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BME Annual Report 2011-2012

Department of Biomedical Engineering, Florida International University

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FIU

FLORIDA INTERNATIONAL UNIVERSITY
Miami's public research university

Biomedical Engineering Department Annual Report July 2011-June 2012

1 Departmental Overview

Growth! Growth! Growth!—This is what defined 2011-2012 for the Department of Biomedical Engineering (BME). The only department in the nation at a public Minority and Hispanic serving institution that offers a full slate of programs (BS (accredited), MS, BS/MS and PhD), BME at FIU was bullish in its growth over the year. True to its mission of merging engineering with science and medicine the department is now included under the umbrella of the Academic Health Center at FIU, in partnership with the colleges of Medicine, Nursing & Health Science, Arts & Sciences and Public Health. The department has risen to the challenge of developing a Worlds Ahead program of research and education. A \$5M endowment from the Coulter Foundation matched by \$5M from the State of Florida helped launch the department in 2002. As the department propels itself to the end of the first decade of existence it has already become a major educator of a diverse engineering work force with over 330 alumni and a 400+ enrollment. A recently released report from the Florida Education and Training Placement Information Program ranks the department first in the entire State University System of Florida for providing BS, MS and PhD engineers for in-state employment. At the same time, as FIU is striving to move from a High Research Classification to a Very High Research Classification, the department has accepted the mandate to enhance its research portfolio. With research awards at approximately \$474K/per faculty member last fiscal year, the Department now leads the College.

The Department faculty and the Chair, Ranu Jung, merged the vision she had laid out in her paper, “Rising to New Challenges”, with those laid out in the Strategic Plans of the University and College of Engineering and Computing to develop a five-year departmental strategic plan. The plan sets specific goals to enhance research excellence and productivity, develop educational excellence, establish local and industrial engagement and create a sustainable model of growth. An external academic Advisory Board was established. To achieve its vision the department has established three areas of excellence in research. Towards this end, two senior faculty were successfully recruited at the Associate Professor level. Each of them brings a world-class reputation, a passion to develop innovative technology to cure ophthalmic or neurological diseases, and extensive publication and funding records. They strengthen the “Diagnostic Imaging and Sensor Systems” research cluster.

2 BME Academic Programs

The BME Department continues to lead the State in biomedical engineering education. Of the eleven universities in the State University System (SUS) of Florida, FIU is the only university with the full slate (BS, MS, PhD) of programs in BME. The enrollment as of Fall 2011 was: BS – 356 (upper and lower division); MS – 15; PhD – 32. Based on the number of faculty contributing to the undergraduate program (8 FTE tenured/tenure track faculty plus 2 FTE instructors) the undergraduate Student/Faculty ratio was $356/10 = 35.6$. This number is considerably high. Based on the number of faculty contributing to the graduate program (7 FTE tenured/tenure track faculty), the graduate Student/Faculty ratio was $47/7=6.71$.

As of Spring 2012, there have been 213 graduates from the BS program, 109 graduates of the MS program and 15 from the PhD program. The student headcount and graduation rates in the BS program have risen steadily (Tables 1 and 2). The program boasts an active student section of the Biomedical Engineering Society (BMES) and an Alpha Eta Mu Beta (AEMB) Biomedical Engineering National Honor Society chapter. Both societies provide for enrichment of undergraduate and graduate students.

Eight PhD students were admitted into the PhD program in fall 2010 and spring 2011 with an average GRE score of 1245. As of the end of spring 11 there have been 11 PhD graduates, 7 male and 6 female. Of the total number of graduate students enrolled in the program to date approximately xx have been female and xx Hispanic. In 2011-12, there were xx% female and xx% Hispanic. These numbers make our BME program highly responsive to the need for preparing the STEM minority population for future leadership roles.

Table 1: BME B.S., M.S., and Ph.D. Headcount Enrollment*

	Fall 2003	Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011
B.S.	53	131	190	227	244	267	259	312	356
M.S.	30	42	36	47	48	27	22	18	15
Ph.D.	NA	8	14	10	14	22	25	34	32

* M.S. program started in 1999, B.S. program started in 2002, Ph.D. program started in 2004.

Table 2: BME B.S., M.S. and Ph.D. Degrees Awarded

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	Total
B.S.	NA	0	8	11	25	32	29	38	39	31	213
M.S.	7	11	14	11	14	11	20	6	5	10	109
Ph.D.	NA	NA	NA	1	0	1	2	3	5	3	15

3 Curriculum Improvement

We re-organized the undergraduate curriculum into concentrations and developed four-year maps of the course sequences. Most importantly, we are now offering an “Introduction to Biomedical Engineering” course for our freshmen. Our Senior-design capstone projects were 100% sponsored by local industry or area hospitals. We hosted a post-final presentation reception for an industry mixer with the students and developed a portfolio booklet for mass distribution. We are also proud of placing our undergraduates in highly ranked graduate programs and medical schools. We have reinvigorated our BS/MS five-year program and we are completing a ‘Self-Study’ as part of a Doctoral Program Carnegie review. We have re-organized our graduate electives so that they provide a strong foundation for our research cluster areas of excellence. We have also strengthened our educational links to other Colleges. BME courses are included in a newly launched Graduate PhD program in Basic Medical Sciences in the College of Medicine. They are also included in a Cognitive Neuroscience certificate program offered through the College of Arts and Sciences. We have started a pilot initiative through which we are offering an MS in BME to highly qualified medical students in a gap year during their medical education.

4 Student Society Activities and Achievements

Student Society Activities

AEMB (Alpha Et Mu Beta) the National Biomedical Engineering Honor Society was recognized as the most active national chapter. Graduate student Rupak Dua was awarded the ‘Outstanding Officer’ award Sridevi Nagaraja the Outstanding Chapter member. AEMB also was recognized as the Outstanding Honor Society Organization 2012 and Most Active Student Organization Spring 2012 by the FOU Council of Student Organizations.

Student Achievements

BME graduates were recognized for their achievements all year around. At the national Biomedical Engineering Society meeting, Rupak Dua (PhD Candidate) was chosen the 2011 Outstanding Officer for the Alpha Eta Mu Beta honor society and Sridevi Nagaraja as Outstanding Chapter Member. At the Summer 2011 commencement at FIU Shradha Prabhulkar was identified as the “Outstanding” doctoral graduate from the College of Engineering and Computing. In Fall 2011, Manuel Salinas was chosen as the “Outstanding” MS graduate by the College and in Spring 2012, BME swept the “Outstanding graduate” category, with Mohamed Goryawala at the doctoral level, Jean Gonzalez at the MS level and Kamau Pierre at the BS level! Doctoral graduates won prestigious Postdoctoral fellowships (Sarah Erickson, American Cancer Society & Canary Foundation); Shradha Prabhulkar (Bascom Palmer Eye Institute) and Sridevi Nagarajan (Biotechnology HPC Software Application Institute (TATRC)). Several students won Dissertation Year Fellowships from the graduate school.

Student placement for higher education was excellent. Of special note were four graduate placements in medical schools, one as an MD/PhD at Ohio State University and a 2010 BS graduate as MD/PhD at NYU. Others had multiple offers for graduate school from some of the highest ranked BME programs (Duke, Northwestern, Cornell, Rutgers). Several undergraduates got employment in industry and one student went to Washington DC as a US Patent Examiner.

5 New Infrastructure and Industrial Outreach

The year also saw establishment of about 3000 sq. ft of extensively upgraded laboratories for research studies in people with neurological disabilities and chronic rodent models of neurological disorders. For the first time some of the laboratory space is on the Modesto Maidique campus, giving the department close proximity to the Colleges of Medicine, Nursing and Health Sciences and Arts & Sciences.

Our department hosted “EDC Biotech” in Miami, an annual life science conference of EDC, a nonprofit South Florida organization. With over 200 attendees, it provided a networking and partnership venue for companies and South Florida universities. Dr. Jung also presented the first webinar for “LifeSciences, South Florida” an initiative to strengthen the university-industry-community partnership.

6 Events

The department held the First Graduate Research Day and the Second Annual Undergraduate Research Day at which keynotes were given by the national President-Elect of the Biomedical Engineering Society, Dr. Gilda Barabino and VP and Chief Financial Officer of the Wallace H. Coulter Foundation, Ms. Susan Racher. The Spring Senior Design Expo was attended by several industry members who also judged the event. Our Senior-design capstone projects were 100% sponsored by local industry or area

hospitals. We hosted a post-final presentation reception for an industry mixer with the students and developed a portfolio booklet for mass distribution.

To engage with our national and local constituencies, BME embarked on several outreach programs. Dr. Jung was a member of a small contingent that traveled to DC to brief Florida congressional staffers about the biomedical engineering programs and our research portfolio. We hosted a booth at the annual Biomedical Engineering Society meeting. Our department hosted “EDC Biotech” in Miami, an annual life science conference of EDC, a nonprofit South Florida organization. With over 200 attendees, it provided a networking and partnership venue for companies and South Florida universities. Dr. Jung also presented the first webinar for “LifeSciences, South Florida” an initiative to strengthen the university-industry-community partnership. Drs. Chenzhong Li and Anthony McGoron hosted and organized the 2011 NanoFlorida conference and we also hosted PAHCE 2012-the Pan American Health Care Exchange conference. Finally, multiple faculty hosted students from elementary through high-school throughout the year for short visits as well as research internships. Several faculty traveled abroad and met with University leaders in China and Taiwan.

Lecture Series

The Department has been very pro-active in running a scientific WH Coulter Lecture Series supported by the Coulter endowment. 20 lectures were presented by international and national invited experts. The speakers were required to meet with all BME graduate students during a separate meeting, giving the students an opportunity to directly interact with them.

7 Research Programs

The Department has 8 faculty members, 3 at the rank of Assistant Professor, 4 Associate Professors and 1 Professor. The department has two full time Instructors, one serving as the Undergraduate Advisor. After a retreat conducted in Spring 2012, the department has decided to cluster it’s research into three areas:

- Basic Research in Engineered Tissue Model Systems
- Diagnostic Imaging and Sensor Systems
- Therapeutic and Reparative Neurotechnology

These three areas are served by technological advancements in:

- Bio-imaging, bio-signal processing and computational modeling
- Bio-instrumentation, devices and sensors
- Biomaterials and bio-nano technology
- Cellular and tissue engineering

Further strengthening the Diagnostic Imaging and Sensor Systems area were a new National Institutes of Health (NIH) grant to develop a hand-held optical imager for breast cancer imaging to Dr. Anuradha Godavarty, and another for development of biosensing devices for cytotoxic and genotoxic assessment of Nanomaterial’s to Dr. Chenzhong Li. In the Neurotechnology area, Dr. Jung received funding from DARPA to develop effective and reliable neural interfaces for peripheral nerve recordings in human amputees and transferred her NIH Bioengineering Research Partnership grant from for development of

neural interfaces for sensory stimulation in amputees. She also transferred a National Science Foundation grant for knowledge dissemination in computational neuroscience. A new patent and a new invention disclosure were filed and faculty publications received high recognition.

The department was also host to three international Biomedical Engineering faculty, one on a government of India fellowship, another on a Taiwanese Govt. fellowship, and one on a sabbatical from Tohoku University, Japan.

Faculty Honors and Research and Service Highlights

The Faculty have been very active in research and establishing new international and national collaborations. They have received national and University honors.

2010-2011 saw new faculty appointments, and professional and community recognition of the faculty. Jorge Riera, PhD a world expert on brain multimodal imaging, who is working on neurodegenerative diseases, was recruited from Tohoku University in Japan. His research is focused on developing strategies to integrate different modalities of brain imaging for the understanding of multicellular signaling in the neocortex. He joins the department June 2012 as Associate Professor. Shuliang Jiao, a world expert on ophthalmic multimodal imaging, who is working on ocular diseases, was recruited from the University of Southern California. Jiao's research is focused on developing high-resolution multimodal anatomical and functional imaging technologies for the diagnosis and research of diseases that cause blindness. He will join the department October 2012 as Associate Professor.

Anuradha Godavarty, Associate Professor was named a Health Care Hero at the Greater Miami Chamber of Commerce's 15th Annual Health Care Heroes® award celebration. She and her research team of students and postdocs has generated multiple inventions of portable, hand-held imaging devices that show early promise in improving the diagnosis of breast cancer and in aiding the pre-screening of sports injuries and other on-site body imaging applications. Sharan Ramaswamy, Assistant Professor was elected Fellow of the American Heart Association and the Council on Basic Cardiovascular Sciences.

Several faculty members were recognized for excellence by FIU. Michael Brown, MD, PhD won the FIU Excellence in Teaching Award for 2011-2012 as well as the Excellence in Teaching Award for the College of Engineering and Computing. Ranu Jung, PhD was recognized as a "Top Scholar 2012" by the University. She is the third faculty from the department to receive the accolade, an Honor bestowed to only a very select group. Anthony McGoron, PhD, received the Outstanding Service award for the College of Engineering and Computing for 2011.

Faculty also received high recognition for their publications. One of Dr. Chenzhong Li's papers was recognized in the "Top-50 most cited articles" as published in Biosensors & Bioelectronics, while an article by Dr. Wei-Chiang Lin was selected to be part of the Physics in Medicine and Biology journal's Highlights collection of 2011. Dr. Ranu Jung published an edited book "Biohybrid Systems: Nerves Interfaces and Machines".

Tables 3a and 3b below give a history of the Research awards and expenditures.

**Table 3a: Summary of BME Research Programs in the Last Seven Years
(Including funds from the Wallace H. Coulter Foundation)**

	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-2012
Research Awards	\$969,236	\$1,151,036	\$2,158,350	\$2,353,409	\$1,803,738	\$1,570,751	\$2,811,528	2,179,161	\$3,788,460
Research Expenditures	\$860,000	\$826,959	\$740,511	\$1,493,877	\$1,290,000	\$1,343,538	\$1,704,879	1,757,749	\$1,458,339
RA (C&G Supported)	7	16	16	18	14	12	18	11	
FTE Faculty*	8	9	9	10	10	9	11 [†]	8**	8

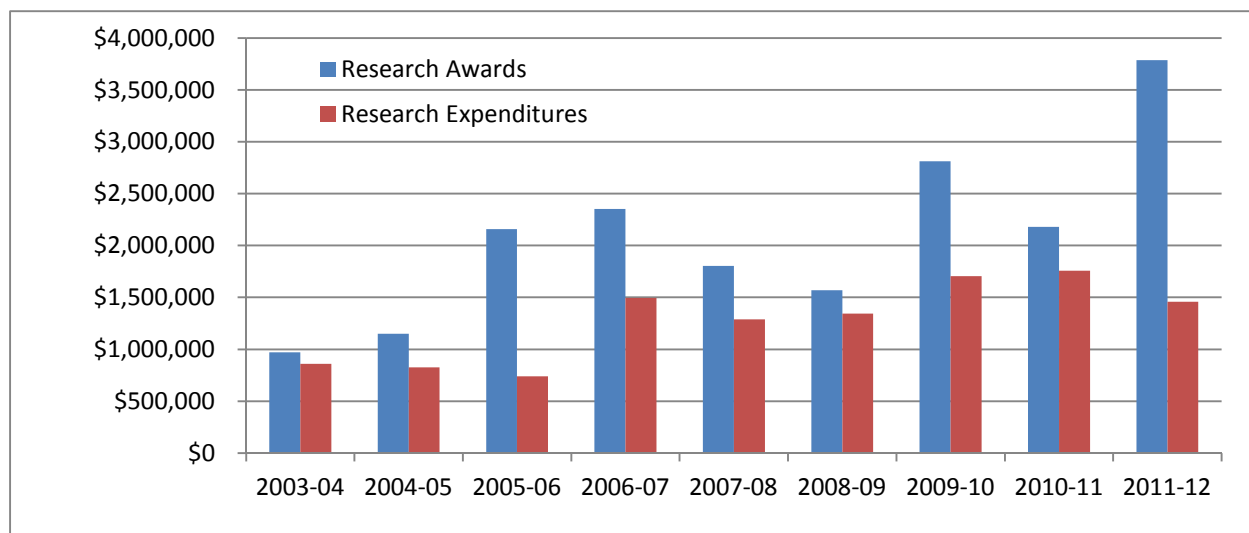
* Includes instructor positions where applicable

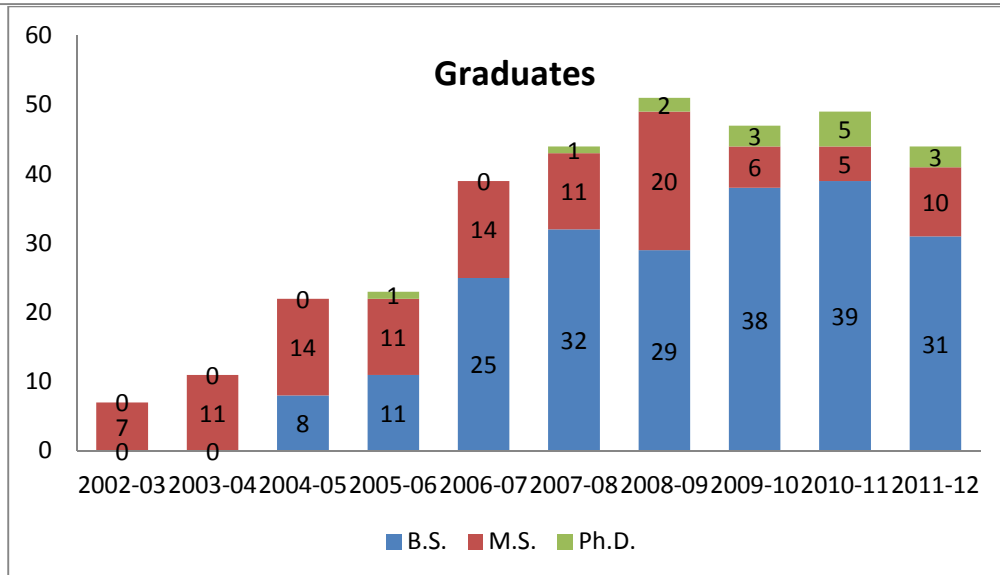
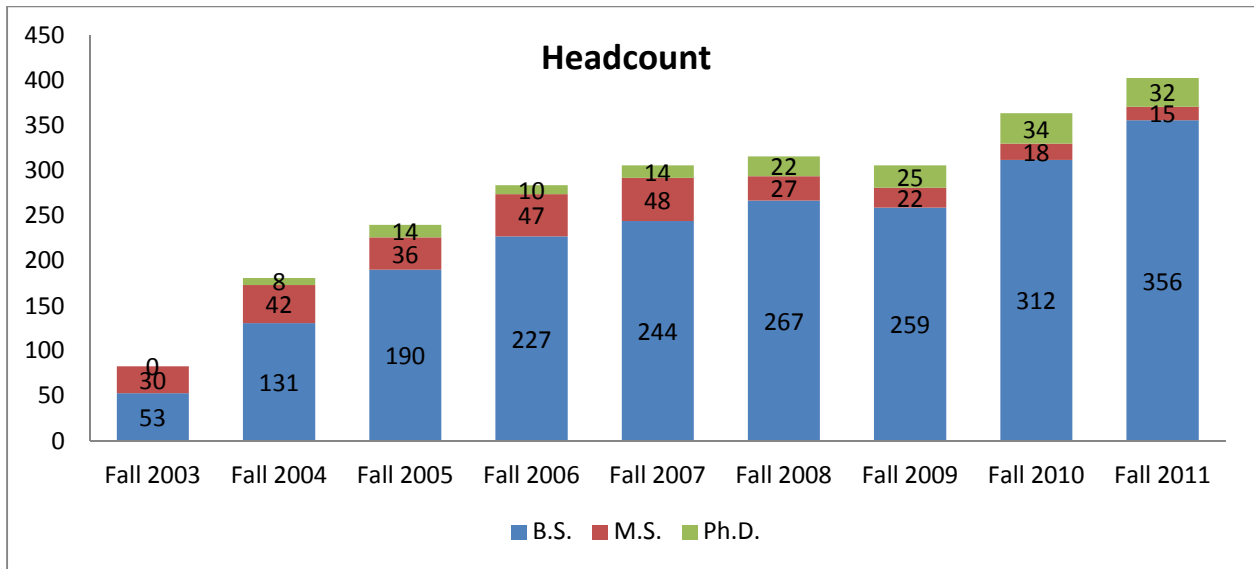
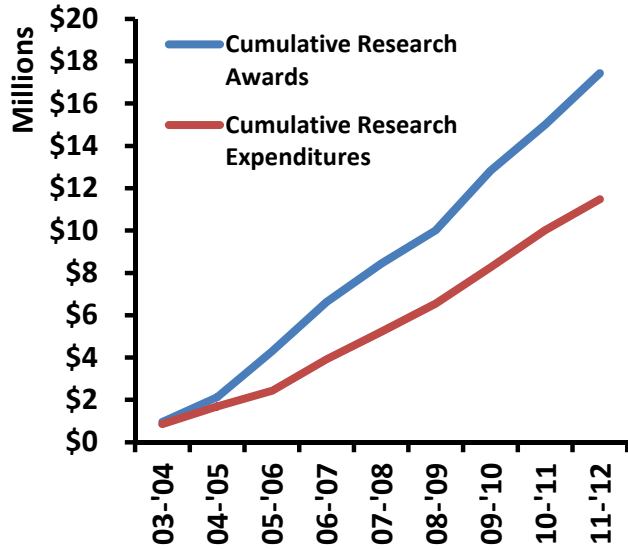
[†]. @2009-2010 data include Drs. Adjouadi and Barreto at 100% each, previously included at 50% each. Ramaswamy joined in spring 2010.

** Ranu Jung joined in January 2011. Dr. Adjouadi and Barreto moved to EE. Does not include instructors and lecturers.

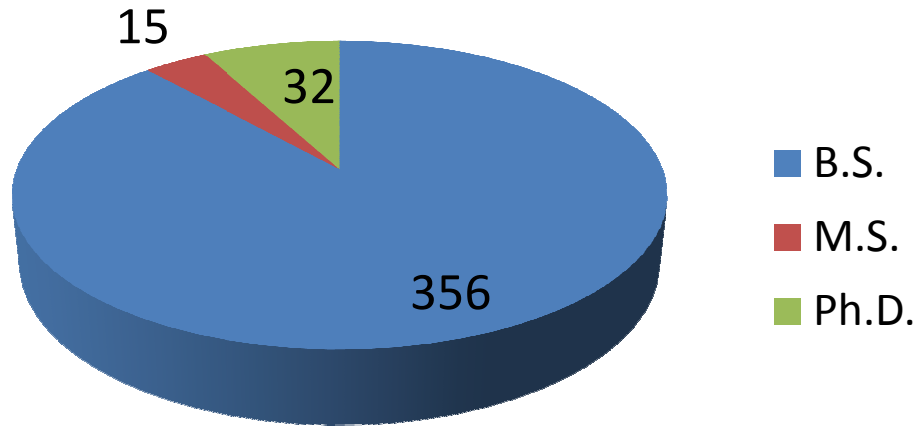
**Table 3b: Summary of BME Research Programs in the Last Seven Years
(Not including funds from the Wallace H. Coulter Foundation)**

	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Research Awards	\$750,320	\$872,025	\$1,706,891	\$1,816,340	\$1,333,619	\$1,078,252	\$2,227,964	\$2,179,161	
Research Expenditures	Not available	Not available	\$1,227,411	\$1,222,220	\$1,313,346	\$1,117,978	\$1,227,774	\$1,757,749	





Fall 2011 Enrollment



Total Degrees Awarded:

