Pursuing
EXCELLENCE

CY 2020-2025 STRATEGIC PLAN

OU

The UNIVERSITY *of* OKLAHOMA
GALLOGLY
COLLEGE OF ENGINEERING

GALLOGLY HALL

VISION

In the *pursuit of excellence*, the Gallogly College of Engineering proposes a bold plan to dramatically improve quality of life and stimulate economic development for our state, region, nation, and world by solving engineering, scientific and technological challenges through leadership in discovery, innovation, education, and engagement.

This Strategic Plan for the GCoE was revised on November 6, 2020 to assure alignment with the University's Lead On Strategic Plan and the VPRP Research Strategic Framework.

INITIATIVE 1

Applied Aerospace, Defense, and National Security Initiative

Become the central U.S. leader in applied aerospace, defense and national security research that addresses the entire systems life cycle for the aerospace/defense industry.

GOALS

- Be a recognized leader on aerospace/defense research for the sustainment and modernization of national security systems.

- Develop and nurture meaningful collaborations through GCoE and government/industry partnerships to address the sustainment and modernization needs of the aerospace and defense community using a framework of convergence research.

- Establish a University Research Center of Excellence, in collaboration with OC-ALC, for Airforce sustainment and modernization of national security systems.

- Work with the University to establish a secure facility that facilitates faculty and industry collaboration.

- Continue to enhance the success of the Advanced Radar Research Center (ARRC) by facilitating initiatives in defense applications.

- Develop new student pipelines between the GCoE and government/industry to support convergence research and build capacity in Oklahoma's workforce.

- Update performance evaluations to align with all initiatives of the GCoE strategic plan.

RESEARCH THEMES

Embedded Systems
Design, development, and implementation of embedded software systems and analytics for robust operations of aerospace/defense platforms.

Material Systems
Integrated research and design of materials and advanced manufacturing, including additive, subtractive and coating technologies, to rapidly develop and apply novel alloys, polymers, and composites materials for aerospace/defense platforms.

Reverse Engineering Systems
Integration of digital and physical models to (re)design, evaluate, qualify, monitor, and optimize production and operations.

Sensing Systems
Design and development of radar systems to advance capability in communications, electronic warfare, and remote sensing.

Incubate Areas for Future Growth
GCoE will be opportunistic and expand research in additional aerospace/defense areas, such as unmanned systems, propulsion technologies for aircraft and unmanned aerial systems, and human-systems integration to improve situation awareness and decision making and reduce cognitive load.

OUTCOMES

- Diverse aerospace/defense research portfolio including GCoE Schools of AME, CS, ECE, and ISE.
- Increased capacity in faculty, staff engineers and scientists, and graduate students.

- Enhanced capacity and ability for project delivery through new business-oriented professional staff in the areas of business development, project management, and finance.
- Establishment of new partnerships with industry and government mission-agencies.

METRICS FOR INITIATIVE 1

Lead time to key milestones for applied

PROJECT INITIATION and **EXECUTION**

Number of **NEW** industry/government **PARTNERS** and **PROJECTS**

Research and development expenditures for **NEW PROJECTS** of **$3M** per year by 2024

INITIATIVE 2

Excellence in Research

Double research productivity, particularly in strategic growth areas of healthcare, computing, energy, and water.

STRATEGIC AREAS

- Healthcare
- Computing
- Energy
- Water

GENERAL GOALS

- Grow investment through external fund raising and university sources to enhance research and infrastructure.
- Establish benchmarks and measure progress.
- Grow research expenditures from all sources 15% annually.
- Clearly communicate progress to internal and external stakeholders.
- Enhance external faculty recognition through awards and boards.
- Leverage synergies between Norman, HSC and Tulsa campuses.
- Establish five convergent research and educational programs spanning GCoE strategic areas and external collaborations.
- Establish three national research centers of excellence.
- Reduce administrative burden for faculty and staff.
- Update performance evaluations to align with all initiatives of the GCoE strategic plan.

HEALTHCARE

Become the leader in the central U.S. region for biomedical engineering research, known for the creation of technologies that advance human health.

GOALS

- Build an interdisciplinary biomedical research enterprise with cluster hires of world-class faculty across OU's three campuses.
- Design and invent translational healthcare technologies and commercialize through new start-up companies.

RESEARCH THEMES

Cancer Nanomedicine
Photothermal therapy, peptide-based drugs, targeted delivery, and theranostics.

Brain Research and Neural Engineering
Traumatic brain injury, post-traumatic stress disorder, cerebral palsy, brain tumors, pain, Alzheimer's disease, and depression.

Regenerative Medicine
Arthritis (bone and cartilage repair), spinal cord, temporomandibular joint, trachea, vision, diabetes.

Medical Imaging
Digital mammography, radiography, fluoroscopy, biophotonics, fluorescence lifetime imaging, cancer imaging, image processing.

Auditory Function
Biomechanical modeling and measurement of blast and other threats of auditory injury; hearing protection mechanisms; and restoration of hearing and balancing functions.

Immunoengineering
Diabetes, cancer, arthritis.

Biomaterials
Drug delivery, scaffolding for tissue engineering, cancer therapy.

Health and Medical Systems
Medical systems scalability, clinical quality and costs of care, digital and personalized medicine, implant and cell factory capabilities, drug delivery systems, telemedicine, healthcare analytics, healthcare operations, emergency care logistics, implant manufacturing and bioprinting, and human technology and AR/VR devices.

OUTCOMES

- A self-sustaining funding stream from NIH, DoD, private foundations, and other agencies for cross-campus biomedical research.
- Enhanced funding from SBIR/STTR programs through industry partnerships.
- Status as the #1 public BME department in the 15+ contiguous states in the central US.
- Enroll 45 BME PhD students by 2024.

COMPUTING

Achieve national visibility in areas of computing research and development that are key to Oklahoma's future.

GOALS

- Establish and lead a center of excellence in artificial intelligence and machine learning for broad multidisciplinary research and application domains.
- Provide research leadership in secure embedded software engineering to support the Applied Research Institute's embedded systems research theme.
- Establish industry-sponsored computing research in sectors of importance to Oklahoma, including aerospace/defense, biomedical, and energy.

RESEARCH THEMES

Data Science and Analytics, Artificial Intelligence and Machine Learning
Development of advanced methods for enormous spatiotemporal data sets constrained by real-time analysis and prediction requirements.

Secure Embedded Software Engineering
Advancements in design, development, testing, and deployment of safety-critical real-time embedded software systems.

OUTCOMES

- New collaborations and synergies among programs in computer science, computer engineering, and data science and analytics.
- Development of applied research programs in cybersecurity and embedded software engineering.
- Computing-related research expenditures in excess of $5M per year by 2024.
- 32 regular faculty in computing, including 10 new faculty on the OU-Norman campus and 7 new faculty on the OU-Tulsa campus.

ENERGY

Broaden OU's national reputation in energy research through strategic initiatives in energy efficiency and power engineering, and by strengthening research collaborations with the Mewbourne College of Earth and Energy.

GOALS

- Innovate unique technologies to support efficient, resilient, diversified, and distributed energy systems.
- Establish new facilities to provide direct experiential training and education with grid modernization technologies.
- Develop and nurture meaningful collaborative relationships among the GCoE, MCEE, and industry to support unconventional fossil fuel research.

RESEARCH THEMES

Sustainability
Advancements in efficiency, resiliency, and diversification in the context of distributed smart power production and distribution systems.

Power systems
Protection of power grids with highly distributed and volatile energy resources.

Refining
Development of new hydrocarbon refining and utilization technologies through advancements in heterogeneous catalytic science.

Complex Fluids
Development of next generation oil field fluids for deep formation permeability modification through the design of new surfactant, polymer, and particle systems.

Produced Water
Development of novel treatment technologies to enable reuse of produced water, working together with the water priority.

OUTCOMES

- Expanded collaborative research portfolio that is significantly supported by industry partnerships.
- Expanded capacity for R&D and graduate program quality in areas of refining, power, and energy systems.
- New state-of-the-art facility for power systems simulation and experimental capabilities.
- Double the annual number of graduates that accept positions in the utilities and renewable energy industry.

WATER

Build an internationally renowned program that addresses complex water challenges – quantity, quality, and management – from local to global scale and requires application of innovative science and technology to provide solutions.

GOALS

- Establish the Oklahoma Water Survey as the leader in enabling science-based solutions for water challenges in Oklahoma.
- Grow the Water Technologies for Emerging Regions (WaTER) Center to address water quantity, quality, and equity issues in emerging regions around the world.
- Lead an NSF engineering or science center (or equivalent) in one of the three thematic areas.

RESEARCH THEMES

Smart Water
Application of sensors, information technology, and data analytics to optimize use of water resources.

Water Reuse
Application of engineered treatment technologies and operational strategies to utilize marginal waters (e.g., produced water, municipal and industrial wastewater, and storm water).

Engineering with Nature
Development of hybrid systems that combine engineered and natural systems to treat and manage polluted water, while also providing additional ecosystem services.

OUTCOMES

- A unified and collaborative university program addressing water resource issues.
- Double the number of Ph.D. students receiving degrees in this topical area.
- Double faculty research expenditures and publications stemming from this effort.

METRICS FOR INITIATIVE 2

Increase regular faculty strength by 60 to
190 TOTAL FACULTY

Increase student enrollment to
500 DOCTORAL STUDENTS

Appropriately
COMPENSATE
faculty and graduate students to peer compa-ratios

Increase GCoE research expenditures by 100% to
$40M
per year by 2024

RESEARCH STRATEGY

The table below illustrates how our GCoE research strategy aligns with that of the Office of the Vice President for Research and Partnerships.

		VICE PRESIDENT FOR RESEARCH AND PARTNERSHIPS STRATEGIC SEGMENTS			
		Aerospace, Defense and Global Security	Environment, Energy and Sustainability	The Future of Health	Society and Community Transformation
COLLEGE RESEARCH CAPABILITIES FOR INVESTMENT	Data Science and Analytics	X	X	X	X
	Advanced Materials and Manufacturing	X	X	X	X
	Healthcare Technologies			X	X
	Sensing Technologies	X	X	X	
	Adaptive Infrastructure	X	X		X

Diversity, Equity and Inclusion

Enhance and broaden GCoE commitment to Diversity, Equity and Inclusion to create a competitive advantage for the college and its stakeholders.

GOALS

- Leverage education and understanding of DEI to build leaders and foster excellence.
- Facilitate opportunities to enable growth in cultural competence and strengthen the college.
- Increase visibility, recognition, and commitment for DEI initiatives and improvements.
- Recruit and support a diverse GCoE community.
- Support a culture of civil and ethical discourse with relevant education and guidance in our common engineering curriculum.
- Expand access to engineering education programs
- Update performance evaluations to align with all initiatives of the GCoE strategic plan.

OUTCOMES

- Improved diversity-related metrics and track using an equity scorecard.
- DEI training for all members of the college community.
- Resources and support available for faculty and staff to drive action and leadership on DEI issues.
- Academic units recognize the importance of faculty who have broad value systems.
- Collaborative DEI culture championed within and among academic units.
- Councils of Inclusive Excellence that provide opportunities for faculty, students, and staff leaders to drive a collaborative DEI culture.
- Dedicated personnel and programs to grow and enhance our graduate student community.
- Expand Summer Bridge to provide more opportunity for accessible education and improve student persistence.

METRICS FOR INITIATIVE 3

Full participation
of faculty and staff in relevant
DEI TRAINING

Close the gap in
STUDENT RETENTION
among student cohorts

Improve
DIVERSITY
within college faculty, staff and student body

Show continuous improvement in
COLLEGE CLIMATE
through survey

INITIATIVE 4

Education and Workforce

Improve and expand opportunities to prepare engineers to excel in professional and research careers.

GOALS

- Broaden state, national and global impact on workforce by producing 1,250 engineering graduates per year.
- Develop and improve support structures to enhance graduate student success.
- Continue to meaningfully improve the education and professionalism of our undergraduate students.
- Ensure appropriate levels of faculty and staff support to maintain excellence of our educational programs.
- Develop a balanced portfolio of faculty appointments and workload to meet research and teaching needs.
- Update performance evaluations to align with all initiatives of the GCoE strategic plan.

OUTCOMES

- Expand online MS programs for workforce advanced education.
  - » Generate revenue to provide resources that drive research productivity.
- Provide new education pathways that prepare students with knowledge and skills needed for the state workforce.
  - » Computer Science (OU-Tulsa)
  - » Academic certificates to provide specialized knowledge
- Develop and strengthen external pathways for recruitment of high-quality and diverse graduate students.
  - » Leverage GCoE for cross-disciplinary recruiting opportunities
  - » Build competitive financial structures for graduate student support
- Enhance and develop opportunities for interdisciplinary educational experiences.
- Identify and implement strategic opportunities to improve retention across all GCoE community members.
- Support graduate student success through targeted professional development programs, workshops, and mentorship.
- Expansion of faculty-led research opportunities for undergraduate and graduate students.
- Support faculty professional development to enhance careers and improve retention/success at OU.

METRICS FOR INITIATIVE 4

DOUBLE REVENUE
from online programs for investment in research
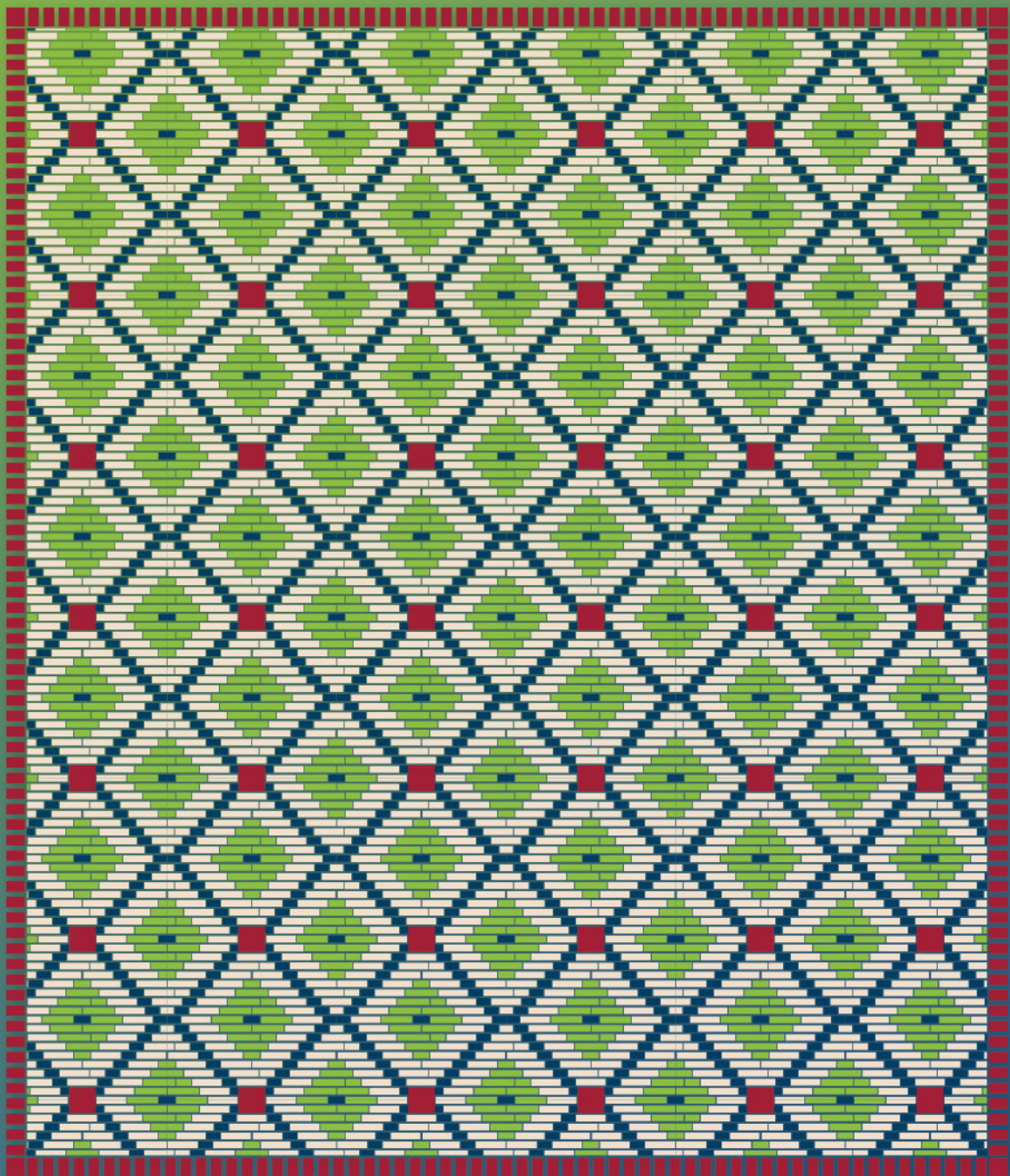
Produce
1,250 GRADUATES
per year

Raise
DOCTORAL STIPENDS
to at least **$25K** per year across the college

Improve
GRADUATION
rate by 10% across college