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NATIONAL ACADEMY OF ENGINEERING
GRAND CHALLENGES SCHOLARS PROGRAM PROPOSAL
Grand Challenges Scholars Program Vision, Mission, and Goals

The mission of the College of Engineering (CoE) at the University of Wisconsin-Madison (UW-Madison) is to educate and inspire future leaders who contribute to society through the creation, application and transfer of engineering knowledge, and through engagement in society. Through our vibrant community of faculty educators, researchers, scholars, engineering practitioners, and students, UW-Madison CoE has lived our vision as a world-class college of engineering recognized for strengths in basic and applied research, educational innovation, technology transfer, and service to society. UW-Madison CoE has also established a history of influential discoveries and research innovations that have shaped the world and created transformative leaders who have eagerly engaged in many of the world’s complex challenges.

The UW-Madison CoE Grand Challenges Scholars Program (UW-GCSP) will leverage this excellence and integrate our dynamic and diverse community for undergraduate students with an enhanced layer of knowledge development, engineering experiences, entrepreneurship, global awareness and servant leadership skills to address and solve the Grand Challenges articulated by the National Academy of Engineering (NAE). We will complete this enhancement while also expanding our students’ understanding of diversity, inclusion, equity and civility. By attracting, training, engaging and disseminating the undergraduate students who will develop solutions to today’s grand challenges, UW-Madison CoE continues to demonstrate its leadership as one of the preeminent institutions in the world.

The vision and mission of the NAE Grand Challenge Scholars Program (GCSP), as articulated through the five GCSP competency areas – talent building, multicultural experience, multidisciplinary education, entrepreneurial activities, and social consciousness – are well-aligned with the vision and mission of the CoE at UW-Madison and resonate with the essence of the Wisconsin Idea – that education should influence people’s lives beyond the boundaries of the classroom. The UW-GCSP program provides a natural opportunity for the CoE at UW-Madison to implement an enhanced and structured experience to a diverse cohort of undergraduate students to help them realize their potential as future engineers, citizens, entrepreneurs and leaders in addressing pressing societal challenges.

In developing UW-GCSP, UW-Madison CoE has developed the following programmatic goals:

- Provide undergraduate students with a new avenue for exploring the most pressing societal problems through multidisciplinary education, training, research and hands-on experience;
- Provide a formal pathway through which students can leverage existing educational programs and resources offered by UW-Madison to structure a unique, multidisciplinary and multicultural educational experience anchored on one or more of the 14 NAE Grand Challenges;
- Link existing CoE programs to UW-GCSP, including the Undergraduate Research Scholars Program, Pieper Servant Leadership Program, Grainger Engineering Design Innovation Laboratory, Steuber Prize in Writing and Communication, and Boldt Entrepreneurial Innovation Competition, providing UW-GCSP and other CoE students with a vast array of unique opportunities;
Weave learning opportunities in inclusivity, civility, servant leadership and the *Wisconsin Idea* throughout the program;

Create a diverse and thriving network of UW-GCSP scholars and alumni who will support each other throughout their careers.

Each of these goals strategically align with the mission and values described.

The UW-GCSP will provide an undergraduate scholars experience that will typically span six semesters, anchored around the 14 Grand Challenges within each of the four themes that include:

**Sustainability**

1. Make solar energy economical
2. Provide energy from fusion
3. Develop carbon sequestration methods
4. Manage the nitrogen cycle
5. Provide access to clean water

**Health**

6. Advance health informatics
7. Engineer better medicines

**Security**

8. Prevent nuclear terror
9. Secure cyberspace
10. Restore and improve urban infrastructure

**Joy of Living**

11. Reverse-engineer the brain
12. Enhance virtual reality
13. Advance personalized learning
14. Engineer the tools of scientific discovery

To complete the UW-GCSP and be designated a NAE Grand Challenges Scholar, our student scholars will have focused on a selected theme and one or more Grand Challenges, will have completed up to six academic courses from a wide selection of offerings and completed a research, multicultural, multidisciplinary, entrepreneurial, social conscious and leadership experience.

