrial Productivity and James Mack of the York Center for Environmental Engineering and Science, evaluates abandoned industrial sites -- brownfields -- in northern New Jersey to determine their potential for freight-related redevelopment.

At the Carteret site, a former landfill adjacent to Exit 12 of the New Jersey Turnpike, the project team helped to develop conceptual plans for a truck stop, hotel and distribution center. The study assessed clean-up requirements, real estate market potential and options for linking the site to the turnpike. The owner of the 13-acre Newark site, the former home of Albert Steel Drum, received technical reports and advice for redeveloping the site into a modern warehouse for shippers using the nearby port. The team recommended that the State of New Jersey should consider creating new mechanisms and policies for promoting freight-related brownfields use.

The Brownfields Project is also assisting the New Jersey Meadowlands Commission in developing an area-wide assessment approach for characterizing 40 acres of brownfields at the Paterson Plank Road Redevelopment sites, and the City of Trenton in performing a Triad based site characterization of the Assunpink Creek Brownfield Project.

Relieving Parkway Congestion

NJIT's International Intermodal Transportation Center (IITC) assisted the New Jersey Department of Transportation in developing the "Congestion Relief Plan for the Garden State Parkway." The study, led by Lazar Spasovic, professor of management and transportation and executive director of IITC, highlights traffic congestion impacts as part of the development of the ten-year plan to remove toll barriers on the Garden State Parkway.

Findings included:

- Eliminating the Raritan Toll Plaza in the southbound direction would reduce peak evening by two minutes or more per vehicle.
- Widening of the Driscoll Bridge would aid in the significant reduction.
- Eliminating the Union southbound and Essex northbound toll plazas would offer minimal impacts.
- Eliminating the Bergen Southbound and Hillsdale Northbound toll plazas would offer a reduction of one minute per vehicle.
- A "one-way" toll system would provide significant travel time reductions.

- Traffic operations between high speed E-ZPass and complete elimination of the toll plaza would reflect very little difference.

Examining IT Strategies

Identifying the companies that have been the most successful in incorporating information technology into their business and using it strategically to gain a competitive advantage is the focus of research by William V. Rapp, holder of the School of Management's Henry J. Leir Chair in International Trade and Business. His recently-published book, *Information Technology Strategies: How Leading Firms Use IT to Gain an Advantage*, is designed to help managers in their struggle to harness the new information revolution advantageously.

Recent studies indicate that despite the explosive growth in the Internet and systems investments, many companies find they are not getting the returns they anticipated. Rapp's research examined the IT-incorporating strategies and "best-practice" paradigm successfully pursued by leading U.S., Japanese and European firms. He is currently examining Business-to-Consumer (B2C) e-commerce. The study is investigating reasons for the development of a more robust model of B2C e-commerce in Japan based on the convenience store model compared to the struggles of Amazon and Barnes and Noble type dotcoms in the U.S.

Protecting the Power Grid

Microscopic sensors that will prevent disruptions in electrical power are the focus of a project led by Kenneth R. Farmer, professor of physics and director of the Microelectronics Research Center. A joint effort between the New Jersey MEMS (microelectromechanical systems) Initiative and Public Service Enterprise Group, the project is developing fiber optical MEMS devices that will alert utilities of irregularities or deterioration within the power grid that may signal a system failure.

The first device in development targets a condition known as partial discharge (PD) activity. PDs occur in high voltage cables as a result of defects such as voids or contaminants. PD activity will gradually degrade and erode dielectric materials, eventually leading to final breakdown. NJIT researchers began by identifying the characteristic spark signature that accompanies a PD and then designed a MEMS sensor that could recognize the spark. This device is currently in field tests and a PSEG field station. The research partnership will submit a funding proposal to the U.S. Department of Energy to support a project that will expand the utility application of MEMS devices and demonstrate the concept of a "smart" utility.

Better Bus Transportation

Janice Daniel, assistant professor of civil and environmental engineering, uses computer models to study ways to make travel on New Jersey's roads and highways more efficient. Two current projects funded by NJIT's National Center for Transportation and Industrial Productivity and the New Jersey Department of Transportation deal with safety and reliability of bus transportation.

Bus nubs are the focus a study she is conducting in collaboration with Professors Walter Konon and Rongfang Liu, both of civil and environmental engineering. Bus nubs are treatments in which the sidewalk at an intersection is extended out to a distance equal to the depth of parallel parking, allowing buses to stop in the traffic lane without risk to passengers. The study will examine safety, travel speed and passenger comfort at bus nubs as compared with conventional bus stops, and to install bus nubs at locations in New Jersey.

In the second study, Dr. Daniel is investigating the effectiveness of traffic signal priority for buses. Signal priority, which can minimize delays in bus transportation, temporarily alters the traffic signal phase when a bus approaches a red traffic signal so that the bus receives a green light when it arrives. The project will assess the impact of signal priority, as well as costs and safety issues. Edward Lieberman, president of KLD Associates, of Huntington Station, N.Y., and Raghavan Srinivasan, of the University of North Carolina Highway Safety Research Center, are partners in the study.

Incubator Expansion

The opening of a third Enterprise Development Center (EDC III) in 2002 makes NJIT's small business incubation program one of the largest in the nation. With 80,000 square feet in five stories, EDC III doubles the previous incubation space. Three floors in the new structure are earmarked for technology start-up businesses, while the remaining two floors will provide "graduation" space for companies that have outgrown an incubation program.

EDC, founded in 1988 by NJIT, with assistance along the way from Prudential, the New Jersey Commission on Science and Technology, the New Jersey Economic Development Authority, and the U.S. Economic Development Administration, is the oldest and largest incubator facility in New Jersey, with the capacity for serving more than 60 client businesses. EDC provides a broad base of support and acts as a "proving ground" for new and developing high-tech products. Many client companies are developing commercial enterprises that reflect the university's major thrusts in information technology, health sciences, environmental science and engineering, and materials science and engineering. The university provides the latest technical information, including access to the university's specialized equipment, faculty experts

and students. The success rate for EDC businesses is higher than 85 percent; more than 50 businesses have graduated from the incubator facility.

Helping Businesses Get Lean

More than 100 New Jersey manufacturing firms benefited this year from the technical assistance programs of the Center for Manufacturing Systems (CMS). The center, directed by Wayne Chaneski, offers services that range from identifying short-term productivity improvement opportunities to long-term engagements geared toward streamlining entire operations. CMS also assisted companies with product design and prototyping, process development, plant layout, machining of complex parts, and training in modern manufacturing concepts.

Training in lean manufacturing is one of the center's most popular services. Lean techniques -- inventory reduction, reduced lead time, continuous flow, increased flexibility -- are critical to the small and mid-sized manufacturing businesses that are the center's clients. One project for Purepac Pharmaceutical, an Elizabeth-based manufacturer of generic drugs, focused on reducing setup time -- the time a machine is out of service for changeover between the end of one run and the beginning of another. The CMS team videotaped an actual machine setup, then helped employees to review the process and identify solutions to problems. One department also got 5S training (Sort, Set-in-Order, Shine, Standardize, and Sustain) for improving efficiency by reorganizing workspace.

Evaluating Polymer Coatings

A study that will compare various types of polymer powder coatings for effectiveness as well as environmental impact during manufacturing and application is underway at NJIT's Polymer Engineering Center. Led by Marino Xanthos, professor of chemical engineering, the study will look at novel "green" manufacturing methods of polymer powder coatings and compare conventional high temperature curing of the dry coatings with lower temperature curing by UV radiation. The UV curing process appears to reduce energy usage and lower environmental impact. The study will look at cost comparison and overall engineering effectiveness. Polymeric powder coatings provide environmental and corrosion protection in a variety of commercial and military applications. Manufacturers would benefit from identification of a process that lowers overall costs while reducing energy requirements and minimizing hazardous air pollutants.

II.H.4. Improving the Natural and the Build Environment

Environmental engineers and architects are working side by side to rebuild and revitalize America's cities, cleaning up brownfields and providing environmentally benign design solutions that preserve a sense of aesthetic.

Coastal Water Quality

Establishing remote sensing as an operational management tool in assessing the quality of New Jersey's nearshore waters is the focus of research by Sima Bagheri, professor of civil and environmental engineering. Under a NASA Faculty Fellowship, she participated in the NASA Airborne Oceanographic LIDAR (light detection and ranging) remote sensing data acquisition over the East Coast.

The program remotely measures biological and chemical substances in the world's oceans and coastal zones, using sensors that are flown in aircraft to make measurements. The research supports satellite measurements of water quality parameters important in global warming, carbon flux and climate change research. In conjunction with the mission, Dr. Bagheri received the data collected over New Jersey during the flight which she is using to calibrate bio-optical models developed in a related National Science Foundation project.

