



VOILAND COLLEGE OF
ENGINEERING AND ARCHITECTURE



Voiland College of
Engineering & Architecture

Strategic Plan 2015-2020



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Voiland College of Engineering and Architecture Strategic Plan, 2015-2020

Introduction and Context

As the land grant university for the state of Washington, Washington State University (WSU) has a unique heritage of advancing knowledge through creative research, extending knowledge through innovative education programs, and applying knowledge to enhance quality of life and to fuel economic growth. The genius of the land-grant university system signed into law by Abraham Lincoln in 1862 is still relevant today—providing high quality teaching, research, and outreach programs that are accessible to all citizens and that are responsive, relevant, and impactful to society.

Much has changed in higher education at WSU, and specifically in the Voiland College of Engineering and Architecture (VCEA) during the last few years. Consequently, we are at a watershed moment in VCEA, with unprecedented opportunities before us. Increasing demand for our graduates from industry and government leaders has meant that our program is growing in reputation at the university, state, and national level, and there is increased understanding of the important work that we do in this college.

The recent changing of our name to the Voiland College of Engineering and Architecture honors the lifelong accomplishments and unflagging support by chemical engineering alumnus Gene Voiland and his wife, Linda. Our new name provides unprecedented opportunity as well as a great responsibility to represent the very best attributes of the Voilands that we wish to emulate: excellence, vision, accountability, and integrity.

We have been able to garner major investments in our infrastructure, and we are excited to move some of our signature, interdisciplinary research programs into our first new building in nearly 20 years, the PACCAR Environmental Technology Building. Moreover, with the new WSU Pullman Campus Master Plan, we look forward to better than ever possibilities for additional new buildings especially for housing our signature interdisciplinary research and education programs. In an example of a novel, interdisciplinary integration, the new School of Design and Construction was recently formed and presents new opportunities for collaborations and interdisciplinary partnerships across our college and across the university.

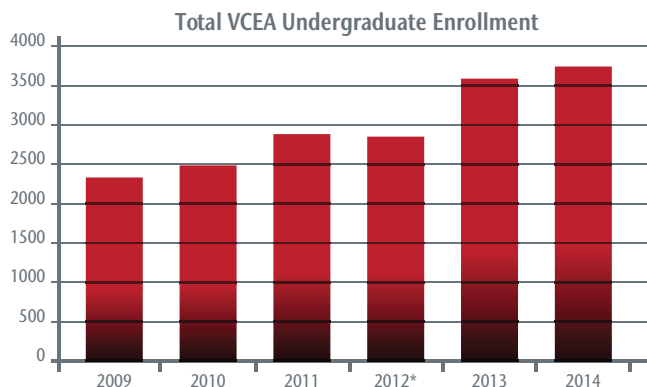
During the last five years, there has been a paradigm shift nationally in how higher education is viewed by legislators and the public, from the perception of higher education as a societal good to the perception of higher education as a personal benefit, so that a larger portion of the cost of higher education is borne by the student. For many students, this means graduating from college with a large student debt load or working full-time while going to college, or both. In response to growing demand across the state of Washington for access to engineering education for place-bound students, we established a hybrid model of delivery of the bachelor of science in mechanical engineering (BSME) degree program, first in Bremerton and now also in Everett, and



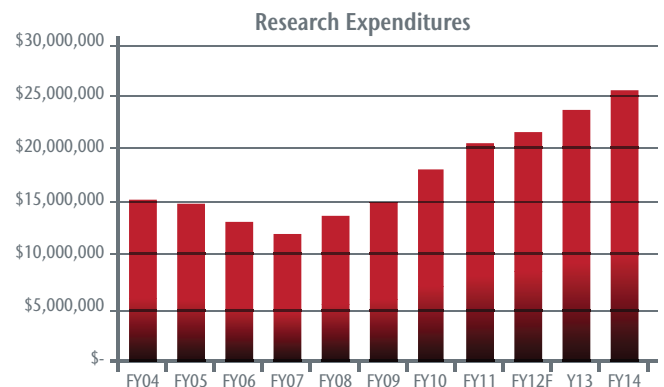
we have expanded our engagement in both locations by increasing the number of students served. Along with the Pullman, Tri-Cities, and Everett campuses, this offers more opportunities for place-bound students throughout the state. New technology associated with online or distance delivery of coursework is sharpening the competitive arena as many universities aggressively compete for students. Still, there are definite advantages for those students who elect to attend college at a residential campus or through a hybrid program that offers a portion of the coursework in their communities. It is more important than ever that we strive to provide the best value for our stakeholders: our students, the state, corporations that hire our graduates, and the agencies that fund our research. In response, we have developed innovative ways to deliver our programs and be responsive to industrial needs in ever more locations.

One of these high-value advantages is our unique capstone design course experience, which is largely based on real industry design challenges, and is especially noteworthy for providing hands-on experience and industrial engagement. We also have a high percentage of our students involved in extracurricular student clubs—they can choose among 40+ groups within the college alone! These and other experiential opportunities enable our students to assemble a portfolio of activities and leadership experiences that make them very attractive and in high demand by employers. Enrollment in nearly all of our programs has skyrocketed and we are approaching 4,000 students enrolled in our undergraduate programs (*see graph below*) along with more than 650 graduate students. In recognition of this, as well as the state’s keen interest in our high-demand fields, both the state and the university have made significant new investments in our college to allow us to add faculty and staff. The Engineering Expansion Initiative provided an initial boost in state funding to VCEA in exchange for a commitment that we would educate an increased number of engineering students. That was followed by a second state initiative in the 2013-2015 biennium that provided additional funding for computer science and engineering programs.