David A. Noyce, the Arthur F. Hawnn professor of Civil and Environmental Engineering and Executive Associate Dean of the College of Engineering, will be the inaugural Director of UW-GCSP. Selected interdisciplinary faculty identified through broad domains of research will make up the oversight committee and provide the foundation of UW-GCSP. Additionally, UW-GCSP will link with and leverage existing educational opportunities and established programs in the CoE and across UW-Madison to add opportunity and breadth to the UW-GCSP and allow students to build their Grand Challenges portfolios.
Uniquely, UW-Madison CoE has developed and continues to develop new curricular and co-curricular programs and initiatives in support of our undergraduate engineering students. To integrate this unique experience, UW-GCSP will leverage several of our existing experiential, multicultural, research, and servant leadership opportunities with new courses and experiential learning opportunities specifically developed to enhance the UW-GCSP experience and in-part open these offerings to our entire undergraduate community. Some of these opportunities will include:

- **Study Abroad** - an international experience plays a significant role in enhancing undergraduate multicultural education. Through more than 50 existing programs, UW-Madison CoE’s study abroad program builds cross-cultural skills and experiences and is available to all students [https://www.engr.wisc.edu/academics/beyond-the-classroom/study-abroad/](https://www.engr.wisc.edu/academics/beyond-the-classroom/study-abroad/);

- **Engineers Without Borders (EWB)** – a philanthropic and service opportunity educating internationally-responsible engineers and students. EWB influences people's lives beyond the classroom by providing engineering and social services in Wisconsin and in under-served communities around the globe [http://ewbuwmadison.weebly.com/](http://ewbuwmadison.weebly.com/);

- **Engineering World Health (EWH)** – a philanthropic and service opportunity to improve health-care specifically in disadvantaged areas by creating, repairing, and educating those about medical technology [https://win.wisc.edu/organization/ewh](https://win.wisc.edu/organization/ewh);

- **UniverCity Alliance** - connects education, service and research activities across UW-Madison with cities, furthering the practice of sustainability [https://univercity.wisc.edu/](https://univercity.wisc.edu/);

- **Suzanne & Richard Pieper Family Foundation Servant Leadership Program** – provides students with a unique experience in servant leadership through leadership training, entrepreneurial innovation competitions, and student organizations [https://pieper.engr.wisc.edu/](https://pieper.engr.wisc.edu/);

- **Transcend and Boldt Innovation Competitions** – annual competitions designed to pique curiosity, ignite the spark of creativity and provide paths along which students can pursue innovative ideas and bring them to life [https://innovation.wisc.edu/](https://innovation.wisc.edu/);

- **Undergraduate Research Scholars (URS)** - the URS program provides research experiences for students who want to acquire an interdisciplinary perspective on research, develop critical thinking, and grow as an informed citizen. Faculty supported research, independent studies, engineering honors programs, research experiences for undergraduates (REU), and summer undergraduate research experience (SURE) program enhance this offering [https://www.engr.wisc.edu/academics/beyond-the-classroom/undergraduate-research/](https://www.engr.wisc.edu/academics/beyond-the-classroom/undergraduate-research/);

- **Senior Capstones** – provides a comprehensive learning experience with key business, industry, and public agency collaborators to enhance the undergraduate student experience; publish technical and non-technical professionally-reviewed project reports, design net-zero, smart, resource-efficient building and site design, materials, and systems, develop innovative design concepts to address environmental challenges, and plan and design in ways that support healthy ecosystems, and develop industry partnerships [https://xdi.wisc.edu/capstone/](https://xdi.wisc.edu/capstone/)

[https://www.engr.wisc.edu/department/civil-environmental-engineering/academics/cee-capstone-partnership/](https://www.engr.wisc.edu/department/civil-environmental-engineering/academics/cee-capstone-partnership/)
- **The UW Makerspace** – a community of designers and builders at UW-Madison within the CoE, the UW Makerspace strives to empower students by providing a unique space, facilities and community for cross-disciplinary research, design, and innovation [https://making.engr.wisc.edu/](https://making.engr.wisc.edu/). The UW Makerspace facilitates the UW-GCSP program through its cross-disciplinary design and innovation (XDI) initiative ([https://xdi.wisc.edu/](https://xdi.wisc.edu/)) from the recruitment of UW-GCSP scholars in their freshman year (first-year interest groups) through their senior-year capstone design projects.

