PENNSTATE

College of Engineering

WORLD-CLASS ENGINEERING

in Learning, Discovery, and Engagement

2014-2019 STRATEGY

PREAMBLE

The College of Engineering at Penn State is a leading academy for learning, discovery, and engagement that is recognized worldwide for excellence in academic programs, research enterprise, and service to the global engineering community. Innovation is a hallmark of Penn State Engineering, with unique programs such as the Learning Factory, Engineering Ambassadors, and formal Leadership and Entrepreneurial programs. The College of Engineering is exceptionally strong among the University Park Campus colleges in terms of number of students, number of faculty, research expenditure, and gift/endowment income. It's undergraduate and graduate programs are nationally ranked 18th and 25th respectively, according to *U.S. News and World Report*. Data obtained from Academic Analytics yields a ranking of 11th for number of citations and awards among all engineering programs in the U.S.A. The College is ranked 8th on the basis of number of research grants, and 4th with regard to number of faculty with a published research article. Our undergraduate program is the second largest in the U.S.A and our alumni association is one of the largest in the world, with more than 95,000 living alumni. While being proud of it's accomplishments, the College is determined to strengthen and broaden its educational programs, modernize it's research portfolio, expand the faculty in emerging areas, and hence deepen it's impact on society and achieve global preeminence.

This document outlines our values, vision, and mission; sets forth our strategic goals in education, research, service, and governance; and defines our education and research thrusts for the next five years. The strategic goals and thrusts are derived from the strategy snapshots of the individual Departments and the priority thrusts of partner Penn State colleges and institutes, reviewed through community consultation with alumni, faculty, and academic leaders in Penn State. Through the implementation of this strategy, the College is poised to develop further it's educational programs towards graduating engineers prepared to be world-class and aspires to focus its research on addressing the world's most pressing challenges.

VALUES

Excellence
We pursue excellence in our educational, research, and service programs, supporting our faculty, staff, and students in their individual and collective efforts to achieve their professional and personal career goals. We expect, value, and recognize excellence from our faculty, staff, and students.

Innovation
We seek and embrace innovation and creativity in teaching and learning; research and discovery; service and engagement; and governance of our academy.

Professionalism
We perform our work safely and at the highest level, exercising good judgment and interacting collegially both inside and outside of Penn State.

Integrity
We respect others; conduct ourselves ethically, honestly, and openly; honor our commitments; and fairly resolve ethical issues in our work.

Diversity
We value living and working in a diverse community that enriches cultural and technical experiences and we strive to enhance the diversity of our faculty, staff, students, and collaborators.

Collaboration
We collaborate across disciplinary, administrative, cultural, and political boundaries to understand and integrate expertise and experiences complementary to ours and to facilitate devising innovative solutions to societal challenges.

Sustainability
We conduct our academic mission in a safe and sustainable manner; strive to protect and enhance our natural and built environment for future generations; and we permeate sustainability principles in our interactions with students, staff, faculty, and collaborators.

VISION

The College of Engineering will be a top-ranked preeminent global academy in world-class engineering education and learning; and research and discovery, in service to and engagement with the technical community and civil society.

MISSION

To nurture and train world-class socially aware, globally connected, diverse engineers, educators, and researchers with rigorous core knowledge and problem-solving skills, who understand complex, interacting engineering and societal systems. To develop innovative solutions to the world's most pressing challenges through transformational interdisciplinary research.

STRATEGIC OBJECTIVES

Education
Develop, in cooperation with Penn State colleges, institutes, campuses and alumni, residence and distance undergraduate and graduate curricula, and research management platforms that respond to current and emerging global needs of society, including industry, government, and academe; and enhance the learning experience through deep and broad curricula that include service learning, increasing diversity and improving student satisfaction.

Research
Perform top quality contextual collaborative research that leads to the enhancement of the quality of life and develop basic knowledge and enabling technologies that contribute to economic development, and addresses the most pressing regional, national, and global challenges.

Service
Contribute to and provide leadership in professional organizations to consolidate the recognition of engineers and scientists as stewards of economic prosperity, innovation and social responsibility, and support service activities of importance to the Commonwealth, the U.S.A., and the world.

Institutional Governance
Create structures and procedures that balance due process and agility. Develop shared governance; transparent and inclusive operations; and business flexibility and efficiency. Institutionalize fiscal responsibility, conscious community-building, increased diversity, concerted workforce development, and enhanced institutional investment. Accentuate response to ever-changing regional, national and international operational conditions.

STRATEGIC GOALS

In Education

1. Enhance the Penn State deep, fundamental undergraduate educational experience with leadership and entrepreneurial training; global awareness; cultural sensitivity; presentation and communication skills; intense project-based and service learning; and more online degree programs.
2. Initiate residence and online cross-Department and cross-College undergraduate majors and minors focused on interdisciplinary topics, institutional priorities, and societal challenges.
3. Offer and continuously expand one-year, non-thesis Master of Science and Master of Engineering degrees in all sub-disciplines of engineering and a number of cross-disciplinary topics based on societal challenges and the priorities of Penn State.
4. Strengthen and expand Ph.D. programs through emphasis on recruiting top external students and Penn State M.S. graduates, provide training in teaching and research management methodologies.
5. Identify and address issues affecting the environment in which are students work and live, to increase retention, diversity, and student satisfaction.

In Research

6. Develop innovative, interdisciplinary research groups working on college-wide topics at the intersection of societal challenges, faculty interest, and research infrastructure to increase externally funded center-type projects.
7. Substantially increase research collaborations with Penn State institutes, colleges, laboratories, campuses, and alumni to probe new fundamental, applied, and interdisciplinary research topics.
8. Increase deliberate college-wide research collaborations with universities, industry, and global partners.
9. Enhance the quality of key laboratories and infrastructure that support priority research thrusts.

In Service

10. Increase faculty contribution to and influence in national and international technical and policy-making committees.
11. Raise the profile of and facilitate engaged service on college and campus committees as well as in support of the Commonwealth, the U.S., and international committees.

In Governance

12. Enhance business operations, fiscal management, and access to and clarity of undertaking administrative and academic tasks by faculty and staff.
13. Align charge and constitution of all committees and sub-units with the College priorities and create mechanisms to implement their recommendations.
14. Recast the financial system to directly support the fundamental functions of education, research, and service and enhance the effectiveness of building and using financial resources.
15. Strengthen institutional affiliation and effectiveness by providing clear career progression models, advanced training opportunities, leadership development, and articulate the alignment of institutional and individual aspirations.

INSTITUTIONAL THRUST AREAS

The College of Engineering institutional thrusts are the outcome of synthesis of: (i) faculty and leadership priorities; (ii) the world's most pressing challenges; (iii) the Provost's draft strategy; and (iv) the priorities of Penn State University Park colleges and institutes. Detailed engagement across Penn State is part of the strategy implementation plan presented under separate cover. The College will invest in launching educational and research projects in the priority areas below through internal competitions. Such focused investment does not preclude supporting individual and small-group initiatives on topics of interest to the faculty and collaborators as well as responding to opportunities and emerging priorities of partners and funding agencies.

Innovative Engineering Education

- New instructional technologies and pedagogy
- Engaged online educational models and practices
- Integrated engineering, ethics, leadership, and entrepreneurship
- Global engineering education and experiences

Optimal and Secure Cyberenvironments

- Network and system design, vulnerability assessment/detection, quarantine, and optimization
- Cybersecurity and cyberphysical engineering; and healthcare services systems
- Data analytics, informatics, data modeling in health, physical, and life sciences
- Multi-scale, multi-physics systems modeling and simulation
- Cyberethics and cultural-technical system integration

Advanced Manufacturing for Medical, Electronic and Mechanical Sciences

- Bioprinting, biomedical sensing, and imaging
- Nanomanufacturing and biomedical devices
- 3D printing, additive manufacturing, and product development systems
- New materials characterization and applications for sustainability and enhanced performance

Resilient Infrastructure Systems

- Autonomous, optimized, and adaptive infrastructure systems
- Advanced land, sea, air, and space vehicles for civil and military applications
- Infrastructure system integration including technology, management, and finance

Sustainable Water-Energy-Food Nexus

- Tri-system modeling, optimization, and management of the interacting systems
- Water resources sustainability, management, treatment, desalination, energy consumption
- Energy efficiency, harvesting, alternative energy sources, biofuels, natural gas cycle
- Food production, harvesting, storage and transportation management, losses, and optimization
- Ethical energy, water, and food policies, socially-responsible production and distribution

STRATEGY IMPLEMENTATION PLAN

Tactics and enabling actions aimed at accomplishing the College of Engineering Strategic Goals are the subject of the Strategy Implementation Plans for the College and the Departments. Each goal is explained in detail, and a set of tactics and enabling actions are listed. Goal champions are identified and allocated the necessary resources, alongside definition of timeline, milestones, and metric(s) for assessing progress. Priority technical topics that are aligned with the strategy of the University are rendered the focus of the strategy implementation plan and resources for opportunities and individual initiatives not part of the institutional thrusts are allocated. The Strategy Implementation Plan includes active cooperation with pertinent University Park colleges and institutes as well as Commonwealth Campuses.