Toward Greener Manufacturing

Improving manufacturing processes while reducing their environmental impact is the goal of research by Marek Sosnowski, associate professor of electrical engineering. Working with NJIT's Sustainable Green Manufacturing Program under a grant from the U.S. Army, he has developed a method to reduce the hazardous wastes generated in the manufacture of military weapons. The technique involves depositing a thin film of tantalum on steel to replace the chromium coating currently used inside gun barrels. Chromium has been found to be a serious environmental hazard, producing highly toxic waste during the electroplating and anodizing process. Tantalum, a very tough metal that has a high melting point and immunity to chemical attack, eliminates environmental concerns and also resolves technical problems of wear and corrosion from new high-energy propellants. The tantalum coatings are deposited by sputtering, a process utilizing electrical discharge in gas at low pressure, or plasma, which does not generate hazardous waste. The sputtering process, developed in the Ion Beam and Thin Film Laboratory, produces superior tantalum coatings on steel. The results are being evaluated by the Army researchers at Benet Laboratories in New York and in the Army Research Laboratory in Maryland.

Excellence in Design

James Dart A.I.A., special lecturer in architecture, recently received a American Institute of Architects' 2002 Honor Award for his "Barn + Lath House" at Historic Bartram's Garden in Philadelphia. The AIA Honor Awards, the profession's highest recognition of excellence in design, best exemplify excellence in architecture, interiors, and urban design. The jury described the project as "an ingenious addition to an historic barn that creates interest by contrasting the assembled nature of the new with the monolithic quality of the old."

The barn had seen many additions and alterations over the years. It had remained a working structure well into the 20th century, having been altered last in the 1920s. Dart's renovation converted the barn into meeting and exhibition space for educational programs. The lath house features bathrooms on the lower level and administrative offices on the upper level. Dart worked hard to maintain the barn's 18th century character, while providing modern comforts. For example, he used already-existing open joints in the plank flooring to hide registers for a climate control system. He redesigned the interior roof construction to evoke the openness of the original queen-post trusses as well as accommodate new insulation and lighting.

Monitoring Emissions in Real Time

Somenath Mitra, professor of chemistry, has invented a new technique for on-line monitoring of toxic chemicals, such as solvents and organic vapors, in air emissions at very low levels. The new device is an automated instrument for continuous monitoring of NMOC -- the non-methane organic carbon analysis -- which is a measure of all carbon emissions except that for methane. Monitoring occurs real-time, and can be carried out at the site of contamination.

The key element in the device a "microtrap" that gathers organics from the air stream in a sorbent. Rapid (1 to 1.5 seconds) electrical heating of the microtrap releases the chemicals in a concentrated pulse that serves as an injection for the detector. The technique works much faster than any conventional monitoring systems and increases sensitivity by two or three orders of magnitude, allowing analysis of very low concentrations. Dr. Mitra has received a patent for the instrument. Funded by U.S. Environmental Protection Agency Office of Air Quality Planning and Standards, the device was successfully field tested by the EPA at a coatings factory in North Carolina. The research team is now exploring options for commercialization.

Offering Design Help On Line

The Affordable Housing Design Advisor is a new, web-based tool created by Deane Evans, executive director of NJIT's Center for Architecture and Building Science Research (CABSR). Created by for the U.S. Department of Housing and Urban Development, the Design Advisor is designed to help community development organizations across the country achieve design excellence in their affordable housing developments.

CABSR is currently upgrading and expanding the scope of the Design Advisor with funding support from three key national agencies: the U.S. Department of Housing and Urban Development; the Fannie Mae Foundation; and the National Institute of Building Sciences. These funded efforts will enhance the user interface for the Design Advisor; create a special training module within the Advisor focused on "demystifying density;" and establish a new, complementary tool called the Energy Efficient Housing Rehab Advisor. Additional partners in the project include the American Institute of Architects; the Enterprise Foundation; the Federal Home Loan Bank of Boston; the Local Initiatives Support Corporation; the National Congress for Community Economic Development; and the Neighborhood Reinvestment Corporation.

Understanding Chain Branching Reactions

A new understanding of chain branching, an important part of hydrocarbon combustion, is the work of Joseph W. Bozzelli, distinguished professor of chemistry. A recent paper, published in the prestigious American Chemical Society Journal of Physical Chemistry describes four completely new, low energy, chain branching steps for hydrocarbon combustion/oxidation processes. His findings represent the first major improvement in understanding chain branching in hydrocarbon oxidation to be published in two decades.

Combustion is a highly efficient process used to produce energy or to convert wastes into minerals. The reason for its high efficiency is because it utilizes elementary chemical reactions that are chain propagating and chain branching. These propagation and branching reactions serve to amplify the chemical reaction system so more and more reactions occur in a unit period of time. Knowledge of the chain branching reactions is critical to understanding and optimizing the combustion processes in internal combustion engines, both spark and compression ignition, in turbines and other thermal applications. Dr. Bozzelli's work is directed at the detailed chemistry for ignition models in spark (gasoline) and compression (diesel) engines. The work will allow modelers to use this new chemistry for design improvements in these engines and in turbines.

Improving New Jersey's Drinking Water

The New Jersey Applied Water Research Center, directed by Taha Marhaba, associate professor of environmental engineering, has been established by NJIT in partnership with the American Water Works Association to unite industry, government and academia in a common effort to research and improve the state's drinking water. Researchers from NJIT and the Water Works Association, a non-profit group dedicated to providing the state with safe drinking water, expect to have a significant impact on the state's water infrastructure. The center's emphasis on applied research specific to New Jersey will fill in the gaps that national research programs have not addressed. Researchers will also work to assure that the region's water supply is safe from bio-terrorist attacks, developing monitoring systems to identify biological agents deposited in the water infrastructure.

Other aims of the center include investigating methods for combating drought; encouraging state utilities and universities to conduct drinking water research; providing state agencies with research ideas on water supply; and establishing a public service center that will inform residents about research on water supply.

II.H.5. Advancing Information Technology

NJIT's expertise in information technology enriches every aspect of campus activity. Faculty in every academic department work to advance the state of the art in computer applications within their discipline.

Leading the Way in CAD Design

For an unprecedented seventh consecutive year, students from New Jersey School of Architecture took top prizes in the annual CADDIES Competition for Excellence in Design Visualization. Sponsored in part by Cadalyst magazine, the annual international competition celebrates excellence in digital imaging and presents awards in student and professional categories for both still images and animation.

Christiano Pereira captured first place in the animation division for his utopian proposal created in an upper level design studio taught by Prof. Glenn Goldman, director of the school's Imaging Laboratory. The 1968 novel, "The Ice People" by Rene Barjavel, inspired the entry that Pereira created in the NJIT Imaging Laboratory.

Dror Kodman of Israel and Michael Coffey of New Jersey tied for second prize in the undergraduate student still-image division. Kodman's project, entitled "An Experiment in Form and Light," was created in the advanced digital imaging class taught by Amado Batour (an alumnus from the School of Architecture who was one of the first CADDIE winners from NJIT in 1996).

Coffey won for his entry, "Crossing the Arno," (right) created in the upper level design studio class taught by Prof. M. Stephen Zdepski. Both projects were developed using Autodesk's 3D Studio and Adobe Photoshop.

Manuel Millan, of Carteret, received an honorable mention with his "Gallery for Romanesque Art" developed with Autodesk's 3D Studio and Lightscape in another upper level studio taught by Prof. Zdepski that focused on the design for a Museum of Art and Architecture in downtown Prague.

Moving Market Research On Line

Researchers at NJIT are building a Web-based software system that conducts a new kind of market research -- it scours areas of the Web and extracts "interest information" from personal homepages. The team, which includes Professors James Geller and Yehoshua Perl, and Assistant Professor Richard Scherl, aims to make use of the abundance of personal homepages on the World-Wide Web where people freely express many of their likes and dislikes. Such information can be very valuable to marketers looking to narrowly identify individuals as potential customers for particular products. It can also be used to draw conclusions about certain relationships between interests and demographic categories.

The ultimate goal is to help marketers to construct collections of individuals (with e-mail addresses) with a potential interest in certain categories of products. A prototype is on line. The system sorts people both by demographics which defines people of interest to market researchers, and by more than 31,000 interests. Marketers will be able to link various classes of individuals to categories of interests and corresponding products. The study is partially supported by the New Jersey Commission on Science and Technology.

Managing Digital Images

Wassim Jabi, assistant professor of architecture has designed a digital asset management and display system attuned to educational settings. Known as VISTA, the system enables instructors to search a database of digital assets, select the ones they want and save them in sortable virtual slide trays. They can then use those trays for in-class presentations. The system, developed under a grant from the NJ I-Tower project, helps administrators and faculty manage the digital collection, the courses, the

trays, and the user accounts. The system is currently being tested at the New Jersey School of Architecture and will soon be made more widely available.

In another project, Jabi is leading a team to faculty and librarians to develop a program that would allow architecture students to view interactive panoramic images for architectural landmarks with a new technology known as "spherical panoramic imaging." The system is ideal for architectural education because it displays 360-degree panoramas that allow students to study an architectural site from many different perspectives. The interactive panoramas can be rotated, reduced and enlarged. Students can focus on parts of a scene and zoom in and out to study details and relationships. The technique is especially valuable for studying interior spaces. He hopes to create a digital panorama of architectural sites in Venice.