- **Grainger Design and Innovation Laboratory** – part of the CoE innovation facilities creating a community of designers and builders with access to shop and flex space with a wide range of rapid prototyping equipment. Part of the CoE ecosystem of fabrication facilities, which includes the Makerspace (rapid prototyping), TEAM Lab (Technical Education and Manufacturing Lab – precision machining, fee for service job-shop), and the Kohler Innovation Visualization Studio (virtual & augmented reality, 3D scanning, and data visualization) [https://making.engr.wisc.edu/](https://making.engr.wisc.edu/);

- **Our Wisconsin** - an inclusion program that was developed to build community among our diverse student body aimed to improve the UW-Madison’s campus climate. Every student at UW-Madison, regardless of their background or how they may identify, should feel safe, valued, supported, and welcomed [https://apps.students.wisc.edu/ourwisconsin/](https://apps.students.wisc.edu/ourwisconsin/).

UW-GCSP will build upon these foundational opportunities and other academic courses and programs across UW-Madison to connect Grand Challenge Scholars and their undergraduate curriculum with all five primary competency areas described by the National Academy of Engineering (NAE):

- Talent;
- Multicultural;
- Multidisciplinary;
- Viable Business / Entrepreneurship; and
- Social Consciousness.

The initial integration of the topic areas into the operational structure of UW-GCSP will be led by Director Noyce with the support of a faculty oversight committee comprised of faculty from across the CoE. Within the first year of the UW-GCSP, a Program Director solely dedicated to the leadership of UW-GCSP will be selected and tasked to lead and grow UW-GCSP. The UW-GCSP Director will work directly with David Noyce in his role as Executive Associate Dean assuring that the administration of UW-GCSP is directly linked to the administration of the CoE. The Faculty Oversight Committee will help the UW-GCSP Director create and maintain an innovative and dynamic curriculum in line with the objectives of both the NAE and UW-Madison. The committee’s efforts will include, but not be limited to, selecting and reviewing the interdisciplinary curriculum and identifying unique experiences to ensure a comprehensive, connected and cohesive program in line with the NAE grand challenges. Annual review and selected updates to one or more of the designated competency areas within the program will also be tasked. The Faculty Oversight Committee may also review selected individual UW-GCSP student plans and assessments to assure fair and consistent evaluations and consistency in mentor expectations.
Mentors for the program are essential and will be selected from the CoE faculty whose research focus in some way touches one or more of the NAE Grand Challenges. Mentors and the Faculty Oversight Committee will coordinate at the beginning of each academic year to review and enhance the UW-GCSP. General guidelines and responsibilities will be created for each faculty mentor such that the goals and objectives of the program are clearly articulated. Before or during the application process, prospective UW-GCSP student scholars will be matched to faculty mentors who will work with the students to prepare a curriculum to fulfill the requirements of the UW-GCSP. Mentors and students will meet regularly to monitor (and document) progress, to assure NAE thematic connectivity and continuity, and to develop a relationship that enriches the overall program. An e-folio or similar repository will be created that provides a home for progress documentation and a record of completion when the program certificates are awarded.

**Essential Elements of Grand Challenges Scholars Program**

**Grand Challenges Scholar Recruitment and Selection**

The UW-GCSP Director and Faculty Oversight Committee will develop and implement a communication strategy that connects with freshman and sophomore students throughout the UW-Madison CoE. In addition, a UW-GCSP website, information seminars, freshman and sophomore course activities and communication with undergraduate advisors and academic planners will inform students of the opportunity, benefits and process for participating in the UW-GCSP. Each of the 50+ CoE affiliated student organizations, including the Society of Women Engineers, American Indian Science & Engineering Society, Society of Hispanic Professional Engineers and Wisconsin Black Engineering Student Society will receive UW-GCSP information. Natural partners including CoE and campus offices for internships, international experiences and student advising will also be employed.

