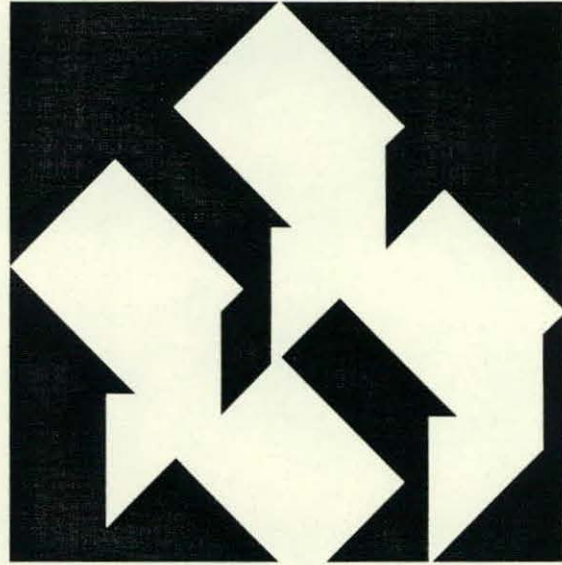


*Handwritten:*  
College  
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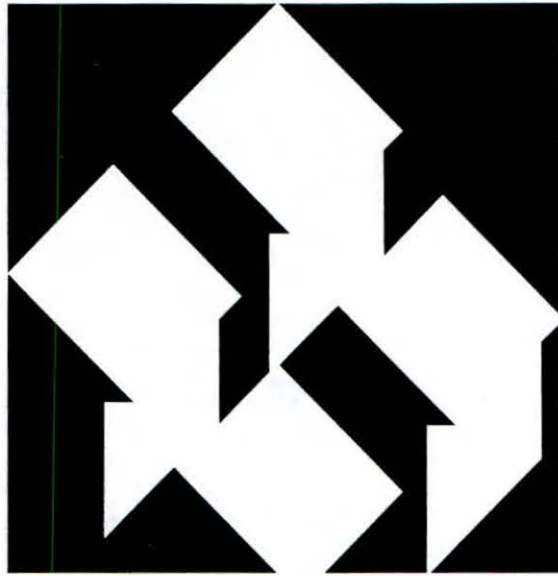


MINORITY  
INSTITUTION  
RESEARCH  
PROTOTYPE

IN APPLIED COMPUTATIONAL RESEARCH



Florida International University

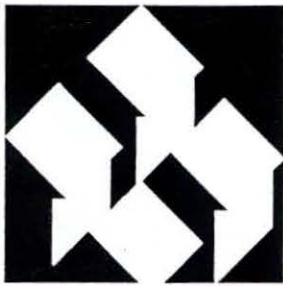


MINORITY  
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Florida International University



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RESEARCH  
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## EXECUTIVE SUMMARY

*As a majority-minority doctoral-granting university in a major urban area, Florida International University (FIU) can uniquely become a role model for creating an effective and efficient science, engineering and mathematics (SEM) student pipeline that goes from the pre-college level through the undergraduate and master's levels to the doctoral level. As a prototype minority-serving research institution, FIU will also become a destination point for students who wish to obtain a graduate SEM degree after having obtained their baccalaureate SEM degrees at other HBCU/MIs.*

*A federal investment at this critical point in its development would furnish FIU with the resources to provide quality SEM doctoral programs and activities conducive to motivating minority students to pursue SEM doctoral degrees. It would give FIU the opportunity to make an enormous and lasting impact in minority SEM higher education and research – thereby addressing the underrepresentation of minorities in science, engineering, computing and academic professions. In close cooperation with the federal government, this prototype would enhance the capacity of the federal government to address issues of national concern and would constitute an effective strategy to reduce the shortage of minority Ph.D.s in these disciplines.*

**I**n order for the United States to remain economically and technologically competitive in a world of increasing change and complexity, it must remain a leader in the interrelated fields of science, engineering and mathematics (SEM). The administration and U.S. governors have designated improving science and mathematics education as one of the top priorities of education reform, with the ultimate goal of making U.S. students first in the world in these critical areas by the year 2000.

Historically, most of the professionals in these fields have been drawn from the white male population. With the rapidly changing demographics of the American population and work force, the nation is posed with a serious problem: the underrepresentation of minorities in these essential fields. At present, African Americans and Hispanic Americans comprise 10.2 percent and 7.3 percent, respectively, of the U. S. labor force, but represent only 2.6 percent and 1.8 percent, respectively, of all scientists and engineers. The representation of minority postdoctoral scientists and engineers is even more discouraging.

Statistics that describe the population of the United States in the year 2000 reflect the growing seriousness of the problem. Minorities are projected to grow seven times faster than whites and will comprise one-third of the entire work force. Ninety-two percent of new entrants into the labor force will be women and minorities. Unless the nation significantly increases the numbers of university-educated minorities in science, engineering and mathematics, it risks decline in technology, industry and the overall economy.

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Florida International University (FIU), one of the nation's three comprehensive doctoral-granting universities with more than 50 percent minority student enrollment, is uniquely poised to address this critical shortage. The University is making a significant contribution in the undergraduate education of minorities; it is ranked sixth of all U.S. higher education institutions for conferring baccalaureate degrees on minorities. In engineering, FIU is ranked first in baccalaureate degrees awarded to Hispanics and 35th in degrees to African Americans, and fifth in degrees to all minorities. A wide range of outreach and support programs administered by the University have significantly contributed to FIU's success in educating minority students. Unlike most majority-minority institutions, FIU is still rapidly growing. Enrollment is projected to reach 33,500 by the year 2001, and full-time enrollment in the computation-intensive SEM disciplines is expected to grow from 1,984 to 2,887, a 45 percent increase. (Minority SEM enrollment is listed in Appendix 1)

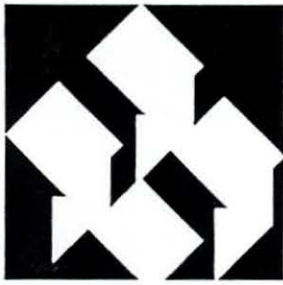
Resource limitations are blocking the University's ability to capitalize on its unique position and to provide mainstream opportunities to minority students in doctoral studies and research. The most critical limitations are the University's lack of the latest computer equipment and infrastructure and

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serious space shortages. Additional equipment and laboratory/classroom space, would enable FIU to extend its pipeline of minority students to the doctoral level and realize its potential to enroll substantial numbers of minorities in a unique doctoral-granting academic track.

FIU is requesting a federal investment of \$11.45 million in infrastructure and equipment to establish a Minority Institution Research Prototype. Funds would be utilized to acquire the state of the art computing and communications equipment needed for students to plug into the international data superhighway and receive first-rate mainstream learning and research experiences. This modest investment would support the minority pipeline of doctoral students, enable the University to attract minority scholars educated elsewhere and ultimately expand the national pool of minority scholars and practitioners, a critical national objective.

The twin federal goals in postsecondary education are promotion of equal access and enhancement of quality. As a majority-minority doctoral granting university in a major urban community, FIU is a natural pipeline for minorities from high school through the doctoral level. A federal investment at this critical point in the University's development would make a major contribution to educate the University's current and future minority student population and would help alleviate the scarcity of university-educated minorities in science, engineering, computing and academic professions.



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## THE INSTITUTION

Florida International University, a member of the State University System of Florida, is a comprehensive, urban, research-oriented, multi-campus institution that offers more than 200 baccalaureate, master's, and doctoral degree programs, conducts basic and applied research, and provides public service.