Total VCEA Undergraduate Enrollment and Research



*Fall 2012—Uncertified students were estimated and are likely low for some majors.





Being able to increase the number of faculty and staff will mean that, with thoughtful hiring practices, we can more fully establish our areas of preeminence upon which our academic and scholarly reputation depends. Philanthropic investments by individuals such as Gene and Linda Voiland and corporations such as PACCAR have been instrumental in this strategy. Such investments have enabled us to attract and retain distinguished faculty who lead our preeminent emphases, to develop new educational and research facilities, and to build programs that enhance our student's education.

Thoughtful hiring will also position us to lead through research, scholarship, and innovation aimed at addressing grand challenges around energy, environment, health, and technology. Our research expenditures have more than doubled in the past seven years to over \$25 million in FY14 and we anticipate that this trend will continue as we focus on core research areas and continue to hire outstanding faculty at all ranks. As we build strengths in these core areas, we also have opportunities to collaborate with colleagues from across the WSU system in global animal health, agriculture, clean technology, and renewable bioenergy. Added to that, the university's pursuit of a medical school on the health sciences campus in Spokane provides tremendous interdisciplinary and collaborative research and educational opportunities among the VCEA and medical sciences faculty and students. This will position our researchers to better compete for National Institutes of Health funding in addressing grand challenges in protein systems, biomaterials, and medical and bio-informatics; assisting the aging population and people with cognitive disabilities; and expanding biomedical engineering, to name a few.

Finally, the vice president for research (VPR) is working to shape the research agenda for WSU around high-impact, interdisciplinary grand challenges for which there already exist significant expertise at WSU. Our eminent faculty have realized for some time that the solutions to society's grand challenges will lie at the interfaces between many disciplines, and the research themes that characterize much of our research are inherently interdisciplinary. Thus, the VCEA is well-positioned to benefit from the university's strategic planning; we conducted a similar exercise as part of our previous strategic planning activities, and are well prepared to contribute to and influence the university's direction. In short, we may never see this level of opportunity to shape our future again.

Being attentive now to the changing higher education landscape, and being clear and deliberate on our priorities, strengths, goals, and metrics will position the VCEA well into the future as a leader among engineering colleges at land-grant universities. By conducting impactful research that addresses the grand challenges, delivers technology and innovation to our stakeholders in the state and beyond, and graduates the next generation of highly sought-after innovators, designers, and leaders, the VCEA plays an important and critical role in elevating WSU as one of the world's most influential and well-regarded universities. We look forward to a new era of "Collaboration. Innovation. Transformation!"



Mission, Vision, and Values

Mission

As a core college in a Research University with Very High research activity,* as well as a land-grant university, our mission is threefold:

- To conduct fundamental and applied disciplinary and cross-cutting **research** that leads to new knowledge, transformative technology, and innovative designs.
- To **educate** and prepare students through state-of-the-art programs, preparing them for professional careers and leadership in engineering and design professions.
- To **engage** people, industry, and communities to improve quality of life and enhance economic development.

*According to the latest Carnegie Classifications

Vision

Founded on the principles of collaboration, innovation, and transformation, the Voiland College of Engineering and Architecture is a world leader in providing solutions to societal grand challenges and quality “work-ready, day-one” graduates.

Values

We whole-heartedly endorse the values stated in the WSU Strategic Plan:

- **Quality and Excellence:** We are committed to providing quality and excellence in all our endeavors.
- **Integrity, Trust, and Respect:** We are committed to ensuring trust and respect for all persons in an environment that cultivates individual and institutional integrity in all that we do.
- **Discovery, Innovation, and Creativity:** We are committed to the pursuit of inquiry and discovery and to the creation and dissemination of knowledge.
- **Land-grant Ideals:** We are committed to the land-grant ideals of access, engagement, leadership, and service to bring the practical benefits of education to the state, nation, and global community.
- **Diversity and Global Citizenship:** We embrace a world view that recognizes and values the importance of diversity, global interdependence, and sustainability.



- **Freedom of Expression:** We are committed to the free exchange of ideas in a constructive and civil environment.
- **Stewardship and Accountability:** We are committed to serving as ethical and responsible stewards of WSU resources.

Research and Scholarly Programs

We note that the National Academy of Engineering, in 2008, identified 14 Global Grand Challenges for Engineering (see side bar). Engineering colleges across the country are tasked with addressing these and other societal grand challenges while preparing the next generation of engineers to be able to contribute effectively to these efforts. See engineeringchallenges.org for more information.

Most of the Global Grand Challenges are aligned around larger themes in energy, environment, health, security, and technology innovation—the very themes that the VCEA has previously identified as key areas. These themes characterize much of the scholarly work ongoing in the VCEA, and it is clear that VCEA faculty is engaged in scholarly activity that is of significant societal benefit. These themes are highly interdisciplinary, frequently interconnected, and highly collaborative. In addressing these themes, faculty researchers in the VCEA collaborate with colleagues from across the college, the university, and the country—even around the world. Below is a sampling of the impactful research in the VCEA related to these broad themes.

Energy

Meeting future energy needs will require a set of solutions that includes making the most effective use of our existing resources while also developing renewable, environmentally friendly energy systems, designing innovative processes that reduce both energy and water usage, and minimize adverse impacts on the atmosphere and global climate. This also requires developing new building materials and structural systems for “green architecture” and addressing our nation’s aging infrastructure with novel and innovative technologies designed to reduce resource usage. Specific topics related to energy and energy efficiency for which VCEA faculty members provide leadership at the university, regional, and national levels include:

National Academy of Engineering’s Global Grand Challenges for Engineering

- Making solar energy economical
- Provide energy from fusion
- Restore and improve urban infrastructure
- Manage the nitrogen cycle
- Provide access to clean water
- Develop carbon sequestration methods
- Advance health informatics
- Engineer better medicines
- Reverse-engineer the brain
- Prevent nuclear terror
- Secure cyberspace
- Enhance virtual reality
- Advance personalized learning
- Engineer the tools of scientific discovery



- Advanced materials—utilizing new energy sources like hydrogen and solar power, and improving energy storage (improving batteries, positron energy storage, and hydrogen storage).
- Composite materials—developing sustainable infrastructure materials for the construction industry and lightweight composite materials to reduce fuel consumption by aircraft.
- Chemical catalysis for fuel processing—chemical catalysis of raw materials to higher value products and fuels, fundamental understanding of catalysis, and reaction engineering for conversion of fossil fuels and biomass feedstocks.
- Bioproducts and biofuels development—development of all aspects of biofuels/bioproducts economy, pyrolysis of biomass and other raw materials, and conversion of biomass to biomaterials and biofuels, including the use of waste materials such as forest residues, construction wastes, and feedstocks.
- Renewable energy sources and the power grid—ensuring the reliability of the power grid as diverse, intermittent energy sources such as solar and wind are integrated.
- Fuel cell systems—development of new fuel cell systems that directly convert bio-based jet fuels to electricity for on-board power systems in aircraft and automobiles.
- Sustainable infrastructure and design—production of cost-efficient solutions to energy challenges through renderings, models, ideas, and management strategies (digital and physical) that encourage high-performance, high-quality buildings that meet developer and client demands for aesthetics, time, and money.

Environment

Population growth and global development will challenge air and water resources for the foreseeable future. We already see many changes, from the historic drought in California, increasing severity and incidence of forest fires, competing demands for water resources, and the specter of global climate change. Our air, water, and land systems are inextricably linked, and our understanding of these systems will require interdisciplinary, collaborative research, the results of which will inform resource management and policy, as well as mitigation approaches. VCEA faculty play leadership roles in addressing these grand challenges around air and water resources, specifically in the following areas:

- Water resources—understanding global systems and interactions between land and atmosphere, earth systems modeling, hydrologic impacts of global change, and regional and national scale water resource modeling and management.



- Aquatic sciences—water quality studies, nutrient and pollutant cycling, and statistical analyses in water bodies.
- Air quality studies—regional air quality modeling and measurements, agriculture and air quality, nitrogen cycling, biogenic emissions, carbon cycling, nutrient and pollutant deposition, urban air quality, global change, and remote sensing.
- Energy and clean technology systems design and implementation—developing new or improved sources of clean energy, improving energy efficiency, and developing sustainability of infrastructure and design through interdisciplinary collaborations.
- Interactions between water resources, water quality, climate change, and human behavior in both agricultural and urban environments—watershed modeling for informing public policy that is economically and scientifically sound.
- Catalysis—development of new catalytic conversion systems that mitigate adverse impacts of transportation systems, and new systems to capture carbon dioxide and convert it to drop-in fuels and chemicals, thus mitigating global climate change.

Health

New challenges to human health, including addressing the needs of an aging population, managing emerging diseases in a world in which our global mobility can spread outbreaks at a frightening pace, new technology developments in medical device technologies, and utilizing the vast amounts of data in a way that produces information for timely decision-making, are all areas of opportunity for engineering, computer science, and design disciplines. VCEA faculty provide leadership in health-related research in the following areas:

- Biofilms—understanding all aspects of biofilm growth and interactions, including interactions with wounds, sensor development, bioremediation, wastewater treatment, safe foods, and biochemical production.
- Bioengineering—new understanding of how cardiac muscles work and cells move will have dramatic impact on the quality of life of our aging populations, and new systems that allow the advanced separation and detection of marker proteins, thus enabling proactive treatment of chronic and infectious diseases.
- Materials—new bone and cartilage replacement materials, leading to reduced incidence of post-surgery infection, improved durability for longer joint replacement lifespans, and lowered risk of the body's rejection of the device.



- Bioinformatics—designing algorithmic solutions for data-intensive life sciences applications, including genomics, proteomics, and metabolomics; drug and vaccine development; epidemiology; and tracking food- and water-borne diseases.
- Devices and sensors—sensor networks and machine learning for monitoring systems that are not based on video, automating resident activities, and allowing disabled or elderly people to remain independent and improve their quality of life.

Security

Security and safety are important in all aspects of our personal lives as well as for businesses, large-scale manufacturing, transportation, communications, computation, and virtually every aspect of modern society. Within VCEA, our research efforts in security and safety include a focus on the power grid, the development of smart sensors and sensor networks for making homes safer, synthesis of crystals for harmful substance detection, environmental protection (as described above), and large scale data analysis to better understand threats to individuals, populations, and society as a whole. Some specific aspects of our research in this area include:

- Smart power grid—developing a software platform to test the smart grid to prevent blackouts and more efficiently and reliably manage shared energy systems. Researchers in our well-known power engineering program are key contributors to national efforts to develop a smart and more efficient electric power grid. Our researchers helped produce a smart grid demonstration project that led to Pullman becoming the region’s first smart grid community. Using smart grid technologies, the Pacific Northwest Smart Grid Demonstration Project is testing new devices, software, and advanced analytical tools to enhance the power grid’s reliability and performance.
- Smart sensors—sensor networks find a wide array of applications, from smart homes to smart grids and many other sensor networks and multi-modal information systems such as “smart plugs” that monitor power consumption of individual devices to permit internet-based monitoring and real-time control for energy efficiency. In addition, we are involved in research on pervasive sensing systems for a variety of applications including volcanic activity monitoring and machine learning, among other applications.
- Detector technology—advances in crystal growth technology to improve the quality of single crystals used as detectors for radiation and other harmful substances is a key component of the work done by the Center for Materials Research. This technology will improve detectors and reduce reliance on countries with low-cost labor where such crystals are typically fabricated.



- Computational and data sciences—faculty and students at VCEA, in collaboration with faculty from other colleges and institutions, are engaged in computational and data science research that is transforming our global future. This life-changing research addresses a broad range of issues and needs, including:
 - o Data-driven control systems for smart home projects that enable the elderly and people with cognitive disabilities to stay at their homes for as long as possible;
 - o Projects involving data collection, data analytics, and data visualization for highly efficient electric power management in well connected, smart cities; and
 - o Using massive data to better understand how diet, hygiene, and cultural practices around the world relate to human milk composition and infant health.

Technology Innovation

In June 2011, President Obama declared a national priority in manufacturing within the United States and in advanced materials, particularly computational materials science. Two high-profile programs were announced at that time—the National Network for Manufacturing Initiative (NNMI) and the Materials Genome Initiative (MGI). These are aimed at the development of a network of public-private partnerships in manufacturing in the form of large research centers for manufacturing, and at speeding the time it takes to develop a new material, respectively. Some of our research efforts in this area include:

- Advanced manufacturing—advanced manufacturing at WSU includes computational, experimental, and developmental efforts.
 - o Three-dimensional printing has been a staple of research at WSU for well over a decade, including research and development in metals, ceramics, and polymers. Current efforts in 3D printing include bio-materials, aerospace, and a variety of electronics applications.
 - o Capabilities for research in manufacturing composite materials at our Composite Materials Engineering Center (CMEC) include true pilot scale capability for layup and processing of composites.
 - o Aerospace manufacturing research is addressed in areas of adhesives and multi-materials, and the development of models for optimizing metals processing.
 - o Design and manufacturing of electronics spans the range of applications from processing circuits and nanostructures in a clean room to exploitation of multi-materials and multi-physics processes from nano-machining to micro-lens fabrication,



functionalization of nanomaterials for polymer nano-composites, and drug delivery and biological feature detection.

o Virtual reality for optimizing manufacturing processes has had strong industrial support at WSU over the past couple of decades.

- **Advanced materials**—research in advanced materials includes all materials classes with specialists in the areas of polymer-based composite materials, metals and solid mechanics, and electronic materials. We have strong interdisciplinary interactions in this area with physics and chemistry faculty members, who, along with VCEA researchers, make up the interdisciplinary materials science and engineering doctoral program.
- **Computational materials**—multi-scale computational expertise in materials and process development exists within VCEA for all materials classes. Modeling at the atomistic and first-principles level exists for applications in fundamental materials and catalyst development, at the meso-scale for materials defects and interactions, and at the macroscale for complex materials systems and performance of engineering components during processing and in service.

Areas of Preeminence

The academic and scholarly reputation of VCEA is heavily dependent on the college's distinctive and interdisciplinary areas of excellence. WSU has similarly identified several areas of excellence that include (but are not limited to) global animal health, clean technology, and agriculture.

There are four areas of VCEA preeminence:

- **Electric power grid**—This is a long-time area of preeminence, dating back to the days of the engineering research center and WSU's involvement in the development of the hydroelectric dams on the Snake and Columbia rivers.
- **Chemical catalysis**—Built upon a long history of expertise in fossil-fuel production, our chemical catalysis group is focused on the development of advanced catalysis and reaction engineering systems that enable the more effective use of existing fossil resources, mitigating the environmental impact of transportation fuels and removing carbon dioxide from the atmosphere, while also enabling a future that makes more effective use of materials that were previously considered waste.



- **Air quality research**—The Laboratory for Atmospheric Research (LAR) is the oldest air pollution control group in the country. The LAR was an interdisciplinary research group long before interdisciplinary activities were recognized and encouraged. LAR has a history of major contributions including elucidating the role of vegetation in tropospheric ozone formation, development of emissions measurement methods and atmospheric organic compounds measurements, and predictive regional air quality modeling.
- **Materials science and engineering**—In the early days of materials science and engineering at WSU, research was focused on metallurgical materials and wood-based materials. Currently, group members are still strong in metals and wood composites, but are also noted for contributions in computational materials and solid mechanics, composite structures, advanced manufacturing techniques, crystal growth, and anti-matter applications, among others.

There are also four additional emerging or desired areas of VCEA preeminence. Wherever possible, it is necessary to take advantage of the expertise and interests of other campuses, colleges, and departments from around the university. Fortunately, such opportunities will likely exist as the vice president for research determines strategic research priorities for Washington State University.

- **Water resources**—We will build upon interdisciplinary collaborations and link VCEA faculty with faculty from across the university in the Laboratory for Atmospheric Research; State of Washington Water Research Center; Center for Environmental Research, Education and Outreach; Center for Sustaining Agriculture and Natural Resources; and Puyallup Extension Center. This emerging opportunity leverages our current activities that include the BioEarth Regional Earth System Modeling program, the Watershed Integrated Systems Dynamic Modeling program (WISDM), and the Nitrogen Systems and Policy-oriented Integrated Research and Education program (NSPIRE).
- **Smart systems**—This area of emerging preeminence is characterized by our faculty, primarily in computer science, who are experts in data mining, sensor networks, pervasive computing, artificial intelligence, and machine learning. Adding to that expertise, computer science faculty members work with colleagues from other disciplines to apply machine learning and develop smart systems that address societal needs, such as the smart homes program that is improving quality of life and reducing the health care costs associated with institutional care.
- **Computational and data sciences**—Leveraging our emerging core competency in machine learning, we will collaborate with colleagues in applied math and applied statistics, take advantage of hiring opportunities in data base management and data analysis, and provide computational and data science expertise to specific application domains among WSU and VCEA signature areas, including global animal health, agriculture, computational materials, air and water resources, and health sciences.



- **Sustainable infrastructure and design**—While our nation’s aging infrastructure is in need of investment, we also recognize that the finiteness of our resources and the complexity of social, economic, and environmental needs must also be balanced against the benefits of new or renovated infrastructure and buildings—the so-called “triple bottom line.” Moreover, buildings represent nearly half of the energy usage in the United States. Designing and engineering energy efficient buildings and dealing with the nation’s aging infrastructure will require careful consideration of energy usage and environmental, community, and economic impacts, and will require interdisciplinary approaches.

Goals and Sub-goals

Theme 1: Exceptional Research, Innovation, and Creativity

Goal 1: Increase productivity in research, innovation, and creativity to enhance reputation and address the grand challenges and opportunities of the future.

Goal 2: Further develop VCEA’s unique strengths and opportunities for research, innovation, and creativity based on its locations and land-grant mandate to be responsive to the needs of the state of Washington.

Goal 3: Advance VCEA’s reach both nationally and internationally in existing and emerging areas of achievement.

Theme 1 Sub-goals

1.a. Grow and diversify extramural research funding.

1.b. Attract, retain, and develop high-quality research faculty system wide.

1.c. Develop and sustain the physical and technological infrastructure, resources, and expertise to support increased research and scholarly productivity system wide.

1.d. Build on VCEA’s current and emerging areas of research excellence and international reputation.

1.e. Increase engagement and productivity of graduate students, postdoctoral associates, and undergraduates in mentored research.



Theme 2: Transformative Student Experience

Goal 1: Provide an excellent teaching and learning opportunity to a larger and more diverse student population.

Goal 2: Provide a university experience centered on student engagement, development, and success, which prepares graduates to lead and excel in a diverse global society.

Goal 3: Improve curricular and student support infrastructure to enhance access, educational quality, and student success in a growing institution.

Theme 2 Sub-goals

2.a. Enhance student engagement and achievement.

2.b. Increase the size, diversity, and academic preparedness of the undergraduate and graduate student populations in Pullman and at the urban campuses.

2.c. Produce graduates who are highly sought by post-baccalaureate and post-graduate employers and graduate/professional programs.

2.d. Align student recruitment, admissions, and retention to enhance access, inclusiveness, and student success.

Theme 3: Outreach and Engagement

Goal 1: Increase access to and breadth of VCEA's research, scholarship, creative, academic, and extension programs throughout the state of Washington and the world.

Goal 2: Expand and enhance VCEA's engagement with institutions, communities, governments, and the private sector.

Goal 3: Increase VCEA faculty, staff, and students' contributions to economic vitality, educational outcomes, and quality of life at the local, state, and international levels.

Theme 3 Sub-goals

3.a. Increase the impact of VCEA research, scholarship, creative, and outreach activities on quality of life and economic development within the state and region.



3.b. Increase access to VCEA place-bound, non-traditional, first-generation, and other underserved and underrepresented students.

3.c. Contribute to economic security, stability, social justice, and public policy through research, education, and design.

3.d. Increase VCEA's global presence and impact.

3.e. Improve VCEA's reputation with external constituencies.

Theme 4: Diversity, Integrity, and Openness

Goal 1: Create and sustain a diverse, inclusive, and equitable community of scholars and students.

Goal 2: Cultivate a system-wide culture of organizational integrity, effectiveness, and openness that facilitates pursuit of the college's academic aspirations.

Goal 3: Steward and diversify resources invested by students, the public, and private stakeholders in a responsible way to ensure economic viability of the institution.

Theme 4 Sub-goals

4.a. Recruit, retain, and advance a diverse intellectual mix of faculty, staff, and students, including women and those from underrepresented groups.

4.b. Maintain respectful, inclusive, and non-biased behavior in all university environments.

4.c. Increase employee productivity and satisfaction.

4.d. Strengthen administrative accountability, innovation, creativity, openness, transparency, and collaboration to advance the college's mission.

4.e. Utilize strategic plans, valid and reliable data, and evaluation indicators to align investments of resources with college priorities.

4.f. Expand, diversify, and effectively steward funding to advance VCEA's mission.



Implementation Plan

Theme 1: Exceptional Research, Innovation, and Creativity

Goal 1: Increase productivity in research, innovation, and creativity to enhance reputation and address the grand challenges and opportunities of the future.

Goal 2: Further develop VCEA’s unique strengths and opportunities for research, innovation, and creativity based on its locations and land-grant mandate to be responsive to the needs of the state of Washington.

Goal 3: Advance VCEA’s reach both nationally and internationally in existing and emerging areas of achievement.

Theme 1 Sub-goals implementation plan:

Subgoal	Tactics	Metrics
<p>1.a. Grow and diversify extramural research funding.</p>	<ul style="list-style-type: none"> • Incentivize and reward interdisciplinary efforts • Pursue joint appointments with PNNL and other government agencies where appropriate • Enhance collaboration with industry, national laboratories, and other universities • Proactively enable the development of embedded corporate laboratories or offices as opportunity arises • Engage high-level visiting scholars to establish collaborative research in our signature areas • Be more responsive to industrial stakeholders by improving communication between administration and individual PIs • Aggressively market, promote, and fund-raise to support research facilities and programs • Maintain an effective administrative staff • Improve laboratory facilities (as outlined in 1.c.) • Improve the effectiveness of our faculty in obtaining extramural funding in all categories (as outlined in 1.b.) 	<ul style="list-style-type: none"> • Research expenditures and % from industry • Number of crossdisciplinary and multi-institution grant awards (tracked by eREX and org/budget numbers, OGRD) • Research funds raised through development efforts



Subgoal	Tactics	Metrics
<p>1.b. Attract, retain, and develop high-quality research faculty system wide.</p>	<ul style="list-style-type: none"> • Establish a process for faculty to buy-out time to develop new research directions and to encourage innovation • Establish flexible faculty workloads to optimize the balance between high quality undergraduate instruction and building, maintaining, and growing vital research programs (refer to the VCEA faculty responsibility guidelines) • Implement strategic recruiting and hiring of top faculty at the appropriate balance of rank and international prominence (for Sr. hires) • Proactively advance faculty prominence by nominating qualified individuals for high visibility awards • Increase number of Washington State and National Academy members • Ensure high standards for tenure and promotion • Support new faculty VCEA seed grants <ul style="list-style-type: none"> o Assist new faculty with proposal strategy and preparation through training (along with OGRD) and writing/editing assistance o Improve mentoring of new faculty for research, teaching, and student advising 	<ul style="list-style-type: none"> • Number of Washington State and NAE members • Number of prestigious awards won by faculty • Number of professional society fellows • Number of CAREER awards or Presidential awards from NSF, DOE, and DOD

Subgoal	Tactics	Metrics
<p>1.c. Develop and sustain the physical and technological infrastructure, resources, and expertise to support increased research and scholarly productivity system wide.</p>	<ul style="list-style-type: none"> • Improve computational facilities and internet connections • Focus resources (space, equipment, graduate assistantships) on signature areas • Establish seed grants for strategic equipment purchases • Develop more center-type facilities where researchers have access to shared instruments that are too expensive to buy and maintain for a single PI <p style="text-align: right;"><i>continued ></i></p>	<ul style="list-style-type: none"> • Number of externally supported research centers • New/revamped square footage of research space • Number/TT-FTE of technical staff and research professorships



Subgoal	Tactics	Metrics
1.c. <i>continued</i>	<ul style="list-style-type: none">• Maintain a highly qualified technical staff<ul style="list-style-type: none">o Work toward recruitment/retention of high quality personnel (strong research and technical skills) at the research staff level; sufficient technical support personnel at all levelso Centralize some common support infrastructure (especially servers and computer support)	

Subgoal	Tactics	Metrics
1.d. Build on VCEA's current and emerging areas of research excellence and international reputation.	<ul style="list-style-type: none">• Invest preferentially in VCEA signature themes and emerging priority areas• Improve interdepartmental and interdisciplinary reach of research in our signature and emerging areas	<ul style="list-style-type: none">• Peer review number from annual report• Research expenditures from the signature areas

Subgoal	Tactics	Metrics
1.e. Increase engagement and productivity of graduate students, postdoctoral associates, and undergraduates in mentored research.	<ul style="list-style-type: none">• Increase the number of highly qualified doctoral students• More strategic and organized student recruiting• Improved facilities (see 1.c)• Faculty mentoring to help with individual student recruiting	<ul style="list-style-type: none">• Percent RAs on external funding• Student publications per GSE



Theme 2: Transformative Student Experience

Goal 1: Provide an excellent teaching and learning opportunity to a larger and more diverse student population.

Goal 2: Provide a university experience centered on student engagement, development, and success, which prepares graduates to lead and excel in a diverse global society.

Goal 3: Improve curricular and student support infrastructure to enhance access, educational quality, and student success in a growing institution.

Theme 2 Sub-goals implementation plan:

Subgoal	Tactics	Metrics
2.a. Enhance student engagement and achievement.	<ul style="list-style-type: none"> • Student clubs <ul style="list-style-type: none"> ◦ Increase support and visibility for student professional clubs by fund raising and visible space allocations • Continue to enhance the Innovation Zone space—this space will offer students a chance for independent, hands-on learning <ul style="list-style-type: none"> ◦ Fund raise to renovate, improve, or construct student experiential learning spaces • Launch a co-op program across the college • Encourage and increase the number of undergraduate students working on research and participating in undergraduate research presentations and posters • Improve courses and curricula <ul style="list-style-type: none"> ◦ Smaller class sizes, particularly for introductory courses ◦ Limit class sizes to 50 students ◦ Implement better course assessment practices ◦ Incorporate more experiential learning into our curricula ◦ Build state-of-the-art teaching laboratories with appropriate technical and administrative staffing 	<ul style="list-style-type: none"> • Percentage of students in clubs • Pass-rate for FE exam • Number of prestigious student awards • Donation amounts for undergraduate programs and space • Fraction of students with Honors college enrollment • Fraction of classes with less than 50 students • Number of undergraduate students working on research • Number of undergraduate students giving research posters and presentations at WSU events such as Showcase • Number of undergraduates appearing as authors on refereed journal articles



Subgoal	Tactics	Metrics
<p>2.b. Increase the size, diversity, and academic preparedness of the undergraduate and graduate student populations in Pullman and at the urban campuses.</p>	<ul style="list-style-type: none"> • Provide better support for struggling students <ul style="list-style-type: none"> o Improve curriculum advising experiences by reducing the student/advisor ratio o Improve graduate student advising by ensuring that the graduate student to graduate coordinator ratio remains low o Improve tutoring services and space 	<ul style="list-style-type: none"> • Number of students served • Fraction of students who are members of underrepresented groups • Student/advisor ratio • Fraction of retained first-generation college students • College enrollment (total graduate and undergraduate students)

Subgoal	Tactics	Metrics
<p>2.c. Produce graduates who are highly sought by post-baccalaureate and post-graduate employers and graduate/professional programs.</p>	<ul style="list-style-type: none"> • Improve the skills of teaching faculty and TAs <ul style="list-style-type: none"> o Creation of a “Teaching Academy” to train faculty members on best practices and to reward the best teachers o Host a NETI workshop so that all faculty have an opportunity to participate, and provide similar types of opportunities o Provide better support for struggling students via improved and more tutoring and training for TAs o Provide effective internal and external mentoring, such as that developed under the ADVANCE grant, for new faculty o Provide teaching mentoring to new faculty members o Improve the faculty mentoring (advising) of the students by providing mentoring/advising training for all faculty members <p style="text-align: right;"><i>continued ></i></p>	<ul style="list-style-type: none"> • Job placement rate of graduating students • Fraction of students going to graduate school • Fraction of faculty who participate in professional development opportunities (such as NETI, Frontiers, etc.) • Fraction of students who complete an internship/co-op experience



Subgoal	Tactics	Metrics
<i>2.c. continued</i>	<ul style="list-style-type: none">• External learning and industry relations<ul style="list-style-type: none">o Establish an experiential learning and professional practice program/industry relations office at the college level to help facilitate practical experiences and employment opportunities for studentso Develop formal experience-enhanced programs (internship/co-op, entrepreneurship, international studies, REU, interdisciplinary studies, etc.)o Increase entrepreneurship training opportunities• Graduate student training in teaching and mentoring<ul style="list-style-type: none">o Teaching fellows program	

Subgoal	Tactics	Metrics
2.d. Align student recruitment, admissions, and retention to enhance access, inclusiveness, and student success.	<ul style="list-style-type: none">• Support programs such as the Louis Stokes Alliance for Minority Participation (LSAMP), as well as the Team Mentoring Program (TMP), by encouraging faculty members to participate in these programs and by educating students about the opportunities available• Increase the amount of scholarship support available to students and increase the diversity of the pool of students eligible to receive scholarship support• Develop recruitment practices to attract women and underrepresented minorities to VCEA programs<ul style="list-style-type: none">o Adapt certain UCORE type courses to highlight the benefits of VCEA degrees	<ul style="list-style-type: none">• SAT/GRE scores• Percent retention• Student enrollment and retention across underrepresented groups



Theme 3: Outreach and Engagement

Goal 1: Increase access to and breadth of VCEA’s research, scholarship, creative, academic, and extension programs throughout Washington and the world.

Goal 2: Expand and enhance VCEA’s engagement with institutions, communities, governments, and the private sector.

Goal 3: Increase VCEA faculty, staff, and students’ contributions to economic vitality, educational outcomes, and quality of life at the local, state, and international levels.

Theme 3 Sub-goals implementation plan:

Subgoal	Tactics	Metrics
<p>3.a. Increase the impact of VCEA research, scholarship, creative, and outreach activities on quality of life and economic development within the state and region.</p>	<ul style="list-style-type: none"> • Develop more industrial consortia, pursue GOALI awards, emphasize research collaborations and grants from private companies and LSDF, JCATI and similar research that requires industrial involvement • Increase the number and quality of graduates • Increase number of significant student awards received • Increase sponsorship and hosting of symposia and conferences/workshops that target industry representatives • Increase the amount and impact of intellectual property resulting from VCEA research as evidenced by an increase in commercialization, licensing, and patents • Show leadership in codes and standards development in areas of research strength • Increase the impact of specialized infrastructure on industries in the state and region through an increase in the amount of “fee for service” extension from industrial users • Strengthen internship programs and develop a strong co-op program for students • Serve the community and the profession by participating in activities designed to improve and preserve the body of knowledge in engineering, computing, and design 	<ul style="list-style-type: none"> • Number of start-up businesses from VCEA research and outreach • Total research and development expenditures from industry (reported to NSF/ASEE) • Patents applied for/awarded • Royalties and other revenue from commercialization activities



Subgoal	Tactics	Metrics
<p>3.b. Increase access to the VCEA for place-bound, non-traditional, first-generation, and other underserved and underrepresented students.</p>	<ul style="list-style-type: none"> • Increase development of online courses where it is reasonable to do so. Continue to emphasize engineering and technology management, and develop master’s programs in software engineering and potentially other professional master’s degrees • Strengthen and continue to develop and grow non-Pullman sites that serve place-bound and underserved students, including the Tri-Cities, Vancouver, Bremerton, and Everett locations • Strengthen student clubs and programs that support URM groups (SWE, NSBE, SOLES) • Increase efforts specifically aimed at fundraising for scholarships for underrepresented students • Develop college-level focused recruitment on URM groups—continue efforts with Latino parents, etc. • Leverage programs aimed at URM populations to increase diversity of the student population in VCEA (including involvement in the LSAMP, TMP, AGEP, and GEM programs) • Support mentoring programs such as TMP, SWE, Boeing, etc. • Increase faculty diversity to help attract URM and provide role models • Proactively advance faculty prominence by nominating qualified individuals for high visibility awards 	<ul style="list-style-type: none"> • Total undergraduate, and graduate enrollment (minority, first-generation, low income) • Urban campus enrollment (Spokane, Tri-Cities, Vancouver) • Enrollment at other sites

Subgoal	Tactics	Metrics
<p>3.c. Contribute to economic security, stability, social justice, and public policy through research, education, and design.</p>	<ul style="list-style-type: none"> • Encourage continued influence on public policy, particularly through ESIC, LAR, and CEREO • Increase interaction with the Ruckelshaus Center • Encourage continued research in areas of cyber and software security and security of the power grid • Encourage and incentivize short-term faculty industry exchange programs • Continue research efforts in the signature theme areas of sustainability, smart systems, and environments 	<ul style="list-style-type: none"> • Number of schools and departments with advisory boards that include alumni and constituency representatives • Total annual college expenditures



Subgoal	Tactics	Metrics
3.d. Increase VCEA's global presence and impact.	<ul style="list-style-type: none">• Provide greater opportunities for international experiences for students, including the Building Bridges and Engineers Without Borders programs• Continue recruitment of international students and exchanges with international scholars• Develop strategic partnerships with targeted international universities• Increase participation in Fulbright program (with faculty and students)• Enhance exchange programs with international universities• Expand projects with WSU International Programs	<ul style="list-style-type: none">• International student enrollment• Number of faculty participating in international activities• Number of students participating in study abroad and other significant international experiences

Subgoal	Tactics	Metrics
3.e. Improve VCEA's reputation with external constituencies.	<ul style="list-style-type: none">• Improve strategic communication, including focused press releases to prominent media and regular communication with deans around the country• Improve marketing planning• Leverage the recent rebranding and naming of the college• Vigorously communicate successes in national polls and rankings for our programs• Do a better job of nominating and promoting faculty and students for prestigious awards	<ul style="list-style-type: none">• Peer assessment score from ASEE• Media, social media, and website analytics (number of views)



Theme 4: Diversity, Integrity, and Openness

Goal 1: Create and sustain a diverse, inclusive, and equitable community of scholars and students.

Goal 2: Cultivate a system-wide culture of organizational integrity, effectiveness, and openness that facilitates pursuit of the college’s academic aspirations.

Goal 3: Steward and diversify resources invested by students, the public, and private stakeholders in a responsible way to ensure economic viability of the institution.

Theme 4 Sub-goals implementation plan:

Subgoal	Tactics	Metrics
4.a. Recruit, retain, and advance a diverse intellectual mix of faculty, staff, and students, including women and those from underrepresented groups.	<ul style="list-style-type: none"> • Assure diversity and inclusion efforts are visibly and consistently supported at the highest levels of leadership (president, provost, chancellors, dean) • Improve mentoring of assistant and associate professors • Continue successful programs from ADVANCE aimed at the hiring and advancement of underrepresented faculty • Develop and implement social media tools to improve outreach to underrepresented groups • Assess and reward data-informed efforts by departments and areas to improve recruitment outreach to underrepresented groups 	<ul style="list-style-type: none"> • Percent of students and faculty from underrepresented groups

Subgoal	Tactics	Metrics
4.b. Maintain respectful, inclusive, and non-biased behavior in all university environments.	<ul style="list-style-type: none"> • Maintain and strengthen units, programs, and spaces that promote community building, intercultural exchange, and a diversity of voices • Recognize contributions to an inclusive and respectful work environment in employee performance evaluations 	<ul style="list-style-type: none"> • Key indicators from biennial institution-wide Employee Engagement Survey



Subgoal	Tactics	Metrics
4.c. Increase employee productivity and satisfaction.	<ul style="list-style-type: none">• Improve functionality of information technology systems for administrative processes, student services, and research• Recognize productivity in employee performance evaluations• Communicate openly and with appropriate timeliness on issues of relevance to students, faculty, staff, and external constituencies• Reduce the administrative burden on high performing faculty and staff• Regularly review current work environments and processes for improvement• Use data/information gathered from the employee engagement survey to improve work environment• Provide resources for professional development	<ul style="list-style-type: none">• Average employee satisfaction rating from Employee Engagement Survey (faculty, staff)

Subgoal	Tactics	Metrics
4.d. Strengthen administrative accountability, innovation, creativity, openness, transparency, and collaboration to advance the college's mission.	<ul style="list-style-type: none">• Undertake regular evaluations of academic units, programs, centers, and institutes to ensure resource alignment is consistent with university goals and productivity• Conduct evaluations and implement improvement of administrative processes to ensure maximum efficiency and effectiveness• Remove administrative barriers that prevent entrepreneurial innovation• Improve administrative and academic analytic capabilities to improve decision making• Improve day-to-day communication from university and college level administration	



Subgoal	Tactics	Metrics
4.e. Utilize strategic plans, valid and reliable data, and evaluation indicators to align investments of resources with college priorities.	<ul style="list-style-type: none">• Engage key constituencies in decision making, governance, and strategic planning• Report annually on progress toward goals of strategic plan• Focus on harnessing individuals and units to partner on large, programmatic initiatives that advance WSU's intended institutional profile• Map VCEA priorities to university, state, and federal plans	

Subgoal	Tactics	Metrics
4.f. Expand, diversify, and effectively steward funding to advance VCEA's mission.	<ul style="list-style-type: none">• Expand revenue from summer session, online education, and not-for-credit offerings• Maintain VCEA development resources at levels in excess of \$10 million per year	<ul style="list-style-type: none">• Annual VCEA private support



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