Developing Community Informatics Systems

The development of community informatics systems as a broad economic, social and political force is the focus of a research project led by Michael Gurstein, visiting professor of management. Supported by a grant from the Ford Foundation, the project aims to expand research, policy, programming, commercial and teaching activities supporting the development of the community informatics sector.

Community informatics is the application of information technologies to enable the achievement of community objectives. Initially used in geographical communities, the concept is now being applied to virtual communities based on common interests, industries or marketplaces. The project will bring together the best current thinking of practitioners, academics and industry experts. Results will be presented in book form, potentially supplemented by a web site and CD-ROM. This comprehensive "living document" can provide an initial electronic architecture and resources for creating and maintaining a vertical community informatics sector as well as horizontal "thematic" sub-sectors. Gurstein anticipates that the project will also help to refocus policy attention on how the Internet is used and how it could be used to enable the betterment of communities -- community wealth creation; community social, economic and cultural development; and community empowerment.

Integrating Library Services

Michael Bieber, associate professor of information systems, is leading a project to develop a Digital Library Service Integration (DLSI) infrastructure. Supported by the National Science Foundation under its National Science, Technology, Engineering, and Mathematics Education Digital Library (NSDL) program, the project aims to provide a systematic approach for integrating digital library collections and services.

Digital library repositories contain on-line collections multimedia documents -- text files, photos, videos and animations, teaching materials, and computer programs.

Digital library services are emerging, such as classification, searching, and peer review, as well as hypermedia functionality such as annotation and guided tours. Currently specific digital library services work for specific digital library collections only. The NSDL program, which aims to establish a national digital library for science, technology, engineering, and mathematics, is focusing on gathering educationally-related collections and services and integrating these so that services can be shared among collections.

Using the Dynamic Hypermedia Engine (DHE) developed at NJIT's Collaborative Hypermedia Research Laboratory, the DLSI program will integrate relatively simple services that may be used without modification. The project will also explore giving access to services that require customization, such as peer review. Services and collections generally will require minimal or no changes to plug into the DLSI infrastructure. The research team believes that DLSI can form the core of vibrant virtual educational communities by supporting a broad range of community support services.

Measuring Software Quality Attributes

Developing a system of metrics -- measurements of software quality which indicate the complexity, understandability, testability, description and intricacy of code -- for software architectures is the focus of a study by Ali Mili, professor of computing science. The goal of the project, supported by a grant from the National Science Foundation, is to facilitate product line engineering, a specialized form of software reuse. One way to reduce the cost of developing a software is to create a product line, a group of similar products structured to take advantage of each other's assets. Dr. Mili is investigating metrics for domain architecture, the organizational structure or design of software systems. The project has a three-tiered approach, involving a distinction among qualitative attributes, quantitative factors and computable metrics. The project will lead to a better understanding of quality attributes of product line architectures and better means of quantifying these attributes.

Next-Generation Wireless Communications

Technologies to enable the next generation of wireless digital communications are the focus of research at the Center for Communications and Signal Processing. Yeheskel Bar-Ness, distinguished professor of electrical and computer engineering and director of the center, leads a team of researchers working to develop the infrastructure needed to support the burgeoning demand for wireless communication. The group addresses issues such as privacy and security, interference and jamming, ever heavier user traffic, and rapid transmission of data through wireless networks. Dr. Bar-Ness recently filed for patents on next-generation devices with two of his doctoral students:

- With Seok Hyun Yoon, a parallel decoding algorithm of Turbo Codes was developed, especially for high-speed data communication system. Error correction codes play an important role in wireless systems, since communication is easily contaminated by channel defects, like noise and fading. A recent innovation known as Turbo Code -- a strong error correction code -- has improved error correction greatly. However, Turbo Code's computational complexity makes hardware implementation complicated for reasonable decoding delay. Yoon's parallel algorithm provides scalable decoding delay without any additional computation or performance degradation.
- With Songping Wu, a patent was filed for a new phase noise suppression method for high speed wireless data communications. In order to conserve frequency resources and combat time dispersion of channels, a transmission technique known as OFDM (orthogonal frequency division multiplexing) is often used by wireless systems since it allows signals to overlap, sharing bandwidth more efficiently. This technique depends on phase synchronization, and phase noise can result in severe interference disrupting communications. Wu's invention provides an inexpensive way to subdue phase noise.

Integrating Psychology with Information Systems

As a psychologist working in information systems, Brian Whitworth focuses his research on how to design software that better reflects human nature. He believes that information systems are becoming more about people and less about technology, and this continuing trend toward human-centered computing makes psychology a critical component in the design of systems and programs. He studies such areas as social behavior on computer networks; the generation of group agreement in computer-mediated groups; the impact of computer-mediated communication on organizations; and computer-mediated education and learning networks. His goal is to design windows-based groupware -- software tools and technologies that support a group of people working together -- that can be used to research how psychological principles can be implemented in a computer software system.

II.H.6. New Jersey Initiatives

NJIT has a long tradition of providing policy analysis and technical assistance to public agencies. In recent years, the legislature and the Governor have commissioned the university to conduct a series of comprehensive studies on issues of importance to the State. The findings and reports from these studies have provided sound engineering and science-based analysis and advice that contributes to public dialogue and significantly influences state policy and decision making. The following highlights some of the initiatives.

At the recommendation of the Speaker, the New Jersey Assembly created a special appropriation for NJIT to make recommendations on the technical feasibility of creating “smart guns” – weapons that would be in a normally locked position and release only in the hands of an authorized users (e.g. the owner). NJIT completed a comprehensive technology survey and has organizing various constituent interest groups to develop quantitative performance criteria for a “smart gun”. The findings were presented to the New Jersey Legislature’s Law & Public Safety Committee in April 2001 and will form the basis of future legislation regarding gun safety. NJIT also developed a unique biometric user-authentication system that is now being applied to prototype weapons for subsequent commercialization. A consortium that includes the major domestic manufacturers of handguns has been formed, and is working with NJIT to secure federal R&D support to advance the technology. NJIT is working with the US Army research centers at Picatinny Arsenal in Rockaway, NJ and Fort Monmouth, NJ as well as Offices of the Speaker of the Assembly and President of the NJ Senate, the NJ Attorney General’s Office, and the Governor’s Office. The project has staged quarterly public briefings as well as special session for NJ Executive and legislative leaders, and maintains an active web site for discussion and dissemination at: <http://www.njit.edu/pwt>.

The Governor’s office authorized special funding to allow NJIT to work with Monroe Township to evaluate alternative energy schemes to reduce the residents heavy dependency on electric power. The study had been requested by Assemblyman Paul Kramer, District 14, and the Governor requested NJIT to do the study. The NJIT team evaluated several alternative energy production schemes to arrive at per capita conversion costs, and quantified additional energy conservations strategies for the residents of the community.

The National Center for Transportation and Industrial Productivity (NCTIP) completed the second iteration of its study "Mobility and the Costs of Congestion in New Jersey" that was funded by the U.S. Department of Transportation (USDOT) and a grant from the Foundation of the New Jersey Alliance for Action. "NJIT’s analysis builds on a 1996 study by the Texas Transportation Institute which made state-to-state comparisons using national highway data," said Lazar Spasovic, NCTIP director. "By using more detailed data on traffic volume and roadway characteristics in New Jersey

and an enhanced methodology, we were able to determine the cost of congestion on the roadway network throughout the state."

The NCTIP research team analyzed data from the N.J. Department of Transportation (NJDOT) to measure and compare congestion in terms of traffic volumes, travel speeds, trip lengths, fuel consumption and truck flows. The study assesses a dollar value for delays experienced by drivers under current conditions, on a statewide and county level, as well as corridor and project level. New Jersey drivers spend about 34 hours — nearly one working week — in traffic delays each year. The study also projects the future cost of congestion in the state for the years 2005 and 2015.

II.H.7. Electronic Network Solutions for Rising Healthcare Costs

This comprehensive study completed by NJIT in cooperation with Thomas Edison State College found that the state's healthcare industry could save \$760 million annually in the administrative costs of processing claims and medical information by adopting a set of standardized electronic forms and using electronic data interchange (EDI) technology. The 18-month study focused on identifying state-of-the-art information technologies, which when implemented, should result in major administrative cost saving for the state's \$30 billion healthcare industry. The State has adopted several recommendations of the report. The Legislature is providing ongoing appropriations to the New Jersey Department of Health and Senior Services to continue to implement the report's major recommendations. NJIT and Thomas Edison State College to continue assisting the State in these efforts.

NJIT will receive more than a quarter million dollars to help fight bio-terrorism under a major grant awarded to New Jersey by the federal Center for Disease Control and Prevention (CDC). The NJIT award was issued by the N.J. Department of Health and Senior Services as part of a \$1 million, one-year grant, which could be renewed each year for up to five years. The money will be used to strengthen the nation's overall public health system to better respond to man-made threats, such as the deliberate release of chemicals or disease-causing organisms, as well as newly emerging infectious diseases, such as antibiotic-resistant organisms or the next influenza pandemic.

Much of the grant will be used to create an Internet-based Health Alert Network. NJIT will develop the computer system that will connect the state health department and 115 local health departments in an around-the-clock system that can function dependably in an emergency. Local health departments, in turn, will be linked to community health and emergency response agencies through a rapid telefax system that can be used to communicate information and coordinate an emergency response. Further information on the grant can be obtained at the Department of Health and Senior Services web site:

<http://www.state.nj.us/health/news/p90915a.htm>

II.H.8. New Jersey Immunization Information System and the New Jersey Local Information Network & Communications System

NJIT has put into production for statewide use the New Jersey Immunization Information System (NJIIS) and the New Jersey Local Information Network and Communications System (NJLINCS) for the New Jersey Department of Health and Senior Services (NJDHSS).

NJIIS is an on-line immunization registry capable of enrolling all New Jersey children at birth and recording and evaluating their immunization histories for completeness under the Center for Disease Control and Prevention's current guidelines. Over 150,000 children are currently in the registry and more than 150 health departments, clinics and private physician's offices are currently participating via dial in modems or the Internet. NJIT installs client software at user sites, operates the servers and provides administrative and technical support for the NJIIS.

NJLINCS is an Internet based communications system that will link all local health departments with the NJDHSS in Trenton. NJLINCS provides rapid, two-way communication between state health officials and local health officers for dissemination and collection of health related information and data. NJIT operates the servers and provides administrative and technical support for the NJLINCS.

II.H.9. NJ Energy Research Consortium

Recently, the New Jersey Board of Public Utilities (NJ BPU) convened an Electric and Natural Gas Industry Task Force/Working Group to explore new distribution and transmission system technologies, which in the future would improve the reliability, safety, and power quality of those systems to end users. Given the establishment of full retail competition in the state for electric-and natural gas customers, respectively, the Task Force is to recommend to the NJ BPU future standards and measures to ensure high-quality performance of those distribution systems over time relating to reliability and safety, as well as to outages and restoration of power.

A Consortium for Energy Research and Development has been created through a synergy involving New Jersey's private sector and research universities to advance the safety, reliability and productivity of the state's energy industries, and assist in the development of new products and services, through a consortial program of pre-competitive research and technology development. For example, fuel cells and microturbines are beginning to enter the market, but the service infrastructure must be built and interconnect standards and local codes must be developed to support these technologies. NJIT will host the consortium and lead the formulation of R&D teams.

II.H.10. Major Research and Public Service Centers at NJIT

Bioengineering & Applied Life Sciences

- Center for Applied Genomics
- Center for Computational Biology and Bioengineering
- Collaborative Telemedicine Environments
- International Center for Public Health
- Human Movement Dynamics Laboratory
- New Jersey Center for Biomaterials
- Personalized Weapons Technology Project

Information Technology

- Center for Applied Mathematics and Statistics
- Center for Communications and Signal Processing Research
- Center for Embedded System-On-a-Chip Design
- Center for Next Generation Video
- Computerized Conferencing and Communications Center
- Data and Knowledge Engineering Laboratory
- Electronic Information Exchange System (EIES)
- Hypermedia Information Systems Research
- Microelectronics Research Center
- New Jersey Center for Internet Security
- New Jersey MEMS Initiative
- New Jersey Center for Multimedia Research
- New Jersey Center for Pervasive Computing
- New Jersey Center for Wireless Telecommunications
- Software Engineering for Distributed Computing and Networking

Sustainable Systems & Infrastructure

- Architecture and Building Sciences
 - Center for Architecture and Building Science Research
 - Concrete Testing Laboratory
 - Imaging Laboratory (CAD in Architecture)
 - Structural Testing Laboratory
- Environmental Science and Engineering
 - Center for Environmental Engineering and Science
 - Center for Airborne Organics
 - Hazardous Substance Management Research Center
 - Northeast Hazardous Substance Research Center Sustainable Green Manufacturing Initiative
 - Geoenvironmental Engineering Laboratory
 - Hydraulics and Hydrogeology Laboratory
 - Laboratory for Process and Field Analytical Chemistry
 - Multi-lifecycle Engineering Research Center
 - Remote Sensing/Geographic Information Systems Laboratory

Solar Physics

Center for Solar Research
Big Bear Solar Observatory
Owens Valley Solar Array

Transportation

Center of Excellence for Airworthiness Assurance
Global Positioning System Base Station
International Intermodal Transportation Center
National Center for Transportation and Industrial Productivity
New Jersey Transportation Information and Decision Engineering Center
North Jersey Transportation Planning Authority
Transportation, Economic and Land Use

System Materials Science and Manufacturing

Bearings and Bearing Lubrications Laboratory
Center for Membrane Technologies
Center for Ultrafast Laser Applications
Dynamic Systems and Control Laboratory
Electronic Imaging Center (Optoelectronics and Solid State Circuits)
Ion Beam and Thin Film Research Laboratory
Keck Laboratory for Electro-Hydrodynamics of Suspensions
New Jersey Center for Engineered Particulates
New Jersey Center for Microflow Control
New Jersey Center for Optoelectronics
Non-linear Nanostructures Laboratory
Optical Science and Engineering
Polymer Processing Institute
Smart Coatings Research Initiative
Waterjet Technology Lab

II.H.11. Sponsored Chairs

NJIT has five foundation chairs and six endowed chairs.

The Foundation Chairs are:

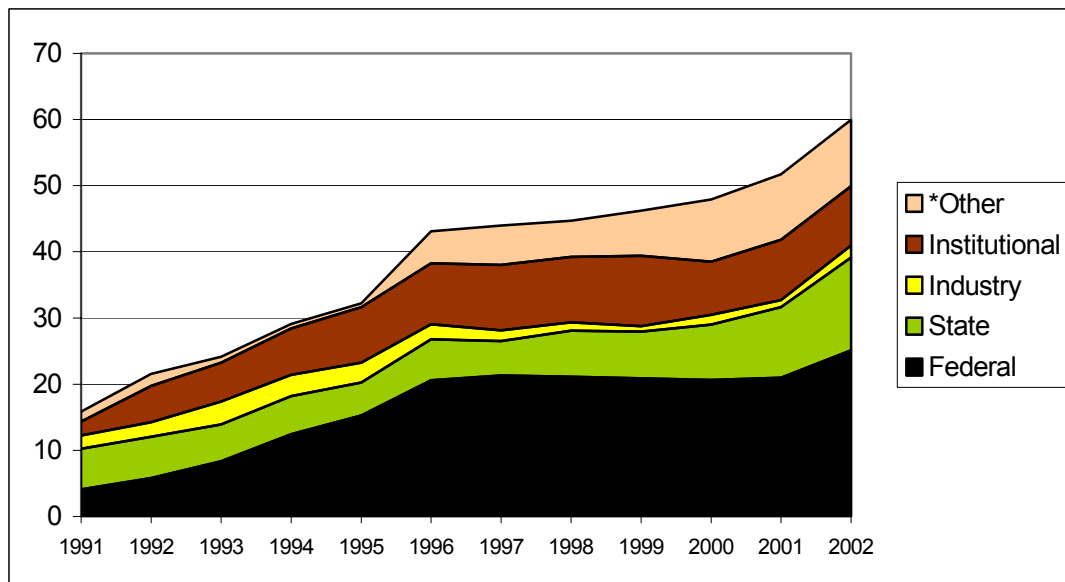
- Applied Mathematics
- Bio-Mechanical Engineering
- Communications & Signal Processing
- Management of Technology
- Membrane Separations

The Endowed Chairs are:

- Becton Dickinson Research Professorship in Public Health
- Leir Chair in International Trade
- Panasonic Chair in Multi-lifecycle Engineering
- Jacobus Chair
- Ada C. Fritts Professorship
- Hurlbert Professorship in Management Information Systems

II.H.12. NJIT Externally Funded Research Expenditures

NJIT Externally Funded Research Expenditures since 1990 are as under:



* funded by multiple sources.

II.H.13. Joint Research Programs - Centered at NJIT

- Center for Solar Research (NJIT, Cal. Tech.)
- Hazardous Substance Management Research Center (NJIT, UMDNJ, Rutgers, Princeton, Stevens)
- Microelectronics Research Center (NJIT, Rutgers, Columbia)
- Multi-Lifecycle Engineering Research Center (NJIT, Rutgers, Princeton, Stevens)
- National Center for Transportation and Industrial Productivity (NJIT, Rutgers)
- New Jersey Program for Engineered Particulates (NJIT, Princeton, Rutgers)
- New Jersey Center for Micro-Flow Control (NJIT, Princeton)
- New Jersey Center for Multimedia Research (NJIT, Princeton)
- New Jersey Center for Transportation Information and Decision Engineering (NJIT, Princeton)
- New Jersey Center for Internet Security (NJIT, Princeton, Stevens)
- New Jersey Center for Wireless Telecommunications (NJIT, Rutgers, Princeton, Stevens)
- New Jersey MEMS Initiative: From Concept to Commercialization (NJIT, Rutgers, Columbia)
- Northeast Hazardous Substance Research Center (NJIT, UMDNJ, Rutgers, Princeton, Stevens, Tufts, MIT)
- Polymer Engineering Center (NJIT, Stevens)

II.H.14. Research Partnerships Centered at Other Institutions

- Center for Airborne Organics (MIT, NJIT, Cal. Tech.)
- Center for Applied Genomics (NJIT, UMDNJ)
- Center for Embedded System-On-a-Chip Design (Princeton, Rutgers, NJIT)
- Center for Ultra-fast Laser Applications (Princeton, Rutgers, NJIT, UMDNJ)
- New Jersey Center for Biomaterials and Medical Devices (Rutgers, UMDNJ, Princeton, NJIT)
- Collaborative Telemedicine Environments (Rutgers, NJIT, UMDNJ)
- New Jersey Center for Optoelectronics (Princeton, NJIT)
- New Jersey Center for Pervasive Computing (Princeton, NJIT, Rutgers)
- Particle Processing Research Center (Rutgers, NJIT)
- Phytoremediation of Dredge Spoils Using Living Plants / Associated Micro-organisms (Rutgers, NJIT)
- Software Engineering for Distributed Computing and Networking (Stevens, Rutgers, NJIT)

II.H.15. Workforce Development

Almost all NJIT activities are related to workforce development. These activities include, but are not limited to:

- Undergraduate and graduate degree programs – as of August, 2002 NJIT has granted 35,647 bachelor's degrees, 19,244 masters degrees, and 683 doctoral degrees
- Continuing professional education programs
- Cooperative education program
- Community and Public Service program
- Career Planning and Placement programs
- Programs designed to recruit and retain under represented groups in NJIT's technology oriented degree fields (e.g., women and minorities are nationally under-represented in the engineering profession)
- Assessment of the skills and knowledge needed by the workforce
- Continual curriculum review to ensure that NJIT students develop the needed skills and knowledge
- Development of additional ways to develop needed skills and knowledge (e.g., Distance Learning, courses offered in either a two semester or three semester format)

As an educational institution, NJIT has always tried to develop in its students the knowledge and skills they need. As workforce needs change, so does NJIT. In response to changing workforce needs, for example, NJIT has introduced more than 30 new degree programs over the last two decades. These programs include biomedical engineering, biological computational biology, human computer interaction, environmental engineering, environmental science, professional and technical communication, and nursing. In 2001 NJIT opened the College of Computing Sciences.

NJIT has also been a leader in developing a technologically trained workforce. Since 1985, for example, NJIT has been providing personal computers to all first-time full-time freshmen. These computers are "free" except for a small annual maintenance fee. This clearly makes personal computers affordable to many who would not otherwise be able to own one. This program combined with NJIT's extensive computing facilities helps to reduce greatly the barrier of financial resources to obtaining the computer literacy needed in the competitive global economy. ACCESS/NJIT allows more students to pursue higher education by reducing the barriers of time and geography. The University Research Experience (URE), University Learning Center (ULC), and McNair grant program provide a range of technical assistance to Educational Opportunity Program (EOP) and minority students who historically have been under-represented in masters and Ph.D. degree programs. URE enables undergraduates, as early as the freshman year, to work with faculty on research

projects and McNair takes their work into graduate degrees. Project CAP, a Career Advancement Program for women and minorities, was established in 1987.

NJIT's expertise in workforce development has been widely recognized in many ways. For example, in 1995, NJIT undertook the New Jersey Manufacturing Extension Partnership (NJMEP): part of a national program of manufacturing technical assistance run by the National Institute of Standards and Technology (NIST) of the U.S. Department of Commerce. Funded at a level of \$4 million per year, half federal and half state support, the NJMEP incorporates a number of existing NJIT resources. Five manufacturing sub-sectors were identified as both critical to the growth of the regional economy and at-risk in the absence of assistance: metalworking and machinery, electronics and instrumentation, rubber and plastics, food processing, and textiles and apparel. A staff of approximately 25 MEP field engineers is responsible for assisting small- and medium-sized businesses adapt to changing regulations and business conditions by bringing them into contact with existing sources of aid, and for refining the state's understanding of their needs.

Continuing Professional Education (CPE) has also played a substantial role workforce development. CPE provides in-house corporate customized training programs for NJ-based companies, agencies and government. As part of this activity, and where appropriate, NJIT staff works with the NJ-based organizations to help them to take advantage of training grants from the NJ Department of Labor. For example, in 00-01, NJIT conducted in-house training of 6,753 NJ employees at their places of work. CPE offers professionals in the general population the opportunity to upgrade their computing skills through short courses and non-credit certificate programs. For example, nearly 2,000 professionals enrolled in one or more of the various short courses that comprise the NJIT WebMaster Certificate Program and studied in classrooms across the state or online.

During the past two years NJIT has received substantial state grants to fund additional technology oriented workforce development projects. The 2000 NJ I-TOWER project's main goal is to create a technologically sophisticated workforce in New Jersey. The project builds connections between NJ industry, the NJIT Enterprise Development Center (EDC), and graduate and undergraduate classroom activity. It also works to disseminate IT research and promote education through NJIT's nationally recognized continuing education program. The 2001 Workforce Development Grant, Pre-Engineering Instructional and Outreach Program, is training teachers, grades 6-12 to do pre-engineering education and develop pre-college programs promoting technology education, particularly for minority and urban students. At the end of three years, 100 NJ schools will be trained.

II.H.16. Assistance to Business

NJIT offers direct assistance to business through several services to small- and medium-sized businesses to encourage their growth and success. These services are delivered primarily through NJIT's six-business assistance centers:

- Technology Extension Program in Manufacturing Engineering (a component of the New Jersey Manufacturing Extension Partnership – NJMEP): a statewide manufacturing extension program to help small- and medium-sized manufacturing businesses to modernize and become more competitive
- Center for Information Age Technology (CIAT): integrates computer technology into the operations of New Jersey business, government, non-profit and educational organizations
- Center for Manufacturing Systems: assists manufacturers with prototype product development, process improvement and modernization with high speed machining center, advanced CAD/CAM and rapid prototyping facilities.
- Defense Procurement Technical Assistance Center: helps New Jersey small businesses obtain defense and other federal contracts
- Enterprise Development Center I and II: small business incubators that help new and developing enterprises survive the typically difficult start-up stages;
- New Jersey Technical Assistance Program (NJTAP): helps New Jersey small- and medium-sized businesses comply with state and federal pollution prevention regulations;
- Micro-fabrication Center: serves to assist businesses with design and fabrication services related to silicon processing technologies in the university's clean room for MEMS and CMOS processing;
- Technical Extension Center in Information Science: technical assistance in computer technology for small New Jersey businesses;
- Polymer Processing Institute: provides assistance to small businesses in processing of polymers and plastics.

NJIT also provides assistance to business through workforce development activities, research activities, economic development activities, and public service activities.

II.H.17. Culture/Cultural Events

NJIT provides a variety of cultural events. For example, NJIT collaborates with Rutgers-Newark to present four plays each year attended by a total of approximately 1000 people. There are also guest musicians and acting workshops. A co-curricular activity with both the "Musical Theater" and "Living Theater" courses at NJIT are student scripted and presented plays called "Stories from Home." To date, more than 150 stories have been told and approximately 50 have been scripted and performed.

In collaboration with Rutgers Newark and Essex County College, all special months are celebrated (Black History, Hispanic Heritage, Asian Pacific and Women's History). NJIT also celebrates World Week. In addition, on-going programs and activities are sponsored throughout the year. These include evening and weekend events with jazz bands and open mikes. Trips to diverse plays and events off-campus are also sponsored.

Student groups and the Office of the Dean of Student Services also present a variety of cultural events. NJIT is a co-sponsor of the annual Black film festival together with the Newark Museum and Rutgers University and the sponsor of the Black Maria Film Festival for young film makers.

II.H.18. Sports/Sports Events

NJIT's sixth year as a member of NCAA Division II was its best yet. The Highlanders improved their cumulative winning percentage by almost 10 percentage points over the previous year. The men's basketball team finished in first place in the Central Atlantic Collegiate Conference, and nine out of 12 teams had as many or more victories than in 2001-02. NJIT's continued its membership in the Central Atlantic Collegiate Conference, which includes such local schools as Felician, Caldwell, and Bloomfield, has significantly cut down on travel time and costs while affording NJIT the opportunity to foster local rivalries. To further increase our visibility in New Jersey, the baseball squad played selected home games at Riverfront Stadium in downtown Newark for the fourth consecutive year.

Ninety-eight students received athletic scholarships in AY 2002-2003 used to supplement the unmet tuition need of student athletes identified by the athletic administration. The total amount awarded in AY 2002-03 was more than \$450,000. These students are all highly qualified student athletes whose academic and athletic skills will benefit the university as NJIT moves into the highly competitive and visible ranks of Division II athletics. During 2002-2003, NJIT honored 91 scholar-athletes who participated in varsity sports and earned a GPA of at least 3.0 for either Spring 2002 or Fall 2002. NJIT also had had five all-conference athletes and 16 Arthur Ashe Sports Scholars. In 2003-04, the university will offer 15 intercollegiate varsity sports: baseball, M/W basketball, M/W Cross Country, M/W fencing, M/W soccer, M/W swimming, M/W tennis, and M/W volleyball. In addition the Men's Soccer team will begin its first year of reclassification to the NCAA Division I level.

II.H.19. Public Service, Charitable Efforts, Volunteerism

NJIT has produced numerous studies for the development of state policies, particularly for projects involving technology, transportation, alternative energy, and technology infrastructure. Most recently, NJIT has taken a leading role in the development of a security plan following the events of September 11 and in response to the need for greater homeland security. NJIT also has established a substantial level of outreach to the K-12 educational community in providing teacher development and special opportunities for children in science, math, technology, and engineering education. Outstanding among NJIT's public service initiatives are:

- Activities related to University Heights Science Park (expected to generate 3000 jobs)
- Activities of the Center for Pre-College Programs – a national model for K-12 students and teachers in the sciences, mathematics and engineering. The program now serves over 3500 teachers, students, administrators, and parents.
- Activities of the Office of Community and Public Service which links classroom theory and concepts with practical applications in the community.

These practical applications include:

- Community Service Work-Study: More than twenty NJIT students worked for a dozen Newark area non-profit organizations during AY01. Agencies sites included Newark Center for Families, Community in Schools-NJ, Community Agency Corporation, St Phillips Academy, Newark Emergency Services for Families, and the Historical Society. "
- NJIT Literacy Corps: Through collaboration with the Newark, America Reads Partnership, 40 NJIT work-study students tutored over 350 elementary age school children at 15 schools & organizations throughout the area.
- Service Learning: Over 350 NJIT students partnered with 75 non-profit agencies to complete over 10,000 hours of volunteer service linking their academic learning with practical experience. This year, EOP and Athletics Department incorporated service-learning activities into their programs to promote civic engagement opportunities for participants. Recent projects included: a group of CIS students who designed and constructed a major volunteer database for the United Way of Essex and West Hudson; for the Clifton Public Library and an EOP student, interested in oral communication, who interviewed senior citizens and developed a video documentary of community historical information for the Newark West Ward Neighborhood Association.
- Volunteer Clearinghouse: Collaborative volunteer activities were sponsored during the year with IFSC, Health Services, DOS, Residence Life, etc. Over 200 NJIT students volunteered for activities such as NJIT/Prudential Global Volunteer Day", NESF Community Tech Network ", United Way "Celebrity Reads" project, Newark Do Something "Give Back Day" and the annual IFSC "Blood Drive".

II.H.20. Special Recognition Projects

The *New Jersey Inventors Hall of Fame*, established in 1987, recognizes the state's inventing heritage and provides a permanent tribute to the individuals and corporations who have worked to advance technology. Outstanding New Jersey inventors are inducted into the Hall of Fame at an annual banquet held during the second week of February. At the same time, a select group of New Jersey inventors holding current patents are awarded *Inventor of the Year* citations and one corporation is named to the *Corporate Invention Hall of Fame*.

The *New Jersey Literary Hall of Fame* is dedicated to remembering and perpetuating the work of New Jersey authors. This recognition was started in 1976 to bring attention to the state's writers past and present. Each year, writers, known nationally and internationally, have been inducted. Books and other memorabilia of New Jersey's major writers have also been collected.

NJIT Archives now houses the collections of Dr. Herman Estrin and Edward Weston long time faculty member and founder of the New Jersey Literary Hall of Fame and the New Jersey Writers Conference. The NJIT Archives also includes the Edward Weston Collection. Edward Weston, one of the founders of the Newark Technical School, is known for his research and development in the fields of electroplating, lighting, and electronic measurements. The NJIT Archives now has many of his papers, including patent litigation, hundreds of mechanical drawings of his equipment, and museum displays of his equipment. The NJIT archives have also begun to digitize and make accessible over the web, NJIT theses and dissertations as well as some yearbooks and other university materials of interest to researchers and alumni.

II.I. Facilities and Major Capital Projects/Improvements

In the spring of 2001, the NJIT campus consisted of 2 million gross square feet of built environment on a 45 acre campus. With the recently completed construction and major rehabilitation, the average age of campus facilities is 14 years. This is in spite of the original building dates of the pre-1967 expansion campus which includes Eberhardt Hall built in 1897, Colton Hall in 1911 and Campbell Hall in 1930. NJIT through its resources and a special appropriation has also acquired some additional land and has other parcels under contract. In addition, in concert with the development of University Heights Science Park, NJIT was able to consolidate a whole block just west of the major portion of the campus, but contiguous to the land acquired for its Enterprise Development Center II, in a “land swap” with the NJ Economic Development Agency of several disparate parcels that NJIT had acquired over time with land the EDA was acquiring on behalf of Science Park. The third building in Science Park, now nearing completion, is a 170,000 square foot laboratory building that will house certain departments of the nearby University of Medicine and Dentistry of New Jersey and the Public Health Research Institute which is relocating from New York City.

II.I.1. The Next Phase of the Building Plan

The Board of Trustees has recently approved a major facilities and financing plan. The overall plan totals \$145.2 million. The major projects are summarized in Table 19 below. Adjustments may be forthcoming.

Project Title	Budget in \$000
Parking Facility Addition	6,000
Residence Hall	17,500
Campus Center	45,000
East Building	37,500
Cullimore Hall	7,500
Eberhardt Hall	5,200
Major maintenance Projects	13,000
Addition to Electrical and Computer Engr.	4,000
Enterprise Development Center III	15,200
Total	150,900

II.I.2. Current Construction

Based on the priorities agreed on as the Plan was being developed, certain construction has begun or been completed. Already built is a two-story addition to the parking structure. Utilizing connections that had been built as part of the original project, 450 spaces were added during summer 2000. Also completed for the fall of 2001 was a 300 bed residence facility which will share an entrance with an existing hall. The facility will also have a small convenience store accessible directly from the outside of the building to service the broader campus community. This brings the campus residential capacity to 1,500.

Phase I of a new Campus Center will be completed in September 2003. This is an involved project which required the demolition of the one-story Alumni Center which was attached to the Campus Center to provide a building site for a four-story addition. Once completed, the addition will serve as “The Center” while the existing Center undergoes major renovations and further additions. The Alumni office has been temporarily relocated and will be moved back to a renovated Eberhardt Hall.

The East Building multi-level structure which will include two levels of parking beneath the building will be completed in the first quarter of fiscal year 2004. Certain offices will be moved from Cullimore to provide expansion for departments in the College of Science and Liberal Arts. The East Building will provide space for the recently created Department of Biomedical Engineering. It will also provide space for the relocation of the Departments of Admissions and Continuing Professional Education.

The space vacated by the latter two functions will provide for the planned expansion space for the Library and the newly authorized College of Computing Sciences.

Eberhardt Hall is on the national register of historic buildings. The planned renovations will make it more suitable for the Alumni Association as both a place for its administrative functions and, more importantly, a place for a variety of gatherings. The space will also provide additional meeting and seminar space for the university. Upgrades to the bathrooms and an elevator will make almost all of the building barrier free.

The Department of Electrical and Computer Engineering project will include a two-story addition to its existing facility. There were provisions made for this expansion at the time the building was originally designed.

When current construction is completed, the campus will consist of approximately 2.6 million gross square feet.

II.I.3. Deferred Maintenance

Another critical element of the facilities plan addresses the outstanding major items of deferred maintenance. To this end, a significant allocation of resources has been made. It should be noted that NJIT has, on an annual basis, continually made progress on this important issue.

II.I.4. Financing

The financing for the foregoing projects comes from several sources. Several of the projects have multiple sources of funding reflective of certain restrictions on funds. For example, the US Economic Development funds can only be used for Enterprise Development III. While the overall debt of the university has risen owing to this construction, the annual debt service is covered from operating revenues, including residence hall rentals and tenant income from EDCIII. The university issued general obligation bonds through the NJ Educational Facilities Authority. Moody's Investors Service and Standard and Poor's Ratings Group have assigned Series 2001 bond ratings of "Aaa" and "AAA," respectively. Moody's Investors Service and Standard and Poor's Ratings Group have designated Series 2001 Bonds underlying ratings of "A2" and "A+," respectively.

II.I.5. Future Needs

With all the expansion and new facilities, can there be further needs? In a growing technological university the answer is a firm yes. As NJIT continues to place greater emphasis on the use of technology in the life sciences, new spaces will be needed. Further, as new research oriented faculty join NJIT, more laboratory space will be necessary. While the overall enrollment is projected to only have modest growth in the next 5 to 10 years and therefore significant additional student service and traditional class facilities are not projected, there will be a need to provide additional facilities to accommodate distance education. Inasmuch as the five residence halls are 100% full, we may also need to consider additional residential facilities. Additionally, in the long term, NJIT has utilized almost all of the available land as building sites. These represent the major challenges facing the university with respect to facilities.

To meet these challenges, NJIT must continue to pursue multiple paths. Limitations on funding and available land makes it imperative that alternative solutions be found. As a critical element of its planning process, NJIT has developed and strengthened strategic alliances with its university neighbors. The Council for Higher Education in Newark (CHEN), which is discussed more fully earlier in this report, consists, in addition to NJIT, of the Newark campus of Rutgers University, the University of Medicine and Dentistry of New Jersey and Essex County College. This consortium has developed both joint academic and administrative programs. In the area of

facilities this has enabled a researcher in the College of Computing Sciences to test computer models on learning curves in laboratory animals by using the animal facilities just across the street. There are several federated departments at NJIT and Rutgers University, including history, physics, and biology, which permit NJIT to have a faculty critical mass without the full facilities burden. It should be noted that this arrangement will also move the Rutgers Geology Department into the NJIT building that houses the Department of Civil and Environmental Engineering as soon as space becomes available.

No further borrowing is anticipated at this time. Future facilities needs will be met by State and Federal appropriations and vigorous fund raising.

III. Other Institutional Information

III.A. Number of Collaborative Academic Programs

Collaborative Academic Programs

Joint Programs

- Rutgers - The State University, Newark Campus
- University of Medicine and Dentistry of New Jersey (UMDNJ)

Joint programs with Rutgers - The State University, Newark Campus include:

- Applied Mathematics (B.A.) 270301
- Applied Physics (B.S.) 400899
- Biology (B.A.) 260101
- Biology (B.S.) 260101
- Computer Science (B.A.) 110101
- Environmental Science (B.S.) 030102
- Geoscience Engineering (B.S.) 141601
- History (B.A.) 450801
- Human Computer Interaction (B.S.)
- Information Systems (B.A.) 110401
- Science, Technology, and Society (B.A.) 301501
- Applied Physics (M.S.) 400899
- Biology (M.S.) 260101
- Computational Biology (M.S.)
- Environmental Science (M.S.) 030102
- History (M.A.T.) 131328
- History (M.A.) 450801
- Public Health (M.P.H.) 512201
- Applied Physics (Ph.D.) 400899
- Biology (Ph.D.) 260101
- Environmental Science (Ph.D.) 030102
- Mathematical Sciences (Ph.D.) 270101
- Urban Systems (Ph.D.)

Joint programs with the University of Medicine and Dentistry of New Jersey include:

- Nursing (B.S.N.)³ 511608 (Mt. Laurel Campus only)
- Biomedical Informatics (M.S.) 119999 (will be solely UMDNJ after 12/06)
- Nursing (M.S.N., Nursing Informatics Track only)

- Public Health (*M.P.H.*) 512201
- Biomedical Engineering (Ph.D.) 104501
- Biomedical Informatics (Ph.D.) 119999 (will be solely UMDNJ after 12/08)
- Urban Systems (Ph.D.) 459999

Joint Research Programs – Centered at NJIT

- Center for Solar Research (NJIT, Cal. Tech.)
- Hazardous Substance Management Research Center (NJIT, UMDNJ, Rutgers, Princeton, Stevens)
- Microelectronics Research Center (NJIT, Rutgers, Columbia)
- Multi-Lifecycle Engineering Research Center (NJIT, Rutgers, Princeton, Stevens)
- National Center for Transportation and Industrial Productivity (NJIT, Rutgers)
- New Jersey Program for Engineered Particulates (NJIT, Princeton, Rutgers)
- New Jersey Center for Micro-Flow Control (NJIT, Princeton)
- New Jersey Center for Multimedia Research (NJIT, Princeton)
- New Jersey Center for Transportation Information and Decision Engineering (NJIT, Princeton)
- New Jersey Center for Internet Security (NJIT, Princeton, Stevens)
- New Jersey Center for Wireless Telecommunications (NJIT, Rutgers, Princeton, Stevens)
- New Jersey MEMS Initiative: From Concept to Commercialization (NJIT, Rutgers, Columbia)
- Northeast Hazardous Substance Research Center (NJIT, UMDNJ, Rutgers, Princeton, Stevens, Tufts, MIT)
- Polymer Engineering Center (NJIT, Stevens)

Research Partnerships Centered at Other Institutions

- Center for Airborne Organics (MIT, NJIT, Cal. Tech.)
- Center for Applied Genomics (NJIT, UMDNJ)
- Center for Embedded System-On-a-Chip Design (Princeton, Rutgers, NJIT)
- Center for Ultra-fast Laser Applications (Princeton, Rutgers, NJIT, UMDNJ)
- New Jersey Center for Biomaterials and Medical Devices (Rutgers, UMDNJ, Princeton, NJIT)
- Collaborative Telemedicine Environments (Rutgers, NJIT, UMDNJ)
- New Jersey Center for Optoelectronics (Princeton, NJIT)
- New Jersey Center for Pervasive Computing (Princeton, NJIT, Rutgers)
- Particle Processing Research Center (Rutgers, NJIT)
- Phytoremediation of Dredge Spoils Using Living Plants/Associated Microorganisms (Rutgers, NJIT)
- Software Engineering for Distributed Computing and Networking (Stevens, Rutgers, NJIT)

NJIT's articulation arrangements

NJIT currently has articulation arrangements with the following 18 institutions:

- Bergen Community College
- Brookdale Community College
- Burlington County College
- Camden County College
- County College of Morris
- Cumberland County College
- Essex County College
- Hudson County Community College
- Mercer County College
- Middlesex County College
- Ocean County College
- Passaic County Community College
- Raritan Valley County College
- Union County College
- Lincoln University of Pennsylvania
- Seton Hall University
- Stockton State College
- William Peterson University

III.B. Number of Collaborative Student Service and Administrative Programs

Collaborative Student Service and Administrative Programs

- Technology and Engineering Center (NJIT, Burlington County College)
- South Jersey Economic Development Network (NJIT, Burlington, Cumberland, Georgian Court, Ocean, Salem, UMDNJ)
- Council for Higher Education in Newark (NJIT, Rutgers-Newark, Essex, UMDNJ)
- University Heights Science Park (NJIT, Rutgers-Newark, UMDNJ)
- Cross registration of courses (NJIT, Rutgers-Newark, Essex, UMDNJ)
- Joint student cultural events (NJIT, Rutgers-Newark)
- Joint shuttle bus service (NJIT, Rutgers-Newark)
- Joint library privileges and interlibrary loan arrangements (NJIT, Rutgers-Newark)
- Coordination of security and public safety programs (NJIT, Rutgers-Newark)
- Federated Department of History (NJIT, Rutgers-Newark)
- Federated Department of Physics (NJIT, Rutgers-Newark)
- Southern CIM Consortium (NJIT, Camden + 5 additional county colleges)
- Northern/Central Advanced Technology Consortium

- Joint admissions programs (NJIT, Bergen, Burlington, Essex, Hudson, Mercer, Middlesex, Ocean, Union) Cooperative agreement on B.S. in Engineering Science/M.D. or D.M.D. sequence (NJIT, UMDNJ)
- Articulation agreements (NJIT, 18 county colleges)
- Sharing of facilities: extension sites (NJIT, Bergen, Drew, Mercer, Paterson, Ramapo, Raritan)
- Energy Conservation Committee (NJIT, Rutgers-Newark)
- Joint street cleaning program (NJIT, Rutgers-Newark)
- Consortium for Pre-College Education in Newark (NJIT, Rutgers-Newark, UMDNJ)
- Communiversity
- New Jersey Higher Education Network

III.C. The Process for Assessing Outcomes for Graduates

NJIT assesses outcomes for graduates through a program that includes multiple measures and surveys. Most programs of the college include exit examinations and projects completed in capstone courses. In addition, all graduates have the opportunity to participate in the survey program conducted by the Office of Institutional Research and Planning. In order to help in assessing outcomes for graduates, the program surveys graduating students, alumni, and employers of NJIT graduates. General results from the surveys include the Graduating Student Survey and Employer Survey.

II.C.1. Graduating Student Survey

All students who graduated in the academic year 2001-2002 were mailed survey forms in April 2002. The instrument includes 80 items on an op-scan format. There are scaled items relating to achievement of Goals, self-assessment of acquired skills and knowledge, and 23 items evaluating academic programs and student services. Graduates are also asked to describe current employment and educational plans and expectations. The final 13 items provide demographic information about respondents.

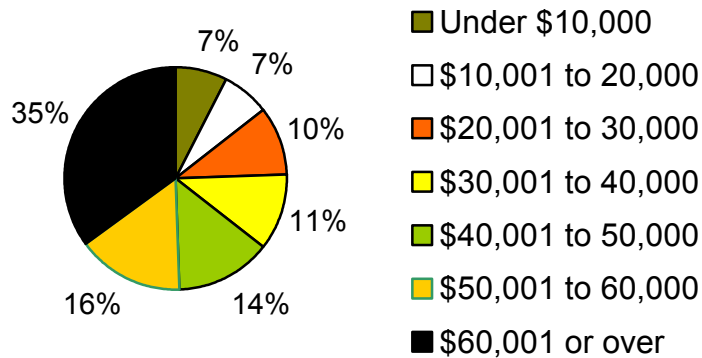
Most graduates report that they have successfully reached Goals relating to meeting degree requirements, preparing for graduate educational programs, and improving professional status and job-related skills.

Graduates were also asked about their employment and educational status at the time of graduation. At graduation, 50 percent of graduates were employed full-time, and 11 percent were employed part-time. Thirty two percent were seeking employment. The figure below shows results on employment status for graduates overall. The table below shows employment status by school.

Employment Status of Graduates at Graduation



Salary Level of Working Graduates



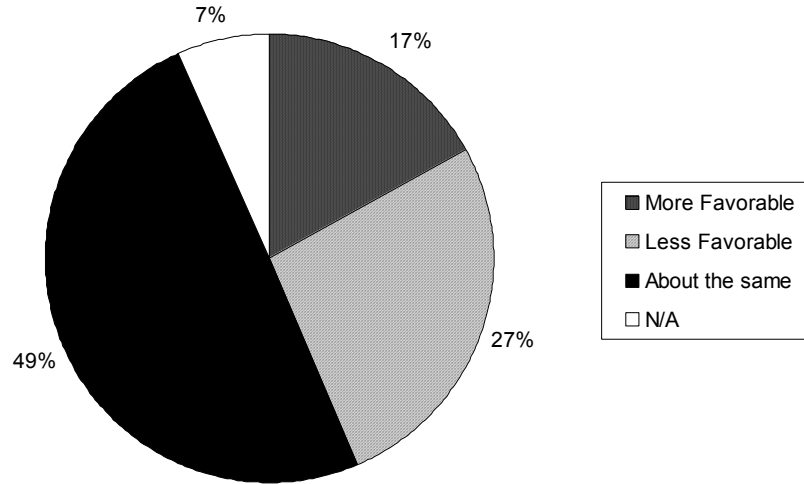
II.C.2. Employer Survey

The Spring 2003 Employer Survey examined the regional business outlook for the next three years with an emphasis on the future job market especially information technology positions. The survey was mailed to 3,617 employers and recruiters of NJIT students and graduates. Based on a pool of 3,510 deliverable addresses and the sample of 177, the return rate was 5%. The instrument consisted of 24 questions, including several multi-item scale, categorical and open-ended items. The content of questions included business demographics, questions on the current and regional business environment, job market, employer recruitment practices, and desired

employee traits. Respondents were asked to rate the performance of NJIT students and graduates on the job.

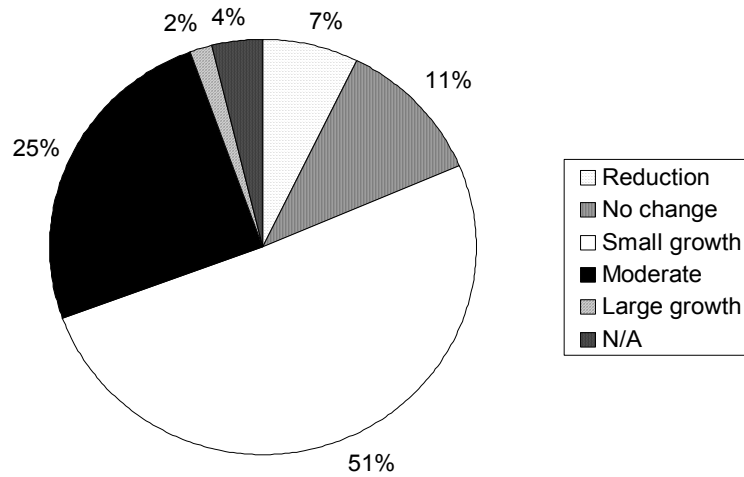
The majority of the employers (49%) viewed the business climate to be about the same in the next 1 to 3 years.

Expected Change in Business Climate Over Next 1-3 Years



The fifty-one percent of the employers anticipated small growth in their workforce in the next three years.

Anticipated Growth in the Workforce in Next 3 years



The majority, between 43% to 53%, saw no change in the information technology job market for all positions. Sixty percent of the employers view the current availability of qualified applicants as good or very good. The quality of applicants have substantially increased compared to the 1999 Employer survey.

Employer generally rated NJIT students and graduates positively. NJIT students and graduates overall were ranked from good to very good on 13 of 17 competencies. The six highest-rated competencies of NJIT students and graduates are computer skills, professional and ethical responsibility, math, sciences, discipline-specific skills and current technology. Of these, three are in the employers' most highly valued competencies include professional and ethical responsibility, computer skills, and discipline-specific skills.

*Employer Ratings of Employee
Competencies Compared with Employer Assessment of
NJIT Student and Graduate Performance On-the-Job
(Low=bottom 1/3, high=top 1/3 of 17 items)*

		<i>Relative Importance</i>	
		<i>LOW</i>	<i>HIGH</i>
<i>Re</i> Relative Performance	LOW	Professional practice on a global scale Management skills Business principles	Written communication
	HIGH	-----	Professional and ethical responsibility Computer skills Discipline-specific skills

II.C.3. Tracking by Office of Career Development, Faculty & Others

In addition to the survey program, numerous other mechanisms are in place that help to provide NJIT with feedback and information about graduates. The Office of Career Development conducts a survey of graduates at the time of graduation, and this survey occurs approximately 1 month after the graduating student survey. At the time of graduation, the number of students reporting that they are employed increased several percentage points across all levels. Many alumni of NJIT continue to participate in the life of the NJIT community through membership in the alumni association, advisory boards established for academic programs, and through other events. Such participation generally includes the opportunity to advise NJIT on the graduate's experiences, achievements, and recommendations regarding programs.

III.D. Degree

III.D.1. Bachelor's Degrees Awarded 2003

CIP Code	Institutional Program Title	Total
30102	Environmental Sciences	3
40201	Architecture / Architectural Studies	78
110101	Computer Science / Computer & Information Science	180
110401	Information Systems / Human Computer Interaction	46
119999	Information Technology	35
140501	Biomedical Engineering	10
140701	Chemical Engineering	20
140801	Civil Engineering	42
140901	Computer Engineering	120
141001	Electrical Engineering / Telecommunications	60
141301	Engineering Science	10
141701	Industrial Engineering / Manufacturing Systems Engineering	13
141901	Mechanical Engineering	51
159999	Engineering Technology	105
231101	Professional & Technical Communication	2
260101	Biology	7
270301	Applied Mathematics / Mathematical Sciences	6
270501	Applied Statistics	2
301501	Science/Technology & Society	4
400501	Chemistry / Applied Chemistry	5
400899	Applied Physics	4
450801	History	5
511608	Nursing	9
520201	Management Of Technology	77
	Total	894

III.D.2. Master's Degrees Awarded 2003

CIP Code	Institutional Program Title	Total
30102	Environmental Sciences	10
40201	Architecture / Architectural Studies	17
40301	Infrastructure Planning	8
110101	Computer Science / Computer & Information Science	267
110401	Information Systems / Human Computer Interaction	90
140501	Biomedical Engineering	16
140701	Chemical Engineering	13
140801	Civil Engineering	29
140804	Transportation	5
140901	Computer Engineering	47
141001	Electrical Engineering / Telecommunications	101
141401	Environmental Engineering	8
141701	Industrial Engineering / Manufacturing Systems Engineering	20
141801	Materials Science & Engineering	12
141901	Mechanical Engineering	40
143001	Engineering Management	57
149999	Internet Eng. / Occupational Safety & Health Eng. / Pharmaceutical Eng.	8
150701	Occupational Safety And Industrial Hygiene	9
231101	Professional & Technical Communication	12
260699	Computational Biology	9
270301	Applied Mathematics / Mathematical Sciences	1
270501	Applied Statistics	4
400501	Chemistry / Applied Chemistry	2
440501	Environmental Policy Studies	2
450801	History	1
520201	Management Of Technology	75
520299	Management	61
	Total	924

III.D.3. Doctoral Degrees Awarded 2003

CIP Code	Institutional Program Title	Total
30102	Environmental Sciences	6
110101	Computer Science / Computer & Information Science	4
140701	Chemical Engineering	3
140801	Civil Engineering	2
140804	Transportation	2
141001	Electrical Engineering / Telecommunications	11
141401	Environmental Engineering	1
141801	Materials Science & Engineering	1
141901	Mechanical Engineering	4
270101	Mathematical Sciences	3
400501	Chemistry / Applied Chemistry	1
400899	Applied Physics	4
	Total	42