Founded in 1965, FIU opened for classes in 1972 with approximately 6,000 students — the largest opening day enrollment in U.S. collegiate history. Today it has 24,000 students, 950 full-time faculty, and 51,000 alumni, making it the largest university in Southeast Florida and placing it among the nation's 50 largest colleges and universities.

The University achieved the criteria for Doctoral Granting Type II status in 1990 (over 10 doctorates in three or more fields). Today, the University has 13 doctoral programs, 89 master's programs and 106 bachelor's programs. In 1992-93, the University awarded 4,415 degrees, including 23 doctorates.

Preparing men and women for work in the professions, while building upon a strong foundation in the arts and sciences, is a major goal of FIU. The University gives priority to the further development of the natural and engineering sciences, and mathematics programs. Aided by the University's social science centers and institutes — for example, the Latin American Caribbean Center, the Institute for Public Policy and Citizenship Studies, the Southeast Florida Center on Aging, the Multilingual and Multicultural Studies Center and the Women's Studies Center — FIU is also expanding and developing its social science programs.

FIU's diverse enrollment reflects the multicultural composition of Greater Miami and its commitment to serving the community's minority population. FIU is one of the nation's largest doctoral-granting majority-minority universities.

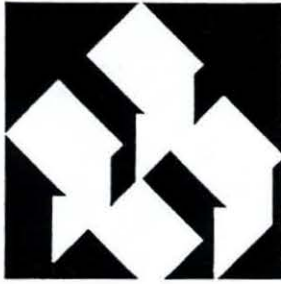
*FIU is one of the nation's largest doctoral-granting majority-minority universities... The University has the second largest contingent of African-American students in the state and the largest contingent of Hispanic students of any doctoral-granting university in the country.*

Approximately 60 percent of enrollment is drawn from minorities, including 46 percent Hispanic, 11 percent African-American and 3 percent Asian. The University has the second largest contingent of African-American students in the state and the largest contingent of Hispanic students of any doctoral-granting university in the country. Fifty-two percent of FIU's faculty are females and minorities. The University has been designated a Title III institution by the U.S. Department of Education, and is a member of the Historically Black Colleges and Universities/Minority Institutions Environmental Technology Consortium and the National Science Foundation's Gateway Coalition.

For the past six years FIU has been recognized as one of the nation's finest comprehensive universities in U.S. News & World Report's annual survey of "America's Best Colleges." It has been cited in several of the country's leading college guides, including Barron's "Guide to the Most Prestigious Colleges," ARCO's "The 300 Most Selective Colleges," and "The Best Buys in College Education," by Edward T. Fiske, former education editor of The New York Times. In 1992, FIU was invited to join the National Association of State Universities and Land-Grant Colleges (NASULGC), the nation's oldest public higher education association.

FIU has two campuses — University Park in Southwest Dade County and the North Miami Campus on Biscayne Bay — and two academic centers that serve Broward County.

The University's location in a growing cosmopolitan area enables it to provide educational services in the context of an urban environment, rich in its diversity of people, languages and cultures. Greater Miami, a major center of commerce, communication and technology transfer, offers faculty and students the opportunity to study ways to promote greater international understanding. The growth and diversity of the metropolitan area require FIU to respond to the emerging needs in international business, high technology industry, health and social services, communications, and of our community colleges and public schools. The University maintains a close association with the public schools to meet the educational needs of their administrators, teachers and students. At the present time, half of Florida's graduating high school students live within fifty miles of Florida International University.



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*If substantial numbers of the nation's future minority scientists and engineers are to take their place alongside the nation's and world's scientific leaders, they must have the full benefit of mainstream graduate educational and research experiences.*

## PROJECT DESCRIPTION

### **Educating the next generation of scientists, engineers and mathematicians**

One of the most serious responsibilities facing America's major universities today is to help alleviate the underrepresentation of minorities in the fields of science, engineering and mathematics (SEM). At present, African Americans and Hispanic Americans comprise 10.2 percent and 7.3 percent, respectively, of the U. S. labor force, but represent only 2.6 percent and 1.8 percent, respectively, of all scientists and engineers. Since the traditional pool of the nation's scientists and engineers as a percentage of the population is declining, the underrepresentation of minority postdoctoral scientists and engineers is a national threat.

Early in the next decade, one third of the labor force will be non-white. Unless vigorous steps are taken, and more underrepresented minorities become scientists, engineers and mathematicians, there will be a major shortfall. This waste of our human capital cannot be tolerated if our nation is to remain competitive in the global economy and serve as the world's beacon for freedom and democracy. The Quality Education for Minorities Network emphasizes this critical problem in its call to:

- Quadruple the number of minority students receiving baccalaureate degrees in the physical and life sciences and engineering, from about 17,000 in 1987 to 68,000 in 2000.
- Triple the number of minorities receiving science and engineering doctorates from 389 students to at least 1,200 in 2000.

If substantial numbers of the nation's future minority scientists and engineers are to take their place alongside the nation's and world's scientific leaders, they must have the full benefit of mainstream graduate educational and research experiences. Florida International University, one of the nation's three largest majority-minority doctoral-granting universities, is an institution that can be instrumental in achieving these national goals.



## Extending the SEM pipeline with a Minority Institution Research Prototype

Florida International University is currently making a substantial contribution to the goal of increasing the number of minorities who earn Science, Computer Science, Engineering and Mathematics baccalaureate degrees.

According to a survey conducted by *Black Issues in Higher Education*, FIU is ranked sixth of all institutions in the 50 states and the District of Columbia for conferring baccalaureate degrees on minorities, and the American Association of Engineering Societies reports that FIU is fifth in the nation for total engineering baccalaureate degrees awarded to minorities. For baccalaureate degrees conferred in Engineering, Computer Science and Math, FIU ranked first in degrees issued to Hispanics, and, although not a historically black university, FIU ranked 47th in such degrees conferred to African Americans. In engineering, FIU was again ranked in first place in baccalaureate degrees awarded to Hispanics and 35th for degrees awarded to African Americans. For master's degrees awarded in engineering, computer science and math, FIU ranked 13th for degrees awarded to Hispanics.

*This modest investment in a Minority Institution Research Prototype could provide the critical boost to ensure that the substantial numbers of minorities at FIU receive the full range of doctoral and research experiences provided at mainstream American research universities.*

Although it has made significant contributions in the undergraduate education of minorities in Science, Engineering, Math and Computer Science, FIU is limited in its resources to expand opportunities for minority students at the doctoral level and in post-graduate research programs. The primary limitations are the lack of funds for equipment, infrastructure, and laboratory/classroom space at this rapidly growing university. (A recent space needs analysis revealed that the University had only two-thirds of the research laboratory space it ought to have to accommodate its FTE level.)

Federal funds are requested to provide equipment and infrastructure support for a minority SEM research center. Funds would be utilized to acquire the state of the art computing and communications equipment needed for students to plug into the international data superhighway and receive first-rate mainstream learning and research experiences. This modest investment in a Minority Institution Research Prototype could provide the critical boost to ensure that the substantial numbers of minorities at

FIU receive the full range of doctoral and research experiences provided at mainstream American research universities.

Thanks to its institutional commitment and specialized minority student programs, FIU has developed a substantial pipeline of minority students attending the University and receiving baccalaureate degrees from SEM programs. The modest additional federal support requested would enable FIU to advance its programs to the next level, thereby extending this pipeline to the doctoral/research level and affording students mainstream research opportunities.

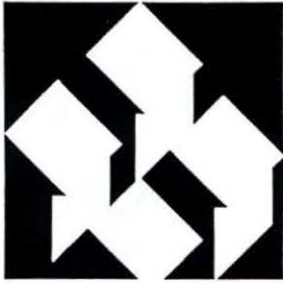
Establishment of a minority institution research center prototype would provide the resources to help nurture a culture of motivating minority students to attend graduate school and support a minority pipeline of doctoral students. It would also provide first-rate research opportunities to attract minority scholars educated elsewhere.

In addition to physical needs, there is a persistent shortage of funding for scholarships, assistantships, grants, loans and employment for students. The limited resources available are not sufficient to support a greater number of minority SEM students. With increased student assistance, coupled with an enhancement of the current facilities and equipment, a high level of success in doctoral student recruitment, retention and graduation will occur.

FIU is one of the universities officially designated by the federal government as a Minority Institution (MI) and belongs to a variety of consortiums of HBCU/MI's established to further minority participation in postsecondary education. The University has also been designated a Higher Education Act (HEA) Title III developing institution by the U.S. Department of Education.

As a majority-minority doctoral-granting university in a major urban area, FIU can uniquely become a role model for creating an effective and efficient SEM student pipeline that goes from the pre-college levels through the undergraduate and master's level to the doctoral level. As a prototype minority research institution, FIU will also become a destination point for students who wish to obtain a graduate SEM degree after having obtained their baccalaureate SEM degrees at other institutions.

A federal investment at this critical point of its development would furnish FIU with the tools to provide quality SEM doctoral programs and activities conducive to motivating minority students to pursue SEM doctoral degrees. It would give FIU the opportunity to make an enormous and lasting impact in minority SEM higher education and research and would prepare students for the 21st century market — thereby addressing the underrepresentation of minorities in science, engineering, computing and academic professions.



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*Funds would be  
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## CENTER DESCRIPTION

FIU is requesting a federal investment of \$11.45 million in infrastructure and equipment to establish a Minority Institution Research Prototype. Funds would be utilized to acquire the state of the art computing and communications equipment needed for students to plug into the international data superhighway and receive first-rate mainstream learning and research experiences.

The proposed Minority Institution Research Prototype will take advantage of the new 59,000-square-foot engineering building Florida International University is currently planning. This showcase facility, to be utilized by students and faculty from a variety of SEM disciplines, will house interactive educational technology as well as state-of-the-art research laboratories.

Twelve interactive classrooms/teaching laboratories, accommodating up to 350 students, will integrate multimedia educational technologies with the latest in distance-learning delivery systems. Automated video cameras, projection systems, and interactive student stations will be under the control of the classroom instructor. This synergistic technology will create the kind of interactive learning environment that will become standard in the 21st century. Three million, forty thousand dollars (\$3,040,000) is the estimated cost of these sophisticated classrooms/teaching laboratories.

An important part of the instructional technology will be the highly integrated Instructional Information Service (IIS, pronounced "eyes") residing on twelve multi-media database servers. Faculty members will store lectures, course work, and references on-line for retrieval both in and out of class. In addition to the usual text and graphics files, these information servers will also hold real-time video and sound data. They will form a distributed computing environment that will be actively used for electronic mail, Internet access,

and inter-departmental collaboration. Estimated cost of the IIS system is one million, two hundred thousand dollars (\$1,200,000).

To develop lectures and course work, faculty members will require desktop studio PCs or workstations, at a cost of one million, five hundred thousand dollars (\$1,500,000) for 100 workstations. Instructors will create course materials by using multi-media authoring systems, which will be linked to the IIS.

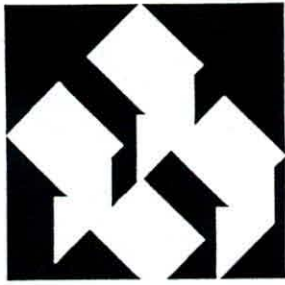
Fiber-optics cables will comprise the communications backbone for the entire building, thus delivering high-bandwidth Asynchronous Transfer Mode (ATM) networking technology to each desktop. Connectivity to the Internet and direct connection to distance-learning sites will be implemented with high-speed wide-area networking technology — including a satellite up-link. Two million, seven hundred and fifty thousand dollars (\$2,750,000) is the estimated cost of this high technology networking infrastructure.

The research laboratories, at a cost of two million, nine hundred sixty thousand dollars (\$2,960,000), will be a center for research in the computation-intensive academic disciplines. The laboratories will include computing systems ranging from personal computers to workstations, at a cost of eight thousand dollars (\$8,000) for each of 150 workstations; to four high-performance parallel computers, at cost of one hundred thousand dollars (\$100,000) per station. Faculty members and students will use a variety of electronics and robotics devices, estimated to cost one million dollars (\$1,000,000) for research experimentation in engineering and the sciences.

This modest federal investment would support the minority pipeline of doctoral students, help the University attract minority scholars educated elsewhere and ultimately expand the national pool of minority scholars and practitioners, a critical national objective.

## PROPOSED BUDGET

Description	Unit Cost	Quantity	Totals
<b>12 Classroom/Teaching Labs</b>			
Aprox. 30 Students per class	\$8,000	350	\$2,800,000
Network Servers Support	\$15,000	16	\$240,000
			<u>\$3,040,000</u>
<b>Instructional Information Service</b>			
High-Throughput IO/Multi-Processor Info Servers (Video, Sound, Data) Distributed Computing Environment	\$100,000	12	\$1,200,000
			<u>\$1,200,000</u>
<b>Faculty Courseware Development</b>			
Desktop Studio PC/Workstation	\$15,000	100	\$1,500,000
			<u>\$1,500,000</u>
<b>Networking Infrastructure</b>			
ATM/per port	\$3,000	750	\$2,250,000
Switch/fiber/components/management			\$500,000
			<u>\$2,750,000</u>
<b>Laboratory Equipment</b>			
Research Servers	\$30,000	12	\$360,000
Research PC/Workstations	\$8,000	150	\$1,200,000
Computational Servers	\$100,000	4	\$400,000
Electronics			\$500,000
Robotics			\$500,000
			<u>\$2,960,000</u>
<b>Total</b>			<u><b>\$11,450,000</b></u>



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## STATEMENT OF INSTITUTIONAL GOALS

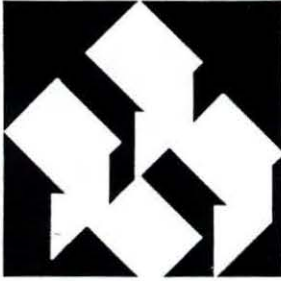
Florida International University has committed itself to becoming a leading teaching and research university by the year 2000/01. Today, FIU has nearly 24,000 students, 951 full-time faculty, and 51,000 alumni. Based on projected enrollment growth, by the Fall semester of the year 2000, FIU will reach an enrollment of over 33,500 with approximately 1,270 full-time faculty. Baccalaureate degrees awarded should increase each year from the 1991/92 level of 3,340 to 6,000. Master's degrees should increase during this time period from 711 to 1,250, and doctoral degrees from 24 to more than 75 annually. It is anticipated that by the year 2000, FIU would have added 17 Ph.D., 17 master's and five baccalaureate degree programs. Contracts and grants will increase from the current annual funding of over \$15 million to approximately \$45 million. The FIU library should gain close to 500,000 new volumes to a total of 1.5 million volumes.

