

# Department of Agricultural and Biological Engineering

## STRATEGIC PLAN, 2008-2013

### Our Mission

Our mission is **to enhance the engineering and technical management of biological and agricultural systems.**

### Our Vision

Our vision is **to expand our position as a national leader for engineering and technical management of biological and agricultural systems.**

### Our Programs

We maintain program strength in the areas of biological materials and food processing, machine systems, natural resources, structures and controlled environments, bioenergy, and safety engineering.

### Our Core Values

- Excellence and creativity in scholarship of education, research, and outreach as our highest priority.
- The highest standards of integrity, honesty, responsibility, and accountability.
- Commitment to a workplace environment that nurtures personal and professional growth and development.
- Lifelong learning and access to information and knowledge for all Pennsylvania residents.

- functional collaborations to solve complex problems for the common good.
- Dedication to diversity, multi-cultural understanding, and cross-cultural competence.
- Involvement, support, and encouragement of our partners in the planning and implementation of Departmental programs.
- Commitment to our parent Colleges (COAS and COE) and the University and to their respective missions.
- Respect in debate, flexibility to change, and responsiveness to emerging issues.

### Our Strategic Goals

**Goal 1: Develop Facilities Commensurate with the Needs and Opportunities for Our Evolving Discipline.**

**Goal 2: Increase the Numbers of BE Graduates to 50 per Year and ASM Graduates to 30 per Year, and Improve the Quality of the Students.**

**Goal 3: Continue Strengthening the ABE Graduate Program.**

**Goal 4: Strengthen Our Capacity to Offer Cooperative Extension and Applied Research Programs.**

**Goal 5: Lead Development of the Biological Engineering Discipline at the University**

**Goal 6: Strengthen Faculty, Staff, Student, and Resource Capacities.**

## Executive Summary

The Strategic Plan, 2008-2013 for the Department of Agricultural and Biological Engineering is built upon six strategic goals: (1) developing facilities to meet the needs and opportunities of our evolving discipline; (2) increasing the number of annual graduates of our undergraduate programs; (3) enhancing our graduate program; (4) strengthening our Cooperative Extension and applied research programs; (5) leading development of the Biological Engineering discipline at the University; and (6) strengthening our faculty, staff, student, and resource capacities. With our metamorphosis toward Biological Engineering from our Agricultural Engineering roots, we realize that conversion of an antiquated 1938 building into a facility appropriate for emerging Biological Engineering activities is our greatest challenge. The January 2008 change of the name of our undergraduate engineering academic program to Biological Engineering substantiates the reality of our metamorphosis. Moreover, the pending 2008 ABET accreditation visit under the new Biological Engineering criterion seals our commitment to this historical transition. This Strategic Plan, 2008-2013, reflects our strategic issues for the coming 5-10 years as we continue to strive for excellence in emerging biological engineering areas in addition to our traditional commitments to agricultural engineering applications. We are truly excited about our renewed potential to bring engineering to a broader spectrum of biology-related problems!

## Our Planning Process

Strategic plans have historically been an integral part of the Department of Agricultural and Biological Engineering since 1984. The current strategic planning process is in response to a directive from the Provost to formulate a plan for the period of 2008-2013. This process immediately follows continuous series of University-led strategic planning processes which began as a formal *Strategic Plan, 1997-2002*, published on May 30, 1997. A *Strategic Plan Update, 1999-2003*, was published in February, 1999, after review at a half-day faculty retreat on December 17, 1998. Particular emphasis was placed on adding relevant "Performance Indicators" for each Implementation Strategy associated with the Strategic Goals. A second annual update was made for a rolling, 5-year strategic planning period (2000-2004) and was published in January 2000. Most recently a new 3-year strategic plan was published in March 2005 for the period of 2005-2008.

As with our previous strategic plans, subgroups of the faculty examined the relevance of each Strategic Goal in March 2005 for the period of 2005-2008. Draft goals submitted by four goal subcommittees were assessed at a Faculty Retreat on January 10, 2008. Following discussions on that date and suggested revisions, a new Strategic Plan for 2008-2013 was prepared as contained in this document.

# Strategic Goals, 2008-2013: Implementation Plans and Performance Indicators

## **Goal 1: Develop Facilities Commensurate with the Needs and Opportunities for Our Evolving Discipline.**

### **Strategy #1 - Plan total renovation of the Agricultural Engineering Building, or construction of alternative facilities, to accommodate current and future needs for our rapidly evolving discipline.**

#### *Tactics:*

1. Solicit renovation or replacement of the Agricultural Engineering Building as the top priority capital project for the College of Agricultural Sciences.
2. Initiate an assessment activity to identify the long-term facilities needs of the ABE Department.
3. Based on the needs assessment, determine appropriate facilities options (renovation, new construction, partnering opportunities such as with ChE, PSIEE, Huck Institute, or others with biological engineering interests).
4. Select the best facilities option and initiate architectural planning and design.
5. Commit to the most appropriate design option for facilities construction and solicit project bids.
6. Initiate construction project.

#### *Performance indicators:*

- Renovation of Agricultural Engineering Building given high priority as a capital project.
- Needs assessment activity completed.
- Decision made on best facilities option and design phase initiated.
- Construction project initiated.

#### *Timeline:*

- Start solicitation of capital project priority in 2008.
- Planning initiated by 2010.
- Construction started by 2013.

### **Strategy #2 - Develop a plan for generating funds to support renovation of Agricultural Engineering Building.**

#### *Tactics:*

1. Request priority for a development plan to solicit capital funds for renovation of the Agricultural Engineering Building.

2. Consult with key personnel involved in recent capital projects in the College and/or University to learn from their experiences relative to generating funding for their new buildings.
3. Team with College and University development officers for guidance on contacting potential donors and on successful fundraising strategies.
4. Develop a list of potential individual and corporate donors.
5. Implement a fund-raising and development plan.

*Performance indicators:*

- Priority established for a development plan for fund raising to support a capital project with the Agricultural Engineering Building.
- Consultation meetings completed with those conducting recent fund-raising projects.
- Development team identified and charged.
- Funding plan implemented.

*Timeline:*

- 2008-2011.

**Strategy #3 - Renovate existing space in Agricultural Engineering Building and equip laboratories for latest and pending new faculty hires.**

*Tactics:*

1. Develop design and financial specifications for equipment and space renovation needs for the Natural Fiber Materials Engineering laboratory for Dr. Jeffrey Catchmark.
2. Develop design and financial specifications for equipment and space renovation needs for the Biomass/Bioenergy Machine Development Engineering laboratory for Dr. Jude Liu.
3. Solicit bids and select contractors for these two laboratory renovation projects.
4. Perform renovations and equip laboratories.
5. Develop design and financial specifications for equipment and space renovation needs for the Synthetic Biology Engineer faculty position when the search process is completed.
6. Solicit bids, select contractors, and perform laboratory renovations for the Synthetic Biology Engineer position and provide necessary equipment.

*Performance indicators:*

- Lab renovations completed in a timely fashion to support the work of the new faculty hires.

*Timeline:*

- 2008-2009.

**Strategy #4 - Reallocate and upgrade facilities to meet the needs of a growing cohort of fixed-term faculty, post-doctoral personnel, visiting scholars, and non-standing technical staff and to accommodate additional technology classrooms.**

*Tactics:*

1. Handle immediate facilities requirements for non-tenure track personnel in the most creative ways possible and incorporate these needs into long-term facilities renovation projects.
2. Solicit commitments from University Classroom Committee (Bob Myrick) to install technology upgrades of classrooms 206 and 252 in the Agricultural Engineering Building.

*Performance indicators:*

- Non-tenure track personnel accommodated by adequate facilities.
- Two additional technology classrooms developed within the AgE Building.

*Timeline:*

- 2008-2009.

**Goal 2: Increase the Number of BE Graduates to 50 per Year and ASM Graduates to 30 per Year, and Improve the Quality of the Students.**

*The most important performance indicators tie to the goal and multiple strategies. They are:*

- Number of BE graduates per year (goal: 50 by 2013).
- Number of ASM graduates per year (goal: 30 by 2013).
- Improvement in overall student GPA.
- Percentage of ABE students taking FE exam and percentage passing exam.
- Increased resources for faculty/staff to support this increase.

**Strategy #1 - Improve recruitment by all department faculty, students, and staff.**

*Tactics:*

1. Continue implementation of the Adopt-a-Campus program whereby individual faculty establish contact with a Commonwealth or state-funded campus for recruitment purposes.
2. Increase contacts with faculty and staff dealing with undecided students and with the students themselves in DUS, Engineering, and Ag Sciences.
3. Identify current students in special recruiter groups such as “*BE Engineering Envoys*” and “*ASM Agents*”.

4. Initiate development and distribution of grades 8-12 instructional materials relative to contemporary issues involving our academic disciplines, working with others in the Colleges of Ag Sciences and of Engineering.

*Performance indicators:*

- Number of visits by faculty, students, and staff to non-UP campus locations.
- Number of potential students visiting UP and the Department.
- Number of Engineering Envoys and ASM Agents engaged.
- Number and availability of recruitment aids.
- Number of alumni referrals made to our pool of potential students.
- Number of students entering BE and ASM undergraduate programs.
- Number of undergraduate BE and ASM graduates/year.

*Timeline:*

- 2008 and continuously thereafter.

**Strategy #2 - Increase recruiting efforts by hiring a recruiter.**

*Tactics:*

1. Hire a staff person as a dedicated recruitment coordinator.

*Performance indicators:*

- FTE level of ABE staff recruitment/retention coordinator hired or shared with other department(s).

*Timeline:*

- Hire staff recruitment coordinator by 2010.

**Strategy #3 - Increase visibility of academic degree programs.**

*Tactics:*

1. Increase contact with undecided students in DUS, Engineering, and Ag Sciences, and advisers in DUS.
2. Increase contact with faculty and staff dealing with undecided students in DUS, Engineering, and Ag Sciences.
3. Maintain a "Student News" feature on the Department web site that is readily visible and engaging to potential new students and updated regularly by current student recruiters.
4. Use electronic media approaches relevant to today's students (facebook, myspace, etc.).
5. Market the concepts of world-class engineers, leadership, communications, etc., i.e. soft skills, in recruitment materials.

*Performance indicators:*

- Number of first year seminar (or similar) class visits to the Department.
- Number of sections of first-year seminar classes taught by ABE faculty.
- Number of visits by faculty, students, and staff with undecided student groups and to non-UP locations.
- Number of contacts made with undecided and potential students.
- Number of times ABET Educational Objectives and World Class Engineer Attributes are publicized.

*Timeline:*

- Immediately and continually.

**Strategy #4 - Improve the quality of our students.**

*Tactics:*

1. Eliminate entry-to-major extensions for students who's GPAs are below 2.0.
2. Raise criteria for extensions.
3. Encourage all BE students to take FE exam.

*Performance indicators:*

- Average GPA of incoming students.
- Number of students receiving scholarships.
- Number of honors students.
- Overall GPA trends.

*Timeline:*

- Immediately and continually

**Strategy #5 - Maintain the capacity to offer a broad-based curriculum for the Northeast US.**

*Tactics:*

1. Identify topical areas and course content for contemporary, "full-service" curricula for the Northeast US.
2. Identify modifications of curricula and courses necessary to accommodate emerging areas.
3. Assess expertise held by current faculty.
4. Match faculty expertise areas with the needs for full-service curricula.
5. Incorporate non-tenure track instructors into curriculum planning and delivery.
6. Decide priorities for future requests for faculty positions, both for replacement and new faculty opportunities.

7. Identify continuing and distance education courses.
8. Develop 2+2 program with Northeast universities.
9. Update relevant areas for curricula (e.g. sustainable energy for ASM, Safety for BE).

*Performance indicators:*

- Completion of a consensus document outlining contemporary “full-service” curricula and emerging areas.
- Matrix of existing faculty expertise mapped over needs of “full-service” curricula.
- Completion of a priority list for future faculty positions.
- At least two continuing and distance education courses.
- At least two agreements for 2+2 program with Northeast universities.

*Timeline:*

- Initiate in 2008 and update as appropriate.

**Strategy #6 - Attract more non-BE and non-ASM students into selected B E and ASM courses.**

*Tactics:*

1. Create first year seminars that are focused on specific topics in BE that have a more universal interest (for example, biofuels or machinery).
2. Advertise selected courses and/or minors to students in other departments via the web, flyers, and communications with other program coordinators and advisors.

*Performance indicators:*

- Number of non-BE and non-ASM students in our courses.
- Number of students transferring into our majors.
- Number of graduates receiving the ABE minor.
- Number of graduates receiving the ASM minor.
- Number of graduates receiving the OFFRD minor.

*Timeline:*

- 2008-2013.

**Goal 3: Continue Strengthening the ABE Graduate Program.**

**Strategy #1 - Increase the number of ABE graduate students, with attention to greater numbers of domestic students and an increased geographical representation of international students.**

*Target – Increase PhD graduation rate from the current level of 0.67<sup>1</sup> to 1.0 per year per research FTE and MS graduation rate from 1.04<sup>1</sup> to 1.5 per year per research FTE.*

*Tactics:*

1. Recruit at least one student per year directly from a BS degree into the PhD program (without a MS prerequisite).
2. Better inform PSU B E and non-ABE undergraduates about ABE graduate program and opportunities.
3. Invite top-notch domestic students and ABE students from universities in the region such as MD, VA, OH, to visit the Department.
4. Offer ASABE student awardees (such as ASABE Honors Award, K. K. Barnes Award, and NABEC Design Award) admission with assistantship in ABE graduate program.
5. Participate in University's summer minority research program(s).
6. Participate in COE's and COAS's annual Graduate Recruitment Visitation programs.
7. Recruit a wider geographic representation of international students (such as, from geographic regions of Africa, Australia/New Zealand, Western and Eastern Europe, South America, China, and India).
8. Increase participation of ABE faculty and enrolled graduate students in promoting ABE graduate program and student recruitment.
9. Recognize and reward graduate student mentoring through annual performance reviews.
10. Develop a recruitment brochure.

*Performance indicators:*

- Graduation rate of 1.0 PhD per year per research FTE.
- Graduation rate of 1.5 MS per year per research FTE.
- Recruit at least three PSU undergraduate students into the ABE graduate program each year.
- Number of differing international countries represented in graduate student enrollment each year.

*Timeline:*

- Five years, 2008-2013.

**Strategy #2 - Maintain and enhance active participation/representation of the ABE graduate program within the College of Engineering and the College of Agricultural Sciences.**

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<sup>1</sup> Based on PhD and MS graduation data from Summer 2003 to Fall 2007

*Tactics:*

1. Graduate Coordinator and Department Head actively represent and engage in graduate program activities/meetings conducted by COE and COAS.
2. Graduate student representation and involvement in Engineering Graduate Student organization.
3. ABE faculty to be actively involved in recruitment activities in both COE and COAS.
4. Graduate Coordinator, together with the Recruitment and Placement, and Web Advisory Committees, to establish active and updated links of ABE graduate program to both COE and COAS research and graduate program web pages and actively market the ABE program in both venues.

*Performance indicators:*

- Participation of ABE Graduate Program Coordinator in COE and COAS graduate program committees.
- Recognition of ABE graduates in commencement ceremonies as College of Engineering affiliated graduates.
- Participation of ABE graduate students in College of Engineering graduate student programs and activities.

*Timeline:*

- Immediately and continuing.

**Strategy #3 - Increase number of graduate assistantships and resources for graduate program.**

*Tactics:*

1. Develop a strategy and targeted program to seek industry-sponsored graduate assistantship funding.
2. Increase annual extramural funding of graduate assistantships.
  - Through increased grant activity – i.e., USDA National Needs, USDA-NRI, PDA and special funding such as Milk Safety.
  - Through fellowship grants targeted specifically for enhanced graduate student enrollment such as USDA National Needs, IGERT, EPA Fellowships, and NSF Fellowships.
  - Through participation in Penn State Institutes of Energy and the Environment, Huck Institute of Life Sciences, Materials Research Institute, and various centers of excellence.
3. Increase department allocation (DA) for graduate assistantships.
4. Actively seek industry and privately-sponsored gifts to support graduate programs and students.

*Performance indicators:*

- Two industry-sponsored graduate assistantships.
- Four grant-sponsored graduate assistantships per year per research FTE.
- Two additional DA assistantships.
- Number of contacts with industry and private partners eliciting support for ABE graduate program.
- Number of gifts received for graduate program support and activities.
- Number of grant proposals.

*Timeline:*

- Five years, 2008-2013.

**Strategy #4 - Enhance and maintain ABE graduate course offerings.**

*Tactics:*

1. Offer each year at least one graduate course in each of the current and emerging research areas within the Department (such as, Biological/Food Engineering, Machine Systems, Natural Resources, Controlled Environment and Structures, Biomass/Bioenergy, and Biocomposites/Nanotech).
2. Continue to offer more “general” graduate courses (i.e., Research Methods, Finite Element Analysis, and Systems Modeling courses) each year.

*Performance indicators:*

- One graduate course offered annually in each of the current and emerging research areas.
- Six graduate courses offered per year (other than ABE 500 and 596).

*Timeline:*

- Three new courses by 2008-2010.

**Goal 4. Strengthen our Capacity to Offer Cooperative Extension and Applied Research Programs.**

**Strategy #1 - Maintain a minimum of five extension standing faculty FTE appointments.**

*Tactics:*

1. Use tenure-track faculty to lead major extension program thrusts.
2. Use extension associate positions to participate in development, delivery, and evaluation of extension program.

3. Employ extension associates only in programs areas with a tenure-track program leader.
4. Expand the bio-mass/bio-fuels extension program.
5. Expand extension programs to include relevant issues such as water quality, storm water management, youth development, GPS/GIS applications, and international exchanges.

*Performance indicators:*

- Number of extension standing faculty appointment FTEs.
- Number of extension associate appointments.
- Number of new and/or different extension program areas expanded or developed.

*Timeline:*

- 2008-2011.

**Strategy #2 - Focus on development of areas of excellence in extension programming.**

*Tactics:*

1. Develop nationally recognized extension programs.
2. Develop focused areas of excellence that integrate applied research with extension programming in key topic areas such as listed in Strategy 1, Tactic 5 above.
3. Explore industry and private support for focused efforts.
4. Continue work on the proposed Agricultural Safety and Health Extension (ASHE) Center of Excellence.

*Performance indicators:*

- Number of extension program areas receiving national recognition.
- Number of centers and/or focused areas of excellence proposed, developed, and/or operating.
- Number and amount of Center(s) of Excellence funding goals met.

*Timeline:*

- Identify focused areas and staffing by 2009 – 2010.
- Initiate construction of ASHE facilities, 2009.

**Strategy #3 - Develop formal regional, national, and international partnerships to support applied research and extension programs.**

*Tactics:*

1. Explore creating regional, national, and international extension programs with extension directors and faculty.
2. Develop extension programs.

3. Participate in relevant existing extension programs.

*Performance indicators:*

- Number of formal proposals with other Northeast, national, or international cooperative extension programs.
- Number of faculty participating in extension programs.
- Number of ABE-developed materials included in extension databases.

*Timeline:*

- 2008-2013.

**Strategy #4 - Develop outreach workshops for non-traditional audiences.**

*Tactics:*

1. Offer formal, fee-based workshops on engineering-related topics to persons seeking continuing education or professional certification credits.

*Performance indicators:*

- Number of workshops offered.
- Participant workshop evaluations average 4 or higher on a 5-point scale.

*Timeline:*

- Offer first workshops in 2008.
- Develop other relevant workshops, 2009-2013

**Goal 5. Lead Development of the Biological Engineering Discipline at the University.**

**Strategy #1 - Lead development of Biological Engineering academic programs at Penn State University.**

*Tactics:*

1. Seek ABET (Accreditation Board for Engineering and Technology) accreditation in 2008 of undergraduate engineering academic program under the Biological Engineering criterion.
2. Lead the metamorphosis of the undergraduate Biological Engineering curriculum and the creation of new courses in emerging topics.
3. Establish an Institute of Biological Engineering (IBE) Student Chapter that involves students from multiple disciplines.
4. Continue faculty support of the Environmental Resources Management (ERM) undergraduate program in the College of

Agricultural Sciences and the Master's in Environment Pollution Control (MEPC), an intercollegiate program.

5. Assess nomenclature for the graduate engineering program in the Department of Agricultural and Biological Engineering.

*Performance indicators:*

- Full-term accreditation under the ABET Biological Engineering criterion.
- Number and type of leadership activities related to metamorphosis of undergraduate Biological Engineering.
- Number of new biological engineering courses.
- Formation of an IBE Student Chapter.
- Number of faculty in teaching and leadership positions in ERM and EPC.
- Determination of nomenclature for the graduate engineering program.

*Timeline:*

- Revised/new course offering(s) as prudent.
- IBE Student Chapter by 2009.
- Graduate program nomenclature by 2010.

**Strategy #2 - Build faculty collaborations and lead coordination for Biological Engineering endeavors at Penn State.**

*Tactics:*

1. Coordinate discussions within the College of Engineering and among other interested parties relative to collaborations for engineering applications to biological systems.
2. Organize an interdisciplinary "faculty of biological engineering" to identify collaborations and opportunities for teaching, research, and outreach.
3. Collaborate closely with Chemical Engineering and Eberly College of Sciences in re-launching the Fermentation Pilot Plant to provide core research facilities for biological processing.
4. Capitalize on opportunities to write major grant proposals for biological engineering teaching, research, and outreach.
5. Seek joint appointments for biological engineering faculty between ABE and other departments.
6. Align our Departmental programs to be integral within the 4 systems-oriented themes of the College of Agricultural Sciences Strategic Plan, 2008-2013: Bio-based Systems; Landscapes and Ecosystems; Food System; and Economic and Social Systems.
7. Provide appropriate leadership and participation under the College of Engineering Strategic Plan, 2008-2013, for bio-based engineering thrusts.

8. Participate actively in Penn State Institutes of Energy and the Environment (PSIEE), Huck Institute for Life Sciences (Huck), and the Materials Research Institute (MRI).

*Performance indicators:*

- Formation of a “faculty for biological engineering” group.
- Re-launch of the Fermentation Pilot Plant core research facility.
- Number of major biological engineering grant proposals submitted annually.
- Number of joint faculty appointments with other departments focused on bio-based engineering.
- Number of Department participants on subcommittees for CAS strategic planning in the four systems-oriented themes.
- Number of faculty with membership on PSIEE advisory committees and/or participation in ongoing PSIEE programs and projects.
- Number of faculty assignments and projects with emphasis in biological, natural resource, and food engineering.
- Number of FTEs in bio- and food-based Extension assignments.

*Timeline:*

- Continual collaboration and coordination activities.
- Successful re-launch of Fermentation Pilot Plant by 2010.
- Alignments with COE and CAS Strategic Goals – 2008.

**Strategy #3 - Participate in national and international endeavors impacting the maturation and professionalism of a science-based Biological Engineering discipline.**

*Tactics:*

1. Maintain membership and prominent leadership roles in societies such as American Society of Agricultural and Biological Engineers (ASABE) and the Institute of Biological Engineering (IBE).
2. Participate in Water Environment Federation (Environmental Engineers), Institute of Food Technologists (IFT), American Institute of Chemical Engineers (AIChE), American Ecological Engineering Society and similar groups.
3. Participate in establishment of a Biological Engineering Professional Engineering (PE) Exam.

*Performance indicators:*

- Number and roles of faculty and student participants in ASABE, IBE, IFT, and similar biology-based, engineering-related organizations.
- Number and roles of participants in development of the BE PE Exam.

*Timeline:*

- Continual throughout 2008-2013.

**Goal 6. Strengthen Faculty, Staff, Student, and Resource Capacities.**

**Strategy #1 - Garner support from colleges, institutes, and consortia for faculty hires to meet enrollment-induced needs and growth opportunities.**

*Tactics:*

1. As appropriate, develop tenure-track faculty hire proposals for priority areas such as *bioenergy/biofuels, bioproducts/biomaterials, bioprocessing, GPS/GIS applications for agriculture, safety, and biosafety.*
2. Seek hire and startup co-funding through institutes/consortia as justifiable.

*Performance indicators:*

- Faculty hire endorsements from college administration.
- Co-sponsorship commitments from Penn State Institutes of Energy and the Environment (PSIEE), Materials Research Institute (MRI), Huck Institute for Life Sciences, and/or collaborating colleges.
- Number of faculty hires made as justified.

*Timeline:*

- 2008-2013 as relevant.

**Strategy #2 - Promote and support professional development opportunities that strengthen skills and experiences of faculty, staff, and students in traditional and emerging areas within our discipline.**

*Tactics:*

1. Encourage faculty and staff to participate in sabbatical, Fulbright, international exchanges, and other professional development opportunities that enhance skills and experiences.
2. Develop a reference document that identifies and describes existing staff positions and addresses needs not currently being met.
3. Encourage and support undergraduate and graduate students to participate in international experiences to enhance the World-Class Engineer objectives of the College of Engineering.
4. Encourage and support undergraduate and graduate students to participate in internships and co-op opportunities.
5. Encourage Professional Engineering (PE) registration.
6. Participate nationally in the development of PE Exam for Biological Engineering.

*Performance indicators:*

- Number of sabbatical leaves experienced and impacts gained.
- Number of professional development opportunities completed by faculty and staff.
- Staff support reference document developed.
- Number and nature of international experiences of students.
- Number of students who participated in internships and co-ops.
- Number and success of engineering students taking and passing the Fundamentals of Engineering (FE) Exam prior to graduation.
- Level of PE registration among the faculty.
- Level of participation in development of PE Exam for Biological Engineering.

*Timeline:*

- 2008-2013 as opportunities arise.

**Strategy #3 - Solicit more endowed scholarships for undergraduate and graduate students.**

*Tactics:*

1. Host regional and employer-located alumni events with a PSU ABE pride and philanthropy focus.
2. Encourage corporations to endow named scholarships.
3. Encourage corporate sponsors of scholarships to include accompanying internships and/or co-op educational experiences.

*Performance indicators:*

- Number of alumni fundraising events.
- Number of alumni attendees at alumni events.
- Amount of scholarship funds awarded.
- Number of corporate-sponsored scholarships.
- Number of corporate sponsored internships/co-ops.

*Timeline:*

- Initiate Fall 2008.

**Strategy #4 - Enhance and support interdisciplinary opportunities for faculty, staff, and students across units and colleges.**

*Tactics:*

1. Invite seminar presenters from other departments and units.
2. Encourage faculty to make presentations to other departments and units.
3. Advertise, university-wide, our department seminars or special presentations to other units.

4. Invite college/university P & T representatives to discuss with faculty appropriate documentation methods for crediting interdisciplinary work in the P&T dossier.

*Performance indicators:*

- Documented interdisciplinary activities of faculty and staff.
- Number of seminars and department visits made to increase faculty's awareness of interdisciplinary opportunities.
- Number of research projects with faculty cooperators outside the Department.
- Number of interdisciplinary publications.

*Timeline:*

- Continuously.

## How Our Goals Correlate with Colleges' Goals

Correlations of the strategic goals of the Department of Agricultural and Biological Engineering with the Strategic Goals of its parent colleges (COAS and COE, respectively) are identified in Table 1.

Table 1. Correlation of ABE Strategic Goals with Strategic Goals of College of Agricultural Sciences (COAS) and College of Engineering (COE).

<i>ABE Strategic Goals</i>	COAS Strategic Goals	COE Strategic Goals
1. Develop facilities commensurate with the needs and opportunities for our evolving discipline	A,B,C	1,2,3,4,5
2. Increase the numbers of BE graduates to 50 per year and ASM graduates to 30 per year, and improve the quality of the students	A,B	2
3. Continue strengthening the ABE graduate program	A,B,C	1,3,4
4. Strengthen our capacity to offer Cooperative Extension and applied research programs	B,C	1,4,5
5. Lead development of the Biological Engineering discipline at the University	A,B,C,D	1,2,3,4,5
6. Strengthen faculty, staff, student, and resource capacities	A,B,C	1,2,3,4,5

**Appendix A**  
Strategic Goals of Our Colleges  
(2005-2008)

**College of Agricultural Sciences**

- A. Increase enrollment and enhance student success
- B. Enhance knowledge discovery and translation
- C. Strengthen meaningful communication and mutual education with current and new stakeholders
- D. Lead and manage the College as a system

**College of Engineering**

- 1. Attract and develop an outstanding and diverse faculty, student body, and staff
- 2. Develop and deliver an undergraduate engineering curriculum based on active, problem-based, and professionally oriented teaching and learning
- 3. Strengthen graduate programs
- 4. Develop research thrusts in areas of state and national needs
- 5. Enhance outreach to the Commonwealth and beyond
- 6. Implement administrative and organizational actions to support strategic goals and increase effectiveness.

## Appendix B

### ABET Educational Objectives Mapped with World-Class Engineer Criteria

The following table presents the correlation of the Department's Categories of Educational Goals (ABET) with the World-Class Engineer criteria:

	WORLD-CLASS ENGINEER CRITERIA					
	Aware of the World	Solidly Grounded	Technically Broad	Versatile	Effective in Group Operations	Effective in Leadership Roles
<b>ABE Educational and ABET Accreditation Program Objectives</b>						
Technical Knowledge – <i>Graduates are able to use basic and engineering sciences to solve problems and to communicate effectively</i>		X	X	X		
Analytical and Problem Solving – <i>Graduates are able to analyze and solve technical problems and to work in teams</i>			X	X	X	
Human Relations and Leadership – <i>Graduates recognize the rights of others and assume leadership roles in employment, professional, and community activities</i>	X				X	X
Professional Responsibility – <i>Graduates assume responsibility for their professions/careers by remaining abreast of developments, technology, and tools in the engineering profession, of major contemporary issues, and of how the engineering profession relates to societal and ethical issues</i>	X				X	

The following are specific characteristics, activities and accomplishments that the IPAC expects of young engineers in ABE related to the broad World-Class Engineer Attributes:

- Aware of the world
  - a. Appreciation of world economics
  - b. Acceptance and understanding of diverse cultures
  - c. Awareness of diverse standards, regulations, and constraints

- Solidly Grounded
  - a. Ability to pass Fundamentals of Engineering Exam
  - b. Rating of the University Program and ABET accreditation
  - c. Strong in fundamental problem solving
- Technically Broad
  - a. Ability to do many engineering functions that once were assigned to specialists
  - b. Awareness of biological processes and ability to apply this to engineering solutions
- Versatile
  - a. Ability to learn new tasks, techniques, and technologies
  - b. Ability to adapt to ever changing market conditions
  - c. Bring creativity and innovation to problem solving
- Effective in Group Operations
  - a. Effective listening and communication skills
  - b. Ability to fill a defined role in an organization/team
  - c. An understanding of multidisciplinary skills and appreciation of their input and value to engineering solutions
- Effective in Leadership Roles
  - a. Goal-oriented and focused on results
  - b. Ability to make fact-based decisions and to build team consensus
  - c. Good foundation in basic project management skills

## Appendix C

### ACCOMPLISHMENTS Strategic Plan 2005-2008

#### Goal 1: Increase numbers of ABE and ASM graduates per year.

- ABE annual graduates increased 69% between 2005 (13) and 2007 (22), yet fell 12% short of our goal of 25 in 2007. With a Spring 2008 graduating class of 21 pending at this time, it is likely that this 2008 goal will be reached.
- ASM annual graduates increased 50% between 2005 (8) and 2007 (13). In between in 2006 there were 15 ASM graduates. The Spring 2008 ASM graduating class is 6; therefore, reaching a goal of 25 graduates in the calendar year 2008 will be very challenging.
- Over the past 5 years, Fall enrollments in the ABE undergraduate engineering program increased 110%, from 46 in 2002 to 97 in 2007.
- Over the past 5 years, Fall enrollments in the ASM undergraduate program increased 82%, from 23 in 2002 to 42 in 2007.
- Over the past 5 years, therefore, the combined undergraduate enrollment in the ABE Department has increased 101%, from 69 in 2002 to 139 in 2007.
- The increase in enrollment over the past 5 years in the Department of Agricultural and Biological Engineering represented **39%** of the total undergraduate enrollment increase in the College of Agricultural Sciences (which gets headcount) for the same period.
- Annual faculty evaluation criteria specifically identified recruitment activities as a recognized and rewarded endeavor.
- An Adopt-a-Campus program was implemented whereby individual faculty members were identified as the primary contact with a specific commonwealth campus for recruitment and informational purposes.
- In March 2005 our IPAC (Industrial and Professional Advisory Council) through the College of Engineering (COE) mapped our 4 ABET Categories of Educational Goals to the COE expectations for a “World Class Engineer.” (See Appendix B)
- The level of scholarship funding awarded through ABE department-based scholarships increased 14.7% from \$25,295 in academic year 2004/05 to \$29,016 in 2007/08. (See Appendix D)
- Created ABE 491, *Contextual Integration of Communication Skills for the Technical Workplace*, and ABE 492, *Contextual Integration of Leadership Skills for the Technical Workplace*, to enhance “soft” skills of our ABE and ASM students. These courses replaced ENGL 202C/D, *Technical Writing*, and ABE 490, *Senior Seminar*, as required courses.

## **Goal 2: Strengthen the Graduate Program of the Department.**

- Graduated 8 MS/PhD candidates in 2005, 10 in 2006, and 10 in 2007.
- Restored in June 2006 designation on the transcripts of our graduate student (MS and PhD) graduates to reflect that the degree was conferred by the College of Engineering in joint administration with the College of Agricultural Sciences rather than conferred by the College of Agricultural Sciences only. This action restored credentials of the degrees coming from an ABET-accredited College of Engineering, which is crucial for professional engineering (PE) registration. This designation had been arbitrarily and unbeknown to the Department changed in 2001 by the University.
- ABE 568, *Food Safety Engineering*, was approved as a new graduate course in March 2006.
- With the loss of nearly half of our funded graduate assistantships (~6.5) in 2001 and 4 faculty positions between 2001 and 2007 because of severe budget cuts in the College of Agricultural Sciences, maintaining traditional levels of graduate students has been very challenging. Active faculty members have compensated partially by diligently writing graduate support into their externally funded grants. The hire of 2 new faculty members in late 2007 should also help attract and support more graduate students.
- We have maintained high numbers of top-quality graduate study applications in the Department and had the highest number of offers accepted in 2008 among the units in the College of Agricultural Sciences.
- Current graduate student enrollment (30) is 71% of what it was 5 years ago (42). Another factor that tends to reduce enrollment is a trend toward offering more PhD assistantships and fewer MS assistantships. The longer period of obligation to the PhD than to the MS reduces the number of assistantships we have to roll over each year. Consequently, there are even fewer assistantships to offer each year.
- In 5 years, the percentage of female graduate students has risen from 9 to 13 (+44%) to a level of 43% of our graduate student body. Minority enrollment, however, has declined from 3 to 1 in this period.

## **Goal 3: Strengthen Capacities of Faculty, Staff, Collaborations, and Facilities Commensurate with the Demands of a Dynamic, Broad-based, Evolving Discipline.**

- Filled a tenure-track faculty position in *Natural Fiber Materials Engineering* in October 2007
- Filled a tenure-track faculty position in *Machine Systems Engineering for Biomass Energy* in December 2007
- Successfully competed university-wide for a co-funded PSIEE (Penn State Institutes of Energy and Environment) faculty position in *Synthetic Biology Engineering* and conducted search in early 2008.

- Successfully used fixed-term hires, graduate students, and post docs up to about the 40% level to continue to offer our broad-based course offering even with a loss of 25% of our tenure-track faculty positions between 2001 and 2007.
- Accommodated 1-2 sabbatical leaves per year over the past 3 years.
- Completed renovation and occupation in 2007 of a new Bioresources Engineering (Biowastes) Lab in Room 113 for Dr. Tom Richard.
- Made significant improvements (drop ceiling, new lighting, new lab cabinets, and painting) in Particle Mechanics Lab (Room 7) for Dr. Puri.
- Renovated Rooms 1 and 4 for installation of a Dynamic Olfactometry Lab that provides unique, scientifically defensible research with odor issues (Drs. Wheeler and Brandt).
- Built considerable faculty and facility resources for biomass energy research.
- Initiated a renovation project of Room 106 and 107 for a new Natural Fiber Materials Engineering Lab for Dr. Catchmark.

**Goal 4: Assure Proper Participation and Leadership from the ABE Department in the Potential Evolution of a Biology-based Engineering Discipline.**

- Gained university approval to change the name of the undergraduate engineering curriculum from Agricultural and Biological Engineering to *Biological Engineering*, effective Spring Semester 2008.
- Have been tacitly recognized by the College of Engineering and the College of Agricultural Sciences as a lead unit for renewable biomass energy and biofuels.
- Collaborating with interdepartmental colleagues in the search for the co-funded PSIEE *Synthetic Biology Engineer* faculty position. Will potentially make this the first faculty position hired jointly (financially) with the College of Engineering.
- Tom Richard was the 2007 President of the Institute of Biological Engineering (IBE), and Roy Young was Secretary-Treasurer of the Council of Societies of AIMBE (American Institute of Medical and Biological Engineering).

## Appendix D: Metrics for our Performance Indicators, 2001-2007

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**Strategic Goal #1: To increase numbers of ABE and ASM graduates per year.**

***Educational Programs:***

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
No. ABE Graduates	11	13	11	15	13	16	22
Ave. GPA	3.13	3.28	2.87	3.35	3.22	3.33	3.06
No. ASM Graduates	3	7	3	10	8	15	12
Ave. GPA	2.64	2.71	2.64	2.97	2.91	2.99	3.02
	<u>Fall 2001</u>	<u>Fall 2002</u>	<u>Fall 2003</u>	<u>Fall 2004</u>	<u>Fall 2005</u>	<u>Fall 2006</u>	<u>Fall 2007</u>
No. of ABE Undergraduates	47	46	58	53	71	87	97
No. of ASM Undergraduates	21	23	28	37	39	36	42
	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
No. of Internships	6 ABE 3 ASM	2 ABE 0 ASM	1 ABE 0 ASM	3 ABE 2 ASM	0 0	1* ABE 2* ASM	1* ABE 2* ASM
No. of Co-ops	3	1	1	0	1*	1*	1*
No. Undergraduate Research Projects	6	3	1	0	1	2	3
	<u>2001/2002</u>	<u>2002/2003</u>	<u>2003/2004</u>	<u>2004/2005</u>	<u>2005/2006</u>	<u>2006/2007</u>	<u>2007/2008</u>
Undergraduate ABE Scholarship \$ Awarded	\$14,115	\$20,690	\$23,258	\$25,295	\$26,094	\$28,528	\$29,016
No. of Revised Courses	1	5	0	10	6	1	0
No. of New Courses	0 (ABE); 0 (ASM)	0 (ABE) 0 (ASM)	0 (ABE) 0 (ASM)	2 (ABE) 0 (ASM)	1 (ABE) 0 (ASM)	1 (ABE) 0 (ASM)	1 (BE) 1 (ERM)

\*As registered for credit. Others were employed in related positions, but not for credit.

***Diversity/Climate:***

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
% Female Undergraduates (No.)	24% (17)	18% (14)	26% (22)	19% (17)	24% (26)	17% (21)	15% (21)
% Minority Undergraduates (No.)	1% (1)	3% (2)	5% (4)	6% (5)	10% (11)	11% (13)	9% (12)

***Marketing:***

No. of undergraduate information letters mailed	81	110	299	285	104	131	256
No. incoming freshmen (ABE)	5	18	12	12	16	11	17
No. incoming freshmen (ASM)	6					12	17
No. of faculty involved with PGSA (PA Governor's School)	5	5	4	5	7	7	4
No. of Commonwealth Campus visits	4	4	4	8	10	11	9
No. of Open House visitors	4	10	10	5	10	25	28

**Strategic Goal #2: To strengthen the graduate program of the Department.**

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
No. PhD Graduates;	PhD-4;	PhD-2;	PhD-1;	PhD-0;	PhD-2;	PhD-8;	PhD-5;
MS Graduates;	MS-2;	MS-2;	MS-3;	MS-1;	MS-6;	MS-2;	MS-5;
Ave. GPA	3.66	3.67	3.62	3.88	3.61	3.62	3.60
	<u>Fall 2001</u>	<u>Fall 2002</u>	<u>Fall 2003</u>	<u>Fall 2004</u>	<u>Fall 2005</u>	<u>Fall 2006</u>	<u>Fall 2007</u>
No. of Graduate Students	46	42	34	29	32	29	30
	<u>2001/2002</u>	<u>2002/2003</u>	<u>2003/2004</u>	<u>2004/2005</u>	<u>2005/2006</u>	<u>2006/2007</u>	<u>2007/2008</u>
Graduate ABE Scholarship \$ Awarded	\$2,500	\$1,350	\$2,249	\$1,350	\$1,285	\$1,370	\$0
<b><i>Diversity/Climate:</i></b>							
	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
% Female Graduate Students (No.)	24% (11)	21% (9)	26%(9)	35% (10)	38% (12)	41% (12)	43% (13)
% Minority Graduate Students (No.)	9% (4)	7% (3)	9% (3)	3& (1)	3% (1)	7% (2)	3% (1)
No. of potential graduate student visits to department	10	7	8	0	4	3	3

**Strategic Goal #3. To strengthen capacities of faculty, staff, collaborators, and facilities commensurate with the demands of a dynamic, broad-based, evolving discipline**

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
<b><i>Interdisciplinarity:</i></b>							
No. of faculty hires (tenure track)	0	0	0	1	0	0	2
No. of adjunct appointments	2	2	2	3	3	3	4
Faculty Professional Registrations	11	11	11	11	11	11	12
No. of Clerical Staff	5	5	5	5	5	5	5
No. of Fixed Term Employees	4	6	6	6	6	6	6
No. of Sabbatical Leaves	-	-	-	-	-	2	3
No. of Staff Professional Development Activities	49	38	31	45	50	36	78
No. and % of faculty with joint appointments	18	19	17	17	18	16	15
% Female Faculty (No.)	6% (1)	5% (1)	6% (1)	6% (1)	6% (1)	6% (1)	6% (1)
% Minority Faculty (No.)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)
No. Refereed Publications	43	34	43	40	44	39	48
No. of Non-Refereed Publications	68	87	81	69	61	61	69
Books, Chapters of Books, and Published Book Reviews	4	1	4	1	4	4	3
	<u>FY 00-01</u>	<u>FY 01-02</u>	<u>FY 02-03</u>	<u>FY 03-04</u>	<u>FY 04-05</u>	<u>FY 05-06</u>	<u>FY 06-07</u>
<b><i>External Activities:</i></b>							
No. and \$ externally funded grants awarded	52— \$2,622,851	44— \$4,489,267	37— \$1,206,239	25— \$3,188,488	28— \$2,125,935	31— \$2,330,658	24— \$1,497,794

No. and \$ of proposals submitted	73— \$15,980,559	45-- \$8,297,471	42-- \$11,088,898	45-- \$28,860,265	49— \$8,839,986	34— \$4,794,702	41— \$5,937,675
No. of faculty on sabbatical leaves	1	0	0	1	0	2	1
No. and \$ gifts	1— \$15,000	0	1— \$20,000	4— \$23,625	0	6— \$30,500	7— \$249,275

***Facilities:***

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
Status of long range planning for renovation	On hold	Inactive	Inactive	Inactive	Inactive	Inactive	Inactive
Renovations Classrooms	Rooms 114 & 124 renovated as technology classroom; Room 106 renovated	--	Upgrade of room 106 to a technology classroom	--	--	ABE priority scheduling given for Room 124	--
Roof Replacements		North section lab wing re-roofed	Central and 2 <sup>nd</sup> north section of lab wing re-roofed	--	--	--	--
Renovations Research Areas	Room 112 occupied	--	Room 112 enlarged w/added cabinet space	Design for renovating Biological Resources Lab in Room 113	--	Upgrades made to Room 7 (drop ceiling, lights, cabinets, paint)	Biological Resources Lab, Room 113, Renovation completed and occupied

**Facilities:**

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
Renovations Research Areas (cont.)							Rooms 1 & 4 renovated for olfactometry lab installation.  Initiated design for renovation of Rooms 106 & 107 for Natural Fiber Materials Lab
Renovations Offices	New furniture for Room 249	--	VoIP Phones installed w/Unified Messaging	--	--	--	--
Renovations Other	--	--	Sanitary drains installed separate from storm drains throughout ground floors	Room 244 conf. room upgraded with new carpet, paint and re-upholstered chairs	--	--	--

**Strategic Goal #4. To assure proper participation and leadership from the ABE Department in the potential evolution of a biology-based engineering discipline.**

	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
Name Change Activities	--	--	--	Proposed August 2004 to change ABE undergraduate undergraduate engineering to Biological Engineering (BE)			Change from ABE to BE for undergraduate engineering curriculum approved & effective Spring 2008 Semester
No. of faculty with IBE Membership	1	1	1	2	2	3	4
No. of faculty with Leadership Roles in IBE, AIMBE, IFT, etc.				1—President of IBE (Young)	1-AIMBE	1-AIMBE	1—President of IBE (Richard) 1—AIMBE Secretary-Treasurer of Council of Societies (Young)