College of Engineering

WORLD-CLASS ENGINEERING THROUGH LEARNING, DISCOVERY AND ENGAGEMENT

2014-2019 STRATEGIC PLAN
PREAMBLE
The first draft strategy of the College of Engineering is described below. The document outlines our values, vision and mission, sets forth our strategic goals in education, research, service and governance, and defines our institutional education and research thrusts.

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 and Ethics
We act with integrity, collegiality and professionalism amongst ourselves and with external organizations; we respect differences in opinions and cultures; and we conduct all our endeavors ethically.

Diversity
We value living and working in a diverse community that enriches cultural and technical experiences, and we deliberately 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 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 is one of the preeminent global academies in world-class engineering education and learning, research and discovery, 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 and campuses, residence and distance undergraduate and graduate curricula that respond to current and emerging global needs of society, including industry, government and academe; enhance the learning experience through broadening curricula that include service learning, increasing diversity and improving student satisfaction.

Research
Undertake top quality contextual collaborative research that leads to the enhancement of the quality of life and develop basic knowledge and enabling technologies that serve society and the economy, and addresses the most pressing 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 of Pennsylvania.

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

Strategic goals in education
1. Enhance the undergraduate educational experience with leadership and entrepreneurial training, global awareness, presentation and communication skills, intensify project-based and service learning, and offer more online degree programs.
2. Initiate residence and online cross-department and cross-college undergraduate majors and minors focused on interdisciplinary 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 Penn State thrusts of health, education, resources, digital and culture.
4. Strengthen and expand Ph.D. programs through emphasis on recruiting external top students and Penn State MS graduates, provide training in leadership in teaching and research methodologies.
5. Identify and address climate issues to increase retention, diversity and student satisfaction.

Strategic goals 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 and campuses through new jointly hired faculty and energizing existing faculty.
8. Increase deliberate college-wide research collaborations with industry and global partners.
9. Enhance the quality of key laboratories and infrastructure that support institutional research thrusts.
MEDIUM-TERM PLANNING

Strategic goals in service
10. Increase faculty contribution to and influence on 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 of Pennsylvania.

Strategic goals in governance
12. Enhance business functions, access to and clarity of undertaking administrative and academic tasks by faculty and staff.
13. Align all committees and sub-units charge and constitution 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 (five pillars), and (iv) the available priorities of Penn State colleges and institutes; namely the Huck Institute of the Life Sciences (three thrusts), the Institute for Energy and the Environment (five themes), the College of Science (three major themes and several sub-themes), the College of Earth and Mineral Science (four themes), and the College of Medicine (five imperatives). Detailed engagement across the Pennsylvania State University is part of the strategy implementation plan presented under separate cover. The outcome from the consultation and synthesis process is below, subject to further discussions and refinement. The institutional thrusts below do 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 and optimization
- Cybersecurity and cyberphysical systems
- Data analytics, informatics, data modeling in learning and discovery
- Multiscale, multiphysics systems modeling
- Cyber-ethics and cultural-technical system integration
INSTITUTIONAL THRUST AREAS

Advanced Manufacturing for Medical and Mechanical Sciences
- Bioprinting, biomedical sensing, and imaging
- Nanomanufacturing and biomedical devices
- 3D printing and additive manufacturing
- New materials characterization and applications for sustainability and enhanced performance

Resilient Infrastructure Systems
- Autonomous and adaptive infrastructure systems
- Advanced land, sea and air 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 15 Strategic Goals are the subject of the College of Engineering Strategy Implementation Plan. 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.