The institution believes that the increasing demand for higher education in the South Florida area will be spearheaded by a particular emphasis on the sciences, engineering and mathematics (SEM). In fact, FIU has made it a policy to provide these academic areas with a "lion's share" of the limited resources available to the entire institution. There are three buildings on campus entirely dedicated to Engineering/Computer Science (ECS Building), Chemistry/Physics (CP Building) and Biological Sciences (OE Building). In addition, pending legislative approval, the state will commit funds for the University to begin planning a new 59,000-square-foot engineering building. Few other academic programs have received such dedicated allotments of facilities from the institution.

At the college and department levels, the commitment to quality SEM education is seen even more clearly. Faculty from the SEM areas engage in sponsored research and also perform their roles effectively as classroom instructors by

incorporating newly acquired knowledge from their laboratories into the classroom. SEM faculty are also active in committing their time and knowledge to increasing minority enrollment in SEM fields. Most of the pre-college, recruitment and retention activities that exist today at FIU were initiated by faculty members who saw a need for greater personal involvement in minority education within their respective academic fields. Such commitment has continued even during these times of harsh budgetary constraints within the State University System when there have been little or no faculty pay increases.





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## ASSESSMENT OF SEM PROGRAMS

### Current Status

Several indicators explain why FIU's SEM programs are receiving considerable favorable attention. One such indicator is the ranking of institutions based on the award of degrees to minority students. According to a survey conducted by *Black Issues in Higher Education*, FIU is ranked sixth of all the institutions in the 50 states and the District of Columbia for conferring baccalaureate degrees on minorities, and the American Association of Engineering Societies reports that FIU is fifth in the nation for total engineering baccalaureate degrees awarded to minorities. FIU also ranked first in total baccalaureate degrees awarded to Hispanics, and 38th in baccalaureate degrees awarded to African Americans in the category for non-HBCUs. For master's degrees, FIU ranked 20th in total degrees awarded to minorities. Again, FIU was first in master's degrees awarded to Hispanics.

For baccalaureate degrees conferred in Engineering, Computer Science and Math, FIU ranked first in degrees issued to Hispanics, and 47th in degrees issued to African Americans. In engineering, FIU was again ranked in first place in baccalaureate degrees awarded to Hispanics and 35th for degrees awarded to African Americans. For master's degrees awarded in engineering, computer science and math, FIU ranked 13th for degrees awarded to Hispanics. FIU also ranked 23rd in baccalaureate degrees awarded to Hispanics in the life sciences. In the physical sciences, FIU ranked 23rd and 42nd for baccalaureate degrees issued to Hispanics and African Americans, respectively. (Minority SEM enrollment is listed in Appendix 1)

Another indicator of SEM quality and productivity is the professional accreditations of individual SEM programs. All academic programs of FIU are approved by the State Board of Education and by the Florida Board of Regents. FIU is accredited by the Southern Association of Colleges and Schools (SACS). FIU is also a member of the Association of

*The American Association of Engineering Societies reports that FIU is fifth in the nation for total engineering baccalaureate degrees awarded to minorities. For baccalaureate degrees conferred in Engineering, Computer Science and Math, FIU ranked first in degrees issued to Hispanics, and 47th in degrees issued to African Americans.*

Upper Level Colleges and Universities, the American Association of State Colleges and Universities, the Florida Association of Colleges and Universities, the National Association of State Universities and Land-Grant Colleges, the American Association of Community and Junior Colleges, a Charter Member of the Southeast Florida Educational Consortium, and numerous other educational and professional associations.

At the departmental level, several agencies and associations have accredited the various SEM programs. The Accreditation Board for Engineering and Technology (ABET) has accredited the Civil, Electrical, Industrial and Mechanical Engineering baccalaureate programs and is currently providing its initial review for the new Computer Engineering baccalaureate program. The American Chemical Society has accredited the baccalaureate program in Chemistry. The Computing Scientists Accreditation Board has accredited the baccalaureate degree program in Computer Science.

A third SEM quality assessment indicator deals with the fast growing enrollment being experienced by the institution, and by the SEM departments in particular. As previously mentioned, based on FIU's current enrollment growth, total institutional enrollment will reach 33,500 from a current 23,000 by the year 2000. Since the mid 1980's, most of the SEM departments have experienced rapid growth in enrollment with the exception of the 1992/93 year, due to the devastation caused by Hurricane Andrew. Currently, FIU has sixteen (16) baccalaureate, thirteen (13) master's and three (3) doctoral degree programs in SEM fields. (See Appendix 2 for a list of all current SEM programs.)

In addition to these formal academic SEM disciplines, there are several programs, activities, and associations that assist the University faculty and administration in providing a quality SEM education. Most of these programs target minority undergraduate or pre-college SEM students. Several of these programs expose students to advanced concepts and teaching in SEM fields, while others provide students with the financial assistance necessary to pursue a degree in a SEM discipline. The University has more than 40 outreach and support programs to assist African American students financially and academically. (Appendix 3 provides a description of some of these programs.)

Florida International University also has an active and growing research program in SEM fields. FIU's research projects have received funding from a variety of sources including federal, state and private agencies and foundations. With the U.S. Department of Energy, for instance, FIU has had a history of 22 funded contracts since 1978. (See Appendix 4 for a listing of selected SEM research projects funded during the last three years.) Graduate research assistantships are integral components of these programs. In the longer term, the University expects to establish an endowment fund to make research projects a component of the training of all students who aspire to obtain master's and doctoral degrees in SEM fields.

### **Potential for enhancing SEM programs**

Several additional SEM academic programs have been scheduled for possible implementation at FIU by 1998, as outlined in the planning cycle of the Florida Board of Regents (BOR) Master Plan. These programs are:

#### **SEM Baccalaureate Degree Programs:**

- Chemical Engineering
- Geography

#### **SEM Master's Degree Programs:**

- Engineering Management
- Statistics

#### **SEM Doctoral Degree Programs:**

- Geology
- Mechanical Engineering
- Chemistry

For the period after 1998, Industrial Engineering, Physics and Statistics are among the SEM doctoral degree programs proposed for FIU.

With the implementation of new graduate-level SEM programs, FIU will be able to strengthen undergraduate SEM recruitment, retention, and graduation. Graduate programs are a crucial ingredient for developing high quality sponsored research programs within the SEM disciplines. Graduate students employed in sponsored research projects enable faculty to conduct the time-consuming experiments necessary in applied research.

*Greater student  
tuition assistance —  
coupled with  
enhanced facilities  
and equipment to  
offer students access  
to the international  
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and mainstream  
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Without graduate student participation, a fully developed and nationally competitive research program is very difficult to achieve. Those institutions not having the capability of developing a quality research program will be unable to attract the high caliber faculty who would obtain research projects targeting undergraduate SEM student participation. Quality SEM graduate programs definitely enhance undergraduate SEM programs. Graduate students involved in research can provide undergraduates with role models and also assist undergraduate students as their tutors or mentors.

Great potential for enhancing the SEM programs at FIU also exists in the expansion of the University's minority outreach and support activities and associations. (See Appendix 3) By expanding the successful concepts and activities across SEM disciplines, FIU would garner this success for all SEM areas.

The College of Engineering and Design, in collaboration with the Dade County Public School System, established the Florida Action for Minorities in Engineering (FLAME) Program, a magnet engineering high school program. The corresponding "feeder" programs through public middle and elementary schools have also been created. FIU will explore an expansion of this program to the math and science areas so that larger numbers of minority students and teachers can be served.