UW-GCSP has set a goal to enroll 25 students in the initial year of the program. Other non-enrolled undergraduate students may elect to participate in parts of the program, primarily those related to academic courses on entrepreneurship and leadership, local experiences such as the UniverCity Alliance, and international experiences including study abroad and Engineers without Borders.

The UW-GCSP Director will implement an application, review and selection process that facilitates the connection of applicant students and faculty mentors for those students who have not previously identified a faculty mentor. All academic advisors, the UW-GCSP website and general communication from the UW-GCSP will have a list of potential faculty mentors. Efforts will be made by the UW-GCSP Director and Faculty Steering Committee members to help students who have yet to establish a relationship with a faculty member to connect and establish this relationship. The need for a letter of recommendation and commitment as part of the student application process should not be a barrier to the applicants. Once identified, faculty mentors will work with UW-GCSP applicants to select a curriculum that fulfills the program requirements while also fulfilling the degree requirements of their major.
To apply for the UW-GCSP, a student must first complete an application form (draft form and instructions attached in Appendix B). The completed application must include a recommendation and commitment letter from a faculty member ideally prepared to be a faculty mentor. Typically, the letter will address student strengths, interests, commitment to a theme and one or more Grand Challenges and motivation to complete the program. The letter will also confirm the faculty mentor’s commitment to support the student throughout the duration of the UW-GCSP. A short two-page essay on reasons and challenges for participating in the program is also required. Finally, applicants will be asked to propose a preliminary UW-GCSP curricular and co-curricular plan that includes activities in all five of the competency areas (see Appendix C). This plan will be reviewed regularly, and revised as necessary, upon acceptance to the program and at multiple times throughout the program.

UW-GCSP scholar selection will take place during the spring advising period each academic year. UW-GCSP applications will be reviewed by the faculty oversight committee with the outcome being recommendations for selection. All students admitted to the UW-GCSP will be matched with a faculty mentor, most likely the faculty member who worked with the student during the application process.

Students selected to participate in the UW-GCSP must have a minimum 3.00 GPA and be in good overall academic standing. Applicants must be a student in the UW-Madison CoE with at least four semesters remaining until graduation.

UW-GCSP Faculty Oversight Committee will review all applications and recommend students for admission to the program. Successful candidates will be notified of their acceptance to the program prior to April 1 and may begin the program in the following summer or fall semester. Those students not accepted will not be offered an appeal.

Students in the UW-GCSP must meet at least once a semester with their UW-GCSP faculty mentor, submit an annual progress report (by April 1 of each academic year) outlining their accomplishments for the past academic year and detailing plans for the upcoming academic year, and attend UW-GCSP functions. Students who wish to change their Grand Challenges topic commitment should discuss with their faculty mentor and submit a request for change approval to the UW-GCSP Director. Students may request a reduced level of participation in UW-GCSP activities or may request a semester suspension of all activities if academic load or personal activities require priority. The UW-GCSP web site will allow for self-submission of student scholar documents that can be reviewed and approved by the faculty mentor and/or UW-GCSP leadership.

Students in good standing with the UW-GCSP will receive an annual notice of continuation. Those students who have not progressed sufficiently and have not met stipulated requirements will be removed from the UW-GCSP. An appeal process will be created for students with extenuating circumstances who wish to be readmitted to the UW-GCSP. To complete the program, students must have fulfilled all UW-GCSP requirements prior to graduation, including a final report describing the breadth and depth of their Grand Challenges program specifically describing the accomplishments within
each of the five competency areas. Final reports will be reviewed and accepted by the Faculty Oversight Committee.

**Grand Challenges Scholars Program Experiