



Armour College of Engineering Strategic Plan: 2003-2010

Introduction

The IIT Armour College of Engineering (ACE) traces its roots to Armour Institute, founded in 1892, to prepare students of all backgrounds for leadership roles—primarily as engineers—in a changing industrial society. Today, Armour College continues that tradition of excellence in engineering education and research. Home to about 90 full-time faculty and about 2500 undergraduate and graduate students, ACE presently houses five engineering departments: Biomedical; Chemical and Biological; Civil, Architectural and Environmental; Electrical and Computer; and Mechanical, Materials and Aerospace Engineering.

ACE also houses two interdisciplinary institutes (Pritzker Institute of Biomedical Engineering, and Energy and Sustainability), and twelve research centers (Complex Systems and Dynamics, Electrochemical Science and Engineering, Polymer Science and Engineering, Power and Power Electronics, Energy and Power, Fluid Dynamics, Particle Technology and Crystallization, Medical Imaging, Integrative Neuroscience and Neuroengineering, Diabetes, Building Materials and Thermal Processing).

With dynamic and motivated faculty and students, smaller size classes and first rate educators who integrate cutting edge research and excellence in education, ACE is well positioned to achieve its vision.

Our strategic plan focuses on launching broader and interdisciplinary engineering education programs and on creating an environment to enhance interdisciplinary research in our core competency and national priority areas. Our plan also includes quantitative goals for a number of faculty, students, research funding, and facilities. It also includes our specific plan for fundraising for scholarships, facilities, faculty development and lectureship services.

We will capitalize on our small size and cross boundaries between traditional academic units to achieve our goals and position ACE among the leading engineering colleges in the nation. The following are our specific plans for faculty and students, education and research programs, communication and marketing and fundraising initiatives, and administrative functions.

Executive Summary

Our goal is to attract world class faculty and top graduate and undergraduate students and to maintain the present core of top faculty and staff to support our vision. To achieve our goal, we plan to increase the number of tenure/tenure-track faculty from 77 in 2003 to 100 by 2010, including hiring 8-10 leading senior faculty in targeted research areas. This will enable ACE to have critical number of faculty with research activities needed to be one of the top 50 schools in engineering. At the same time, increase the number of degree seeking students per faculty from approximately 25 to about 27 by 2010. This means 30% in undergraduate and 50% in graduate enrollment increase by year 2010. The increase in the number of students is based on our expected general increase in undergraduate students (due to significant improvements and the modernization of undergraduate laboratories and classrooms), transfer students (due to our plan to expand partnership with colleges in the Chicago area and the impact of the ACE scholarship in attracting top quality graduate and undergraduate students), an increase in professional master students in the targeted areas of interest (e.g., biological and pharmaceutical engineering; manufacturing; power; imaging; and computer engineering related areas) and an increase in the number of PhD/ MS students due to the increase in the number of new senior and junior faculty and improvement of present faculty activities by enforcing our comprehensive faculty performance evaluation and reward system.

Our research goal includes cross-disciplinary research, via our two research Institutes, ten research centers and core research competency areas, and launching Collaborative research with other academic units at IIT, other universities, government laboratories and research organizations, and industry. Our plan also includes focusing on research priority areas of the College in which we should stake out a stronger leadership position and earmarking of additional faculty and financial resources. To date, in addition to the present research center activities, we have identified four main areas of high priority: Energy and Sustainability, Bioengineering, Manufacturing and Nanotechnology. We expect our research revenue to grow continuously due to hiring new faculty in recent years in manufacturing and bio-related areas who are beginning to receive research grants. The research growth rate should be enhanced significantly when we begin to launch our initiatives to hire senior faculty and improve the research infrastructure and complete new labs in the engineering research building, incubator and Technology Park. Our goal is to reach and maintain number of PhD graduates per faculty per year above 0.5 and to increase Armour College average research funding to a level of \$14 million per year by 2010. This means increased of more than 100% in annual research funding; and funding/faculty per year from \$90,000/faculty in 2004/2005 academic year to \$140,000/faculty in 2010.

In addition, we will specifically address short- and long-term issues that improve the ranking of the Armour College of Engineering. Our goal is to be among the top 50 engineering schools in the nation.

Strategic Plan

Faculty/Students*

Our goal is to attract world class faculty and top graduate and undergraduate students and to maintain the present core of top faculty and staff to support our vision. To achieve our goal, we plan to increase the number of tenure/tenure-track faculty from 77 in 2003 to 100 by 2010, including hiring 8 leading senior faculty in targeted research areas. At the same time, increase the number of total students per faculty from approximately 25 in 2003 to about 27 by 2010. This means more than 40% increase in student enrollment by year 2010. The increase in the number of students is based on our expected general increase in undergraduate students (due to significant improvements and the modernization of undergraduate laboratories and classrooms), and transfer students (due to our plan to establish partnership with colleges in the Chicago area and the impact of the ACE scholarship in attracting top quality high school students), an increase in professional master students in the targeted areas of interest (e.g., biological and pharmaceutical engineering; manufacturing; power; imaging; and computer engineering related areas) and an increase in the number of PhD/ MS students due to the increase in the number of new senior and junior faculty and enhancement of research activities. In addition, we will specifically address short- and long-term issues that improve the ranking of the Armour College of Engineering.

The following is the specific action plan for ACE faculty and students:

- Hire needed faculty in research growth areas of national interest. This includes hiring about 8 senior faculty and chair professors in the areas of renewable energy, power and electric network security, energy conversion (coal/bio), aerospace, neural engineering, diabetes, manufacturing, construction/ architectural engineering, and biological and pharmaceutical engineering. We will use our present four vacant endowed chairs and future position of the chairman of BME as part of package to attract senior faculty. Our plan also includes hiring 15 new assistant professors to support activities of senior professors and to support our educational and research needs in the growth areas.
- Allocate additional faculty and resources to areas that continuously show significant positive enrollment growth. If today's trends continue, potential candidate programs include aerospace and bio-engineering.*
- Continue to conduct teaching workshops in fall and spring semesters required for all new faculty and provide funds for them to attend one of the National Teaching Workshops offered by the American Society of Engineering Education (ASEE).*
- Continue revising all Ph.D. exams and faculty promotion and tenure procedures in all five engineering departments and raising the bar to enhance quality of research and education in the College.*
- Implement the faculty load and evaluation processes approved by all ACE academic units.*

- Continue to encourage and provide incentives for faculty to seek joint appointments- this will further enhance collaboration between faculty from different academic units.*
- Develop graduate scholarship and research seed funding to support faculty research in the existing and emerging research competency areas identified in ACE.*
- Establish committees to promote our faculty achievements and to enhance the reputation of ACE by nominating our faculty for national and international research and educational awards.*
- Promote increased interaction between our graduate and undergraduate students across different departments and different cultures-as the primary contributors to engineering research, graduate students can serve as mentors and role models for undergraduates.
- Continue to attract more women and minority students and faculty by creating a more welcoming and diverse community. Prepare and submit proposals for graduate support, with a focus on women and minority students, to federal and state agencies and foundations.*
- In collaboration with Undergraduate and Graduate Admission groups, develop a comprehensive plan to increase enrollment. This could be achieved by focusing on marketing of targeted areas of professional master's programs (wireless communication and professional engineering courses for civil engineers), and launching innovative programs at the undergraduate level such as the ACE scholarship, UG research, and establishment of showcase laboratories.*
- Develop a dual admission program with two- or four-year colleges in the Chicago area to attract additional transfer students to ACE and, in turn, increase undergraduate enrollment.

*Task has already been completed, or a significant portion has been accomplished.

Education Programs

Our goal is to play a key role in educating future leaders in engineering by providing state-of-the-art programs in engineering research and education. Our goal also includes continued improvement of the undergraduate and the graduate curricula for education of a new breed of engineers. These engineers should possess not only a strong knowledge of fundamentals, but also the knowledge required for broad engineering applications and an understanding of societal, legal and environmental issues that determine intellectual technological choices.

The following is the specific ACE educational action plan:

- Continue to work closely with faculty task forces and earmark resources to significantly revise the undergraduate and graduate engineering curriculum at IIT (make it interdisciplinary with broad engineering applications). We expect this initiative to put us in an educational leadership position among engineering colleges in the nation.*

- Develop professional master programs and short courses in new emerging areas (bioengineering, manufacturing, pharmaceuticals, energy, imaging, aerospace and computer engineering).
- Secure resources and raise funds from foundations and individuals to establish endowments to support tuition and stipends for teaching assistants (T.A.). This resource is essential to attract top graduate students as T.A.s who will be a significant factor in enhancing the retention rate in the College.
- Launch a campaign to raise spendable and endowed funds to support graduate research scholarships. Provide facilities and needed resources and incentives to encourage faculty to write multidisciplinary proposals to raise funding for graduate research fellowships from agencies such as the National Science Foundation.
- Strengthen Armour effort in data collection from alumni, current students, faculty and employees to establish a comprehensive assessment process and, at the same time, continue to implement all engineering program plans and assessments in compliance with ABET and NCA guidelines.*
- Establish Armour College of Engineering seminar series, and invite leaders in engineering education and research to the campus.*
- Continue commitment to provide students with fundamental knowledge within the core disciplines of engineering, and, at the same time, broaden the curriculum by introducing interdisciplinary, real world examples with continuing focus on interprofessional (IPRO) and entrepreneurial (EnPRO) team projects.*
- Continue to enhance collaboration with Food Safety and Technology Center and IIT Research Institute in biotechnology and food processing areas. Create a joint tenure-track faculty slot between ACE and Food Safety and Technology Center.*
- Launch biological engineering education and research programs in ChEE Department, and develop a master's degree program in bioengineering and strong undergraduate and graduate specializations and certificate programs in biological and pharmaceutical engineering.*
- Evaluate Internet course/degree offerings and take advantage of this means of communication and marketing to attract students from all over the world.*
- Develop short courses and professional master programs in new technology and emerging areas in partnership with industry.*
- Establish faculty task forces and earmark resources to develop courses and educational tracks to expose students to emerging and important fields such as: bioengineering, renewable energy, health-related areas and nano-engineering and science.*
- Enhance our activities at Rice Campus by offering different certificate and professional master programs in targeted areas in collaboration with industry and research laboratories in the western suburbs.
- Strengthen environmental program and explore possibility of offering environment related course for all undergraduate engineers.

*Task has already been completed, or a significant portion has been accomplished.

Research Programs

The challenge in engineering research is to discover new knowledge and apply it to the invention and development of new processes and products. Today, engineering research is being conducted on several levels—on a micro-scale, from molecules and living cells, to a macro-scale, from processes and products. Meeting this challenge requires researchers who are able to combine efforts in several engineering and science fields.

Our mission includes cross-disciplinary research, via our two research Institutes, twelve research centers and core research competency areas. Program objectives include integrating research from other departments and disciplines at IIT, and from our collaborators at other universities, government laboratories and research organizations, and in business and industry. Our plan also includes identification of research priority areas of the College in which we should stake out a stronger leadership position and earmarking of additional faculty and financial resources. To date, in addition to the present research center activities, we have identified four main areas of high priority: Energy and Sustainability, Bioengineering, Manufacturing and Nanotechnology in collaboration with the College of Science and Letters and other colleges and institutes. We expect to increase Armour College average research funding to a level of \$14 million per year by 2010. This means increased of more than %100 in annual research funding; and funding/faculty per year from \$90,000/faculty in 2004/2005 academic year to \$140,000/faculty in 2010.

The following is the specific ACE research action plan:

- Continue to provide additional needed assistance in fundraising and large-scale proposal preparation to our present Institutes and Centers and core competency research areas in the College.*
- Work closely with External Affairs and Research Offices at IIT to include a provision for new initiatives that may arise occasionally that takes advantage of the unique attributes of IIT and resources of the Chicago area and to seek opportunities for funding from city, state and federal government agencies.*
- Strengthen the Energy and Sustainability Institute by allocating resources for Center director/ associate director, additional senior faculty, the needed educational and research facilities, and launching a campaign to raise funding to support the Institute's plans. IIT has a major opportunity to become one of the leading academic institutions in the nation in addressing the intertwined issues of industrial ecology, energy, security and sustainable development. The opportunity leverages our recognition in energy, power and environmentally-related research and education, the original formulation of the Energy/Environment/ Economics paradigm, and the current and emerging strengths across several academic disciplines.*
- Continue to strengthen biomedical engineering research and education programs and the Pritzker Institute for Biomedical Science and Engineering by: 1) allocating resources to the Institute for additional senior faculty and needed educational and research

facilities; 2) enhancing relations with The University of Chicago and other medical schools in the Chicago area and elsewhere; and, 3) providing needed resources and launching a campaign to raise funding for the neural engineering and science, medical imaging and diabetes centers.*

- Continue our leadership in launching the National Coalition of Manufacturing Innovation with Mechanical, Materials and Aerospace Engineering as the lead department. This initiative is expected to attract significant government funding to the Coalition and to IIT.*
- Launch nanotechnology initiatives in collaboration with the College of Science and Letters, other colleges and institutes at IIT, Argonne National Laboratory, and industry.
- Initiate research and development partnership in specific areas with industry, government laboratories, City of Chicago and State of Illinois to address issues that affect economic growth and environmental and social concerns such as energy and sustainability, manufacturing and bioengineering.*
- Continue to provide additional needed assistance and resources in fundraising and large-scale proposal preparation to our present institutes and centers and core competency research areas in the College.*
- Explore ways to further enhance support service for faculty to prepare proposals and provide facilities to encourage faculty to write proposals for small business initiatives programs.
- Appoint faculty committee and finalize the endowment account to support graduate students and research in Fluid Power Engineering.*

*Task has already been completed, or a significant portion has been accomplished.

Facilities

Investment in labs and equipment allows us to offer increased opportunities to undergraduates and enables graduate students and faculty to continue producing visionary work.

The following is the specific ACE facilities action plan:

- Request from administration as high priority and collaborate with development group to raise funds for badly needed space renovation for laboratories and maintenance of major equipment and offices in the College.*
- Identify final space for Biomedical Engineering Department and faculty offices-work closely with central administration to complete this task according to the original plan.*
- Acquire new equipment that will benefit and be used by the entire College.
- Secure the establishment of two new needed undergraduate labs for Biomedical Engineering Department (according to original plan submitted to Whitaker Foundation).*
- Establish an undergraduate lab in Computer Engineering.*

- Continue our modernization of undergraduate labs in Electrical and Computer Engineering, Civil and Architectural Engineering, Mechanical, material and aerospace and Chemical and Environmental Engineering (\$5 million is estimated in total needs to renovate all undergraduate laboratories).*
- Work closely with development group to establish endowment fund of about \$5 million for maintaining modern undergraduate laboratories.*

*Task has already been completed, or a significant portion has been accomplished

Communications & Marketing*

The following is the specific ACE communications and marketing action plan:

- Develop marketing tools in collaboration with Graduate Admission for specific programs such as: bioengineering professional master, and professional engineering courses for civil engineers.*
- Market our short courses, certificate, and professional degree programs at Rice Campus in collaboration with Chicago area industries.*
- Launch global marketing of our programs, possibly by initiating alliance with selected universities outside the United States.*
- Develop and maintain Armour College and all of its departmental user-friendly web sites.*
- Prepare brochure and marketing documents for targeted graduate education areas and for our core research competency areas.*

*Task has already been completed, or a significant portion has been accomplished.

Fundraising*

The following is the specific ACE fundraising action plan:

- Identify Armour College campaign priorities and continue to work with Development and Alumni Association offices to achieve our campaign goal . This plan includes fundraising for faculty development, graduate and undergraduate scholarships, and laboratory facilities.*
- Initiate a campaign to establish Armour College of Engineering fund to support graduate scholarships, chaired professorships undergraduate and research laboratories and a discretionary fund which will allow Armour College to support academic opportunities and urgent needs as they arise.*
- Establish Women in Engineering Scholarship and prepare proposals to attract minority graduate students to ACE programs.
- Establish Armour College of Engineering Undergraduate and graduate Scholarships (ACE Scholarship) as a means of attracting high caliber students to IIT engineering programs.*

Administrative Functions

The following is the specific ACE administrative action plan:

- Continue development of a strong advisory board consisting of leaders of industry, national labs and universities plus a representative member from each ACE departmental advisory boards to ensure communication between the leadership of all academic units in the College. *
- Assist in strengthening the advisory boards of the individual academic units.*
- Streamline all Armour activities such as payroll, communication, graduate and undergraduate admission, technical services, etc.; coordinate the purchase of goods and services with existing and prospective strategic partners; and develop a task force for each activity consisting of a leader from Armour College and at least one representative from each department. These task forces identify issues and directly collaborate with responsible individuals at IIT to facilitate our everyday operation.*
- Maintain high quality staff and hire additional technical and administrative staff as needed.*