Several impediments exist to the recruitment, retention and graduation of students in the SEM fields at FIU. In addition to the equipment/infrastructure limitations detailed in this proposal, there is a continuing shortage of funding for scholarships, assistantships, grants, loans and employment for students, especially those who come from a low income population group. The limited resources currently available are not sufficient to support a greater number of minority SEM students. Greater student tuition assistance — coupled with enhanced facilities and equipment to offer students access to the international data superhighway and mainstream learning and research experiences — will significantly increase success in undergraduate student recruitment, retention and graduation.

## APPENDIX I

### Florida International University S.E.M. FTE enrollment and projections

	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
<b>Undergraduate</b>								
Electrical & Computer Engineering	162	170	178	187	197	207	217	228
Computer Science	393	413	433	455	478	502	527	553
Decision Sciences	322	338	355	373	392	411	432	454
Industrial Engineering	113	118	124	130	137	144	151	158
Mathematics	558	586	615	646	678	712	748	785
Statistics	261	274	287	302	317	333	349	367
Subtotal	1,809	1,899	1,994	2,094	2,198	2,308	2,424	2,545
<b>Graduate</b>								
Electrical & Computer Engineering	42	46	51	56	61	67	74	82
Computer Science	29	32	35	39	43	47	52	57
Decision Sciences	54	59	65	72	79	87	95	105
Industrial Engineering	17	18	20	22	24	27	29	32
Mathematics	9	9	10	11	12	14	15	17
Statistics	26	28	31	34	38	41	46	50
Subtotal	176	193	213	234	257	283	311	342
<b>Total</b>								
Electrical & Computer Engineering	204	216	229	243	258	274	291	309
Computer Science	422	445	469	494	521	549	578	610
Decision Sciences	376	398	420	445	471	498	527	558
Industrial Engineering	129	136	144	152	161	170	180	191
Mathematics	567	595	626	657	691	726	763	802
Statistics	286	302	318	336	354	374	395	417
Subtotal	1,984	2,092	2,206	2,327	2,455	2,591	2,735	2,887

# FLORIDA INTERNATIONAL UNIVERSITY

## FALL 1993 ENROLLMENT FOR THE SCHOOL OF ENGINEERING

BY ACADEMIC PROGRAM, ETHNICITY AND GENDER

UNDERGRADUATES	CIVIL	COMPUTER	ELECTRICAL	INDUSTRIAL	MECHANICAL	TOTALS
<b>AFRICAN AMERICAN</b>						
MALE	33	10	49	8	27	127
FEMALE	5	2	3	3	5	18
TOTAL	38	12	52	11	32	145
<b>HISPANIC</b>						
MALE	147	56	227	63	100	593
FEMALE	33	16	31	34	11	125
TOTAL	180	72	258	97	111	718
<b>INDIAN/ALASKAN</b>						
MALE	0	0	0	0	0	0
FEMALE	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0
<b>ASIAN/PACIFIC ISL.</b>						
MALE	5	8	27	4	17	61
FEMALE	1	1	3	1	0	6
TOTAL	6	9	30	5	17	67
<b>WHITE</b>						
MALE	63	21	41	18	40	183
FEMALE	14	1	10	4	8	37
TOTAL	77	22	51	22	48	220
<b>NONRESIDENT</b>						
MALE	18	9	40	23	22	112
FEMALE	4	4	4	13	0	25
TOTAL	22	13	44	36	22	137
<b>TOTALS</b>						
MALE	266	104	384	116	206	1076
FEMALE	57	24	51	55	24	211
TOTAL	323	128	435	171	230	1287

# FLORIDA INTERNATIONAL UNIVERSITY

## FALL 1993 ENROLLMENT FOR THE SCHOOL OF ENGINEERING

BY ACADEMIC PROGRAM, ETHNICITY AND GENDER

GRADUATES	CIVIL	COMPUTER	ELECTRICAL	ENVIRONMENTAL	INDUSTRIAL	MECHANICAL	EE PH.D.	TOTALS
<b>AFRICAN AMERICAN</b>								
MALE	2	0	2	0	1	5	1	11
FEMALE	0	0	0	0	0	1	0	1
TOTAL	2	0	2	0	1	6	1	12
<b>HISPANIC</b>								
MALE	4	8	15	5	8	15	6	61
FEMALE	2	1	3	3	5	0	2	16
TOTAL	6	9	18	8	13	15	8	77
<b>INDIAN/ALASKAN</b>								
MALE	0	0	1	0	0	0	1	2
FEMALE	0	0	0	0	0	0	0	0
TOTAL	0	0	1	0	0	0	1	2
<b>ASIAN/PACIFIC ISL.</b>								
MALE	1	3	4	0	3	4	2	17
FEMALE	0	0	0	2	0	0	0	2
TOTAL	1	3	4	2	3	4	2	19
<b>WHITE</b>								
MALE	1	4	10	9	2	5	2	33
FEMALE	1	1	1	3	0	0	0	6
TOTAL	2	5	11	12	2	5	2	39
<b>NONRESIDENT</b>								
MALE	7	6	15	10	6	10	7	61
FEMALE	0	2	1	3	2	4	0	12
TOTAL	7	8	16	13	8	14	7	73
<b>TOTALS</b>								
MALE	15	21	47	24	20	39	19	185
FEMALE	3	4	5	11	7	5	2	37
TOTAL	18	25	52	35	27	44	21	222

**Florida International University  
Minority Enrollment in the Sciences  
Fall, 1993**

	No. of Students			Black			Hispanic			Black & Hisp as a % of Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Biology BS	336	515	851	35	79	114	203	268	471	68.7
Biology MS	11	25	36	0	3	3	1	6	7	27.8
Biology PhD	19	10	29	0	0	0	3	2	5	17.2
Chemistry BS	21	27	48	4	0	4	10	15	25	60.4
Chemistry BA	67	63	130	6	9	15	31	36	67	63.1
Chemistry MS	10	11	21	1	1	2	3	4	7	42.9
Eviron. St. BA,BS	62	79	141	0	1	1	26	31	57	41.1
Computer Sci. BS	321	119	440	48	21	69	140	68	208	63.0
Computer Sci. MS	35	4	39	1	0	1	8	2	10	28.2
Computer Sci. Ph	15	2	17	0	0	0	0	0	0	0.0
Geology BS	3	4	7	0	0	0	1	1	2	28.6
Geology BA	6	3	9	0	1	1	2	1	3	44.4
Geology MS	10	8	18	1	1	2	0	0	0	11.1
Math Sci. BS	5	11	16	1	3	4	4	5	9	81.3
Math BS	30	33	63	6	5	11	12	20	32	68.3
Math Sci. MS	2	2	4	1	1	2	1	0	1	75.0
Physics BS	17	4	21	0	0	0	12	0	12	57.1
Physics MS	13	4	17	0	1	1	5	1	6	41.2
<b>TOTAL</b>	<b>983</b>	<b>924</b>	<b>1907</b>	<b>104</b>	<b>126</b>	<b>230</b>	<b>462</b>	<b>460</b>	<b>922</b>	<b>60.4</b>

Note: Numbers represent all lower, upper and graduate majors.  
AS LMG MINORITY 12/93



## Current SEM Programs offered at Florida International University

SEM Program	Baccalaureate Degree	Master's Degree	Doctoral Degree
BIOLOGY	CURRENTLY OFFERED	CURRENTLY OFFERED	CURRENTLY OFFERED
CHEMISTRY	CURRENTLY OFFERED	CURRENTLY OFFERED	<i>In 1993-98 Master Plan</i>
CIVIL ENGINEERING	CURRENTLY OFFERED	CURRENTLY OFFERED	
COMPUTER ENGINEERING	CURRENTLY OFFERED	CURRENTLY OFFERED	
COMPUTER & INFORMATION SCIENCE	CURRENTLY OFFERED	CURRENTLY OFFERED	CURRENTLY OFFERED
ELECTRICAL ENGINEERING	CURRENTLY OFFERED	CURRENTLY OFFERED	CURRENTLY OFFERED
ENVIRONMENTAL ENGINEERING		CURRENTLY OFFERED	
ENVIRONMENTAL STUDIES	CURRENTLY OFFERED	<i>In 1993-98 Master Plan</i>	
ENVIRONMENTAL & URBAN SYSTEMS	CURRENTLY OFFERED	CURRENTLY OFFERED	
GEOLOGY	CURRENTLY OFFERED	CURRENTLY OFFERED	<i>Implementation Fall '94</i>
INDUSTRIAL ENGINEERING		CURRENTLY OFFERED	
INDUSTRIAL & SYSTEMS ENGINEERING	CURRENTLY OFFERED		
INFORMATION SCIENCES & SYSTEMS	CURRENTLY OFFERED		
MATHEMATICS	CURRENTLY OFFERED		
MATH SCIENCES	CURRENTLY OFFERED	CURRENTLY OFFERED	
MECHANICAL ENGINEERING	CURRENTLY OFFERED	CURRENTLY OFFERED	<i>Implementation Fall '94</i>
PHYSICS	CURRENTLY OFFERED	CURRENTLY OFFERED	
STATISTICS	CURRENTLY OFFERED	<i>In 1993-98 Master Plan</i>	

## APPENDIX 3

# FIU SEM MINORITY ACTIVITIES, PROGRAMS AND AFFILIATIONS

- FLAME (Florida Action for Minorities in Engineering)
- PREP (Pre-freshman Enrichment Program)
- AMP (Alliance for Minority Participation)
- QEM (Quality Education for Minorities in math/science/engineering)
- MBRS (Minority Biomedical Research Support)
- MUTEC (Minority Undergraduate Training in Energy-related Careers)
- HBCU/MI (Historically Black Colleges and Universities/Minority Institutions)
- HACU (Hispanic Association of Colleges and Universities)
- NACME (National Action Council for Minorities in Engineering)  
NAMEPA (National Association of Minority Engineering Program Administrators)
- Dade County Community Lab Program
- Project SEED
- Chemathon
- SECME (South Eastern Consortium for Minorities in Engineering)

### **Other Minority Student Outreach and Support Programs**

- SABLE (Student Achievers in the Black Life Experience)
- PIP (Partners In Progress)
- AOP (Academic Opportunity Program)
- Golden Drum
- Invitational Scholars Program

### **FLAME (Florida Action for Minorities in Engineering)**

The Florida Action for Minorities in Engineering (FLAME) program is a joint program between the Dade County Public School System and Florida International University (FIU), especially designed for minority high school students. The program starts with a residential summer program at FIU. This "Full Immersion Summer Program" lasts three weeks and is designed for students that will enter the tenth grade.

During the regular academic year, participants enroll in introduction to Engineering and Critical Thinking Skills, in addition to their regular math, science and English high school courses. The following summer, students participate in the "Engineering Summer Institute", which is also a three-week residential program. In their eleventh grade year, students attend FIU every day for two class periods and take Applied Mathematics I and Applied Engineering Principles I in addition to their regular load. During the next summer program, students participate for six weeks in the "Executive Internship Summer Program" in which they are placed at engineering related companies. During their senior year, students take six credits of dual enrollment courses at FIU and also take Applied Mathematics II and Applied Engineering Principles II.

The philosophy of the FLAME Program is to instill in students a desire for academic excellence, to prepare students to complete college, and to encourage them to become solid contributing citizens.

The FLAME Program has several objectives:

- Provide a structured, rigorous, three-year academic program that enables high academic achievement in college-bound students.
- Offer strong components for those students interested in science, mathematics, computers, architecture, engineering and technical careers.
- Develop resourceful, self-motivated, well-rounded graduates who can analyze new situations, make decisions and communicate their ideas effectively.
- Develop individuals who will be responsible, well-adjusted citizens able to compete in a complex society of the future.

### **P.R.E.P. (Pre-freshman Enrichment Program)**

The FIU P.R.E.P. (Pre-freshman Enrichment Program) Summer Program, sponsored by the U.S. Department of Energy and in partnership with the Dade County Public School System and FIU, offers highly motivated, middle school students the opportunity to participate in an science/engineering/math (SEM) enrichment program that emphasizes hands-on laboratory experiences, field trips, and guest speakers. During the program, the students are exposed to the basic concepts of energy, mechanics, environment and materials and engage in a series of lab experiments involving wind tunnels, materials, soil mechanics, electronic instrumentation, environmental engineering and chemistry. Some of the assigned activities promote parental involvement. Teamwork, as well as individual initiative, is emphasized.

### **A.M.P. Scholarship Program (Alliance for Minority Participation)**

The Florida/Georgia Alliance for Minority Participation in Science, Engineering and Mathematics Program will focus on efforts to increase recruitment, retention, graduation, and graduate school placement of minority students who are enrolled in undergraduate Science and Engineering degree programs. This project, by applying a holistic approach to the student's preparation, will emphasize multiple components that will positively impact the student's undergraduate performance and substantially improve their qualifications for graduate school admission. The disciplines from which students are eligible to participate are biology, chemistry, mathematics, physics, and all engineering specialties. Alliance member institutions, which have established Ph.D. programs in these fields will accept Alliance scholars for summer research opportunities, provide sites and faculty to help organize and sponsor pre-sophomore and post-senior summer experiences, and insure the availability of opportunities for graduate study within their own institution for Alliance scholars upon graduation with B.S. degrees.

The overall goals of the Florida-Georgia A.M.P. program are to significantly increase the number of targeted students who obtain undergraduate and graduate degrees in the sciences and engineering by:

- Recruiting greater numbers of students to the SEM disciplines at the freshman level and graduating these students from the disciplines of their choice within 4 years;
- Establishing working relationships with a significant number of graduate institutions for the purpose of facilitating the placement of all S&E B.S. degree graduates from participating A.M.P. institutions;
- Enhancing the graduate school placement opportunities for project graduates through the provision of significant external research experiences;

- Enhancing and strengthening working relationships among students and between students and faculty with the aim of improving the academic performance of students;
- Providing project trainees with summer academic experiences that will review and preview important mathematics and science concepts as part of a plan to reduce high attrition in the freshman year; and
- Bringing together on member campuses significant numbers of highly motivated minority students who, by their organized and serious approach to their work, will serve as positive role models for other students.

### **Q.E.M. in M.S.E. Network (Quality Education for Minorities in Math/Science/Engineering)**

The Q.E.M. in M.S.E. (Quality Education for Minorities in Math/Science/ Engineering) Network is actively involved in forming an educational consortium of five universities and 50 schools that will develop a Mathematics and Science Education Teacher Leadership Corps (TLC) of at least 100 K-12 teachers. Participating teachers from school districts near each of the five universities will be linked to each other by local-area computer networks, and they will also be linked to the teams clustered around the other universities by wide-area computer networks. Participating teachers will receive the broadly-based education and development necessary to serve as credible spokespersons at the national, state, and local levels for the reform of mathematics and science education. Special focus will be placed on ensuring that those involved in reform efforts are aware of, and responsive to, the implications of such efforts for the education of low-income and minority children and youth.

### **M.B.R.S. Program (Minority Biomedical Research Support)**

The Minority Biomedical Research Support Program at Florida International University has been funded by the National Institutes of Health since 1985, as part of a set-aside assistance program for minority educational institutions. This program funds student participation in faculty research in an attempt to stimulate interest in research related careers. Student exposure to the latest in biomedical research allows them to successfully continue with a career in medicine or medical research.

The MBRS program is in its eighth year of funding from the NIMH. This program encompasses biology, chemistry, physics and medical laboratory sciences. As of last year, the program graduated 34 students, all but two of whom entered graduate or medical school. Currently, 22 students are financially supported, all of whom are expected to spend 20 hours per week assisting faculty with research. Each year students present their research at a national meeting and at an FIU-sponsored conference.

### **M.U.T.E.C. (Minority Undergraduate Training in Energy-related Careers)**

M.U.T.E.C. is a national program sponsored by the U.S. Department of Energy. Its primary goals are:

- To attract minority students into FIU's Mechanical Engineering program;
- To set up a research experience for undergraduates in order to influence their decision to continue on towards a graduate engineering degree;
- To enhance the pass rate of students on the EIT (Engineer In Training) Exam.

Incorporated within these goals is the enhancement of energy related areas. These goals have been met by restructuring the Mechanical Engineering program to provide several options to students, including two in energy-related areas; by creation of an engineering fundamentals examination similar to the EIT Exam; and by introduction of a course, "Introduction to Engineering", which will provide guidance as

to what engineers are, what they do, and how they synthesize math and the sciences to achieve their individual goals.

### **H.B.C.U./M.I. Environmental Technology Consortium (Historically Black Colleges and Universities/Minority Institutions)**

The H.B.C.U./M.I. Environmental Technology Consortium is committed to active involvement in national research and development, policy formulation, and minority manpower needs in:

- Hazardous waste technology
- Environmental technology
- Environmental restoration
- Environmental health

And the development of a technical infrastructure that will accomplish the following:

- Increase minority participation in environmental policy making
- Enhance environmental awareness among minorities
- Promote interaction between HBCU/MIs and other universities, industry, and interest groups
- Develop institutional capabilities in environmental education and research
- Involve minority technical businesses in the environmental industry

The HBCU/MI Consortium is committed to increasing the number of minority and disadvantaged students to be trained in the fast-growing career areas of Environmental Technology and Waste Management. Each institution will make environmental science an integral part of the curriculum in science and engineering, and strengthen the research capabilities of the faculty. The near-term objectives consistent with the U.S. Department of Energy (DOE) environmental restoration and waste management plans follow:

- Develop and implement environmental courses within the traditional disciplines in the sciences and engineering.
- Develop and implement minor concentrations of study in the environmental sciences and engineering as a complement to the classical "majors" in the sciences and engineering.
- Guide and promote the development of Environmental Restoration and Waste Management (ER/WM) training of "technologists" at the certificate and associate levels in two-year junior colleges and technical schools, and at the bachelor level in four-year institutions.
- Assist and provide resources to elementary, middle, and high schools and to infuse environmental issues in science courses.

In the long-term, curricula will also be developed for:

- Graduate concentrations in the environmental sciences and engineering within traditional science, engineering, and public policy disciplines.
- Continuing education courses in environmental science and engineering for waste managers, technologists, teachers, etc.

## **H.A.C.U. (Hispanic Association of Colleges and Universities)**

The Hispanic Association of Colleges and Universities is a national organization representing Hispanic-Serving Institutions (HSIs) of higher education — those nonprofit, accredited colleges and universities in the United States where Hispanics constitute a minimum of 25 percent of the total enrollment. HACU is dedicated to bringing together the member institutions with potential resource providers to:

- Promote the development of member colleges and Universities.
- Improve access to and the quality of post secondary educational opportunities for Hispanic students.
- Meet the needs of business, industry, and government through the development and sharing of resources, information, and expertise.

## **M.S.I.P. (Minority Science Improvement Program)**

The Department of Education has awarded a Minority Science Improvement Program grant to Florida International University for the period August 1, 1993 to July 31, 1996.

## **N.A.C.M.E. (National Action Council for Minorities in Engineering)**

N.A.C.M.E. is a nonprofit organization founded to act as a catalyst in the minority engineering education effort. This movement, started more than a decade ago by companies, educators, professional societies and minority organizations, strives to increase the number of underrepresented minorities — African Americans, Hispanics, and American Indians — who earn bachelor's degrees in engineering.

N.A.C.M.E. achieves its goals in a variety of ways. The Incentive Grants Program is the nation's largest privately supported scholarship fund for minorities in engineering. Its Field Services Program supports local and regional organizations with grants and with technical assistance in establishing and strengthening precollege and university programs. And N.A.C.M.E.'s active research and publications program make vital information available to students, parents, educators and corporate supporters.

## **N.A.M.E.P.A. (National Association of Minority Engineering Program Administrators)**

N.A.M.E.P.A. is a national network of educators and representatives from industry, government, and nonprofit organizations who share a common commitment to improving the recruitment and retention of African Americans, Hispanics, and Native Americans earning degrees in engineering. As an authority in minority engineering education, N.A.M.E.P.A. serves as an advocate for those students, promotes the professional development of members, and generally engages in a wide range of activities that respond to the needs of its membership.

## **Dade County Community Lab Program**

Dade County Public Schools operates a Community Laboratory Program in which academically talented high school students earn course credit while assisting university faculty in research. Over the past several years, large numbers of minority students have become involved in research in FIU's science programs due to the early exposure of basic scientific research provided by this program.

Project SEED

Sponsored by the American Chemical Society, this program is designed to encourage disadvantaged high school students to pursue higher education and introduces them to research over one or two summers. Students are paid a stipend and are expected to carry out research in the laboratory of a faculty member and present their research at a national conference. Thus far, 20 students (mostly minority) have participated in this program, most of whom have since pursued careers in science.

## **Chemathon**

FIU's Chemistry Department has sponsored this program, which is designed to acquaint students with the sciences in general and chemistry in particular. Local high school students attend a lecture on the chemistry profession, view a series of "chemistry in action" demonstrations and participate in a "quiz bowl". Students and their teachers also tour the chemistry laboratories at FIU. Over 1000 students have participated in this program over the past 11 years. Faculty, students, high school teachers and advanced high school students conduct a series of hands-on laboratory demonstrations in elementary school classes. In the past three years, this program has reached approximately 40,000 children, about 75 percent of whom were from minority groups.

## **S.A.B.L.E. (Student Achievers in the Black Life Experience)**

The Student Achievers in the Black Life Experience Program is a cooperative venture of Florida International University, the Dade County Public School System, and a variety of community agencies, businesses and organizations. In 1984, the Florida Department of Education's College Reachout Program funded S.A.B.L.E. to provide educational motivation and preparation to African American high school students and to assist parents in completing the college admission and financial aid processes. High school students who participate in the S.A.B.L.E. program participate in a variety of college activities and have the opportunity to participate in other University sponsored minority enrichment programs.

## **P.I.P. (Partners In Progress)**

The Partners In Progress Program is a cooperative effort between Florida International University and the Dade County Public School System. Its objective is to increase the representation of African Americans and other minorities in Florida's public colleges and universities. This is accomplished by providing instruction to tenth graders in math and English, and by providing scholarship opportunities to attend FIU.

In PIP-1, participating tenth graders receive intensive math and English instruction to prepare them for college entrance exams. Workshops on preparing for college are also provided. Only participants of PIP-1 can advance to the PIP-2 segment. In PIP-2, participants receive a scholarship to attend college level classes at FIU during the summer semester. Additionally, PIP-2 participants who are admitted to FIU are awarded four-year tuition scholarships.

## **AOP (Academic Opportunity Program)**

Academic success is the foundation on which the Academic Opportunity Program is based. Since 1988, talented students of African American descent, who have the potential for academic success, have been recruited to remain in South Florida for their higher education.

Program components include full tuition awards to those students who have submitted the Financial Aid Form (FAF), financial aid information and counseling for parents and students, and required attendance at the residential summer and non-residential fall "Orientation for Students of African Descent".

## **Golden Drum**

Golden Drum is the name chosen by the Achievers of Greater Miami to identify a program designed to reward outstanding African American high school seniors in Dade and Broward counties. In addition to recognizing the talents, academic achievements, and community service contributions of students participating in the Golden Drum competition, the program includes full tuition scholarship awards to universities/colleges. Presently, Florida Memorial College, Barry University, Florida International University, St. Thomas University, and the University of Miami are the participating educational institutions.

Golden Drum is one of the community action programs adopted by the Achievers of Greater Miami. The drum was selected because of its historic symbolism as a means of communication.

## **Invitational Scholars Program**

The Invitational Scholars Program, under the auspices of the Office of Undergraduate Studies, provides an opportunity for selected Dade County Public High School students to attend Florida International University as Invitational Scholars. The program provides academic and financial support for students of African, Hispanic and Asian descent who successfully complete FIU's pre-collegiate programs, Partner-In-Progress I and II (PIP I and PIP II), and who are admitted to and attend Florida International University as full-time degree seeking undergraduate students.

The program has an early academic intervention component for monitoring the academic performance of Invitational Scholars and providing specialized academic counseling and support to them. Financial support is provided over a four-year period, as Invitational Scholars receive a \$600 scholarship each fall and spring semester as long as they meet the Invitational Scholars Program's requirements. The scholarship covers the cost of 120 credit hours of undergraduate coursework at FIU and, in some instances, will exceed that limit for Invitational Scholars whose degree programs require additional credit hours.

The Invitational Scholars Program also sponsors activities that attempt to enhance the academic, social, cultural, and intellectual environment of Invitational Scholars. As most of these programs are discipline-based, the focus is to help Invitational Scholars acquire personal and professional skills with particular relevance to their major fields of study.



## APPENDIX 4

# SELECTED SEM RESEARCH PROJECTS AT FLORIDA INTERNATIONAL UNIVERSITY

- Faculty from the Department of Mechanical Engineering are conducting advanced research on the decontamination of radioactive waste using microwave technology. Current research is focusing on contaminated concrete, and the department seeks to expand the project to include contaminated liquid waste. FIU is one of only three institutions in the world conducting such research.
- FIU has a partnership with the Continuous Electron Beam Accelerator Facility, the \$554 million national laboratory in Newport News, Virginia, which enables University faculty and students to use the accelerator to study how the particles that make up the nucleus of the atom are held together. This partnership is an exceptional opportunity for faculty and students to conduct physics research at the most advanced level with federal scientists.
- The Computer Engineering program is conducting research with artificial neural networks (ANN's), which resemble the architecture and algorithmic performance of their biological counterpart. ANN's have been successfully applied to various engineering problems such as electricity consumption forecasting, image compression for HDTV, thin film analysis, MRI image reconstruction, vascular geometry modeling and telecommunication traffic control.
- The School of Computer Science is actively engaged in research in parallel computing, database management, computer architecture and the connection machine. The School laboratory has transputers that can be connected together in different configurations for parallel processing using message passing. The database project involves implementation of a huge transaction-oriented database using the semantic model and massive parallelism.
- The Drinking Water Research Center (DWRC), the only facility of its kind in the state of Florida, conducts scientific research and develops essential technologies which can be used to provide quality drinking water. Utilizing an electron beam accelerator located in a waste treatment plant on Virginia Key in Miami, researchers from the DWRC and the University of Miami are studying the effectiveness of high-energy electron irradiation on the removal of toxic and hazardous organic compounds from water, wastewater and sludge. DWRC researchers are investigating the chemical reactions that lead to the degradation of halogenated organic compounds in groundwater and during water treatment and distribution for drinking purposes. Since several halogenated compounds are known or suspected carcinogens, the fate of these contaminants in drinking water is of grave concern. The Center is also conducting research on the release of mercury from soil in the Everglade and phosphorus cycling in Shark River Slough. Research in the Everglades will help bring understanding about how changes in conditions in the Everglades will affect the water quality in the Biscayne Aquifer, the source of South Florida's water.
- The Department of Biological Sciences conducts extensive research on tropical botany. Current projects include a study in Malaysia on deforestation and the effect of light quality on tropical tree growth and a study in Costa Rica on the natural regeneration of tropical trees. The department has close ties with research institutions including Everglades National Park, Fairchild Tropical Garden, and the United States Department of Agriculture. Its membership in the Organization of Tropical Studies fosters research and teaching in Costa Rica and elsewhere in the tropics.
- The Department of Mechanical Engineering has research funded by the U.S. Army on shape memory alloys, materials that have the ability to retain their shape when subjected to extreme heating or cooling.

- Researchers in the College of Engineering have developed and patented a process that could triple the service life of airplanes by making their metal skins stronger and more fire resistant, thereby also reducing casualties in airplane accidents. The process, called PantherSkin, uses a common inexpensive polymer to coat the inside of the thin metal skins of airplanes.
- The Department of Mechanical Engineering has a project supported by the American Heart Association, National Institutes of Health and the Whittaker Foundation on replicating human biofluid inside the body and optimizing it for catheterization.
- Several departments in the College of Engineering are conducting research on robotics capable of an extremely high degree of accuracy. The Industrial Engineering Department is conducting research on all aspects of manufacturing, including material handling, quality control, CNC machining and CNC plastic injection molding.
- Scientists in the Department of Electrical Engineering have patented the first instrument ever developed that can non-invasively measure levels of electromagnetic current in human tissue.
- The U.S. Army is providing support to the Department of Civil Engineering for an assessment of oil pretreatment technologies to improve the performance of reverse osmosis systems.
- Out of its work with CAD/CAM technology, the Department of Industrial Engineering is conducting research on concurrent engineering which is funded by the Defense Advanced Research Project Agency (DARPA). FIU is one of only three universities, along with 18 corporations and government agencies, engaged in the national project. The research involved the development of a system which enables designers, manufacturers and others to share a common database which gives rise to higher quality in products, higher productivity among workers and more efficiency in the work place.
- Researchers in the Department of Geology have uncovered evidence that a giant extraterrestrial body struck the planet some 65 million years ago, triggering the climactic changes that led to the extinction of dinosaurs.
- The Department of Electrical Engineering is developing software for short-term electric load forecasting which will enable electric utilities to operate more efficiently.
- The Department of Electrical and Computer Engineering is conducting research in the area called "thin films," which is concerned with forming and measuring thin material layers from only a few atoms to a few thousand atoms thick. These exquisitely thin layers are used in building microelectronic devices such as computer chips, in optical devices such as the emerging optical computers, and for engineered optical coatings.
- The University recently created the Southeast Environmental Research Program (SERP), an umbrella group to focus its environmental research and foster future interdisciplinary efforts.
- FIU is designated by the U.S. Department of Interior as the site of a Cooperative Park Studies Unit (CPSU) for the Southeastern United States. The CPSU provides environmental research and training for the National Park Service.

3/29/94