## The Mission of the Lyles School of Engineering is to:
Advance civil engineering learning, discovery, and engagement in fulfillment of the Land Grant promise and the evolving responsibility of a global university

### Our Vision is to:

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<th>I. Amplify our impact on society</th>
<th>II. Lead the civil engineering profession</th>
<th>III. Attract top students, exemplary faculty, and support research opportunities</th>
<th>IV. Reach new heights in learning, discovery, and engagement</th>
<th>V. Have an unwavering commitment to ethics and diversity</th>
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<th>Recruit and retain highly productive faculty</th>
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<th>Establish new linkages to the world outside academia</th>
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INTRODUCTION

Purdue University’s Lyles School of Civil Engineering is among the best in the nation. With over 12,000 living alumni and with undergraduate and graduate programs consistently top-ranked by sources such as US News & World Report, it is clear the School has had a meaningful and lasting impact on society. While our accomplishments, not to mention our graduates, have been exemplary, we will not merely reflect on the past but continue to make civil engineering history. The Lyles School of Civil Engineering will be poised to leverage opportunities that enhance our education programs in the broad categories of discovery, learning and engagement.

The mission of our School is to advance civil engineering learning, discovery and engagement in fulfillment of the Land Grand promise.

The School is also committed to a strategic process. We will continue to address the critical needs of society and will regularly revise this plan to ensure it remains relevant and up to date.

MISSION

The mission of our School is to advance civil engineering learning, discovery, and engagement in fulfillment of the Land Grant promise and the evolving responsibility of a global university.

The Lyles School of Civil Engineering supports the missions of Purdue University and the College of Engineering.

VISION

The vision of the Lyles School of Civil Engineering is to be a preeminent program by building on our existing strengths and outstanding reputation and by amplifying our impact on society. This strategic plan sets forth a framework that allows us to lead the civil engineering profession and to be the most sought-after civil engineering program in the country by attracting top students, exemplary faculty, and by supporting discovery, learning and engagement opportunities. Underpinning all endeavors will be our unwavering commitment to ethics and diversity.

Learning:

Our future graduates will need to excel in a world where growing populations, increasing environmental stressors and diminishing resources will constrain economic growth. Problems such as climate change will demand global solutions that require better understanding of the causes, responsibility, and risk management. Integrated lifecycle project design and delivery will be the norm. Our students will learn flexibility and adaptability to change, which will be key attributes as they become leaders in tomorrow’s workforce.
To meet current and future challenges in infrastructure systems for transportation, the power grid, water supplies, waste disposal, fuel supplies and communication networks, among others, we will provide each student a firm grounding in mathematics, sciences, mechanics, and materials. This will be their foundation as they learn risk-based engineering design of structures, facilities and systems while we persistently emphasize critical thinking, the scientific method and creativity throughout our curriculum.

Purdue civil engineers will continue to be known for their determination to develop and implement new methods and products.

Employers and our advisory council emphasize that communication skills are key. We are taking measures so that our graduates can communicate effectively with technical and non-technical audiences, and collaborate in traditional or virtual teams that are intradisciplinary, cross-disciplinary, and multidisciplinary. We are creating new programs and opportunities for students to learn and embrace management and leadership skills.

We also strive to instill in students the importance of global consciousness. Purdue civil engineers will continue to be known for their determination to develop and implement new methods and products that are energy efficient, technologically innovative, and socially, economically and physically sustainable.

Discovery:

Faculty, student, and staff research in the Lyles School of Civil Engineering will reflect our strong ongoing commitment to create more resilient, sustainable, and holistic solutions for an ever-changing world.

Integrated and optimized building design and operation, combined with renewable and innovative construction materials, technologies and controls, will determine the nature of future modular, dynamic, pre-fabricated buildings that provide comfort and energy efficiency. Ensuring the safety, sustainability, resilience and reliability of our national infrastructure will be key outcomes of the transcending research conducted at our state-of-the-art and continually improving research laboratories.

Water sustainability cuts a wide swathe with solutions needed for urban infrastructure for water supplies, sewage, and runoff. We also will ambitiously pursue all opportunities for water reuse for irrigation and potable water, as well as nutrient recovery from wastewater, food security, renewable energy systems, and ecological services. We will continually ask ourselves, "What innovative solutions are needed for water-related problems in the developed and developing world, and how can we make a difference?"

We will use distributive adaptive systems to increase the resiliency of our infrastructures. By combining engineering with social thinking and behavioral models, we will improve disaster preparedness and response methods and mitigate risks from natural hazards. We will develop next-generation methods for rapid estimation of impending crash risks on highways, and will increase our understanding of multi-hazard behavior and design of structures including bridges, buildings, and power plants producing nuclear, thermal, and hydro power.
We will engage the full power of growing computing capabilities to address these problems. We will capitalize on the development and ubiquitous deployment of "smart" sensors — location-and context-aware sensors — for monitoring interdependent infrastructure and environmental systems. Space-based, airborne, and ground-based remote-sensing platforms and laser scanning devices will produce 3D point clouds with geospatial applications all across the board of engineering applications and management. These will yield incredible amounts of data that will require new algorithms for data retrieval, archiving, processing, and dissemination, and also for sifting through the information to extract what’s needed for informed decision making.

Building on our strengths in innovative computational solutions that combine ingenuity and practicality, we will seek positive-sum solutions where using natural resources is a key part of the equation. As master builders, we will enable new modes of transportation, such as vehicle-to-vehicle and vehicle-to-infrastructure integration, which are connected vehicles and driverless modes, that will save energy and use road systems more efficiently. Virtual teams are already in play. Virtual-reality visualization and training for construction equipment will allow future workers to acquire skills at reduced costs without exposure to the risks associated with conventional hands-on training. Cloud computing will aid a wide range of problems — from traffic signal operations in cities to evaluating the impact of climate change on water resources. Advanced computational capabilities will allow for resolving fluid- and geo-mechanics problems at ever finer scales for fundamental understanding and for predicting failure mechanisms of infrastructural material at multiple scales.

To support the growing infrastructure, our faculty and students will lead in developing stronger and more durable high performance materials. Purdue civil engineers will continue to be leaders in developing higher quality concrete from new internal curing procedures, life-sensing protocols to predict concrete performance over time, and developing specifications for control and prevention of such distress mechanisms as steel corrosion, cracking of pavements, and freeze-and-thaw damage. Other examples include assembling light-weight, high-performance materials inspired by nature; paradigm-changing materials that will outperform current composites; alternative cementitious binders; and more energy-efficient and adaptive materials for sustainable infrastructure.

**Civil engineering touches every aspect of society and the Lyles School has an obligation to ensure our programs remain responsive to societal needs.**

**Engagement:**

Civil engineering touches every aspect of society and the Lyles School has an obligation to ensure our educational and research programs remain responsive to societal needs. We will work closely with, and involve, our local, state and national constituents, the professional community (from small business to multinational corporations) and our large base of alumni (over 12,000) and friends.

We will continue the role of the School’s Advisory Council (composed of prominent alumni and business leaders). We can seek to expand its use as a resource for providing suggestions for
more effectively engaging state and national constituencies, the professional community, alumni and friends. We will develop a list of state and national officials, business and corporate representatives and alumni willing to review and suggest new School initiatives. We’ll use this list to promote community involvement in undergraduate and graduate curricula and to encourage our faculty to use them as resources in their instruction and research activities.

The possibilities, as we see them at the Lyles School, are endless.

**GOALS**

We will amplify our impact on society through a multi-pronged approach as described through these four major goals and associated objectives and action items. Our goals will be to:

1. **Think and act locally and globally**
2. **Enhance students’ critical thinking skills**
3. **Increase accessibility to high quality, flexible and affordable higher education**
4. **Enhance linkages to alumni, industry and foundations**

**OPERATIONAL ENABLERS**

*The possibilities, as we see them, are endless.*

In addition to the goals above, there are several operational enablers required to facilitate our continued success, across all goals, objectives, and action items. These elements will be pervasive throughout our School and in our approach to meeting our goals.

- Diversity is a core value of the College of Engineering: the quality of our innovation is directly tied to the diversity of the people who sit around our table
- Provide a world-class learning experience to students
- Enhance the flexibility of research and teaching infrastructure
- Enhance faculty interactions with students, sponsors, collaborators and alumni
- Leverage Purdue alumni, partners and friends to increase engagement and visibility
- Align resources with the strategic plan
- Develop a marketing & media plan to implement elements of the strategic plan
- Seek participation, support and continuous assessment from alumni and friends

**OBJECTIVES**

1. **Goal 1 – Think and act locally and globally.** This speaks to our aspirations for achieving high impact across various spheres of influence – locally, regionally, nationally and globally. The following describes what this goal encompasses for us:
   - Enhance linkages to people and communities to educate them about the breadth of our profession and highlight the connection between our work and people’s lives
   - Create sustainable student exchange/study abroad programs and long-term partnerships with reputed international universities
   - Recruit and sustain faculty who can contribute to new and emerging areas
   - Enhance wide outreach to K-12 institutions and top “source” schools and emphasize the broader impact of civil engineering education and profession
The specific objectives contributing to this goal are:

a. Develop interdisciplinary programs within the School in areas of emerging importance. Given the changing landscape of funding, the school will develop programs where faculty from diverse areas can collaborate and develop proposals, lead center-related efforts, advise students and develop certificate programs.

b. Recruit and retain highly productive faculty. Civil engineering faculty members are achieving increasing impact in diverse fields and are highly sought after by many programs. We need to recruit and retain highly productive faculty to further our vision of preeminence.

c. Create and maintain sustainable international programs. There is a growing need to increase the global experience of our students. Purdue’s strategic plan calls for programs to increase the number of study abroad offerings. We should build on our current initiatives to provide a robust and sustainable study abroad program.

d. Establish linkages to the outside world. Civil Engineering currently faces an image problem. Some of the high impact and emerging work done by our faculty and students is not easily perceived by students, industry and the community. It is imperative we develop ways to highlight the value and skills we bring to solve global grand challenges.

e. Create tomorrow’s leaders. An important mission of our school is to provide a transformative experience for our students and provide a foundation to develop them into tomorrow’s leaders.

2. **Goal 2 – Enhance students’ critical thinking skills to better prepare them to tackle the increasingly complex engineering challenges faced by society.** Inherent within this goal is experiential learning. We seek to provide opportunities for students to not just learn by doing but by reflecting on their experiences while doing. Experiential Learning includes cultural immersion, design projects, internships, practica, service-learning, undergraduate research, cooperative education, and other activities. The following describes what this goal encompasses for us:

- Evaluate and refine the existing on-campus teaching (and evaluation) methods to enhance critical skills by ensuring a systems approach to problem solving; reinforcing problem decomposition methods and integrating open-ended problems in classroom activities.
- Further enhance the research and teaching infrastructure of the school to enable experiential and active observational learning for students in high quality laboratories
- Commensurate increase in qualified staff and personnel to achieve effective and efficient delivery of experiential content
- While maintaining strong disciplinary programs, encourage further development of research and teaching programs that require interdisciplinary efforts.

We will take measures to enhance students’ critical thinking skills so they are prepared to face increasingly complex engineering challenges. Specifically:
a. Enhance undergraduate research experience. Along with teaching, it is essential to enhance the research experience at the undergraduate level to enhance critical thinking skills. This can be accomplished by taking students into modern and well-staffed laboratories and by bringing research problems into classrooms, organizing seminars on research methods, and/or organizing special projects focused on research activities. We will integrate open-ended problem-solving and systems thinking in several classes and exams, include case studies, guest speakers, and communication/reporting components.

b. Upgrade/modernize teaching and research environments. Classrooms will be fashioned as flexible spaces with a variety of learning activities (virtual labs, hands-on activities, experiential learning); enhance laboratory staffing by training students and strengthening professional staff presence to support teaching and research activities and properly maintain labs and research equipment.

3. GOAL 3 – Increase accessibility to high quality, flexible and affordable higher education. The following describes what this goal encompasses for us:
   - Develop a hybrid undergraduate distance-learning/on-campus program that integrates online courses (during semesters away from campus) with lab experiences, summer programs, and other select courses delivered on campus (for semesters in residence).
   - Develop a 4+1 BS-MS offering that enables students to reliably attain an MS degree after one year of graduate study.
   - Develop a professional M.S. degree program.
   - Increase graduate fellowship opportunities and endowments to retain the best undergraduate students and to attract top students from around the world.

   We will take measures to enhance students’ critical thinking skills so they are prepared to face increasingly complex challenges.

4. GOAL 4: Enhance linkages to alumni, industry and foundations. The following describes what this goal encompasses for us:
   - Develop a programmatic approach for strategic partnerships with industry, including (i) ways to obtain research funding; (ii) membership on the advisory council or an “industrial council;” (iii) development of senior design projects and internships with industry partners and (iv) creation of industry-university research centers. Seek alumni participation and help in initiating and sustaining these partnerships.
   - Establish endowments, scholarships and other resources to improve school operation and infrastructure.
   - Engage with at least two different foundations each year, invite them to campus, and establish long-term relationships.

   We will take measures to enhance linkages to alumni, industry and foundations. Specifically:

a. Develop a programmatic approach for strategic partnerships with alumni and industry. Interactions with alumni and industry offer unique opportunities for research collaboration and support that can complement typical national and state government programs. These industrial partnerships will be proactively pursued in collaboration with Purdue’s office for corporate and global partnerships.
b. Develop a mechanism to routinely engage in research and engagement dialogue with companies in the broader civil engineering ecosystem. Civil engineering is increasingly interacting with and influencing fields far beyond the traditional focus of the discipline and as such new opportunities to collaborate are emerging. We will enhance our awareness of critical industry challenges related to our work and simultaneously alert commercial organizations to our capabilities by developing a mechanism to engage representatives from research-supportive companies in the broader ecosystem impacted by civil engineering, calling out their specific research needs and potential collaboration opportunities.

c. Pursue creation of industry-university research centers. Recognizing the interdisciplinary nature of practical societal challenges that rely upon civil engineering know-how, we will pursue industry, foundation, and school-wide research centers with interdisciplinary themes (across emphasis areas) in order to maintain continuous research funding and to work on complex and innovative problems of significant impact.

d. Establish endowments, scholarships and other resources to improve school operation and infrastructure. Despite efforts to streamline costs, delivery of an education in an intensive experiential learning environment requires funding to support student education and key infrastructure. We will therefore pursue endowment and sponsorship strategies in partnership with corporations to support endowed graduate fellowships and/or supply key laboratory equipment and software to sustain lab and/or class activities while driving awareness among our students of corporate employment and service offerings.

e. Engage with at least two different foundations each year to establish long-term relationships. Achieving our collective goal to drive tangible impact will require long-term commitment to the development of effective solutions to grand challenges. With this in mind, we will build deep relationships with foundations that will provide strong links to the key stakeholders that face these challenges while also supporting the work to address critical issues that can be solved by civil engineers.

We will enhance our awareness of industry challenges related to our work and alert commercial organizations to our capabilities.
PEER INSTITUTIONS AND BENCHMARK MEASURES

Pursuing a vision to be the most sought-after civil engineering program, the Lyles School of Civil Engineering will benchmark against other flagship civil engineering programs of comparable quality, stature, and size. These peer institutions are:

- Cornell University
- Georgia Institute of Technology
- Massachusetts Institute of Technology
- Stanford University
- University of California – Berkeley
- University of Illinois at Urbana-Champaign
- University of Michigan, Ann Arbor
- University of Texas at Austin

Consistent with Purdue’s university-level benchmarking, in assessing progress toward our goals, we will consider the following benchmarking measures to compare the Lyles School of Civil Engineering to civil engineering programs at peer institutions:

**Input Measures**
- Undergraduate enrollment per full-time equivalent (FTE) faculty
- Graduate enrollment per FTE faculty
- Faculty teaching load (courses and student credit hours per FTE)
- Sponsored funding per FTE faculty
- Percent of graduate students supported by research
- Percent of graduate students supported by teaching assistantships
- Graduate Record Exam (GRE) scores of graduate students (applied and admitted)
- Faculty salaries by rank
- Dollar amount of graduate assistant stipends
- Undergraduate and graduate class sizes
- Private giving and endowment value
- Number of distinguished professorships, named professorships, and rising stars.
- Number of research centers and dollar value of work

**Output Measures**
- National ranking of undergraduate and graduate programs
- Number of undergraduate degrees granted per year
- Number of M.S. and doctoral degrees granted per year
- Number of scholarly publications per FTE faculty
- Number of students involved in scholarly publications
- Number of citations of faculty research work per FTE faculty
- Career and advanced study placement of graduates
- Demography of underrepresented populations (students, faculty, staff)
- National academy and other prestigious memberships/awards
- Participation rate of alumni as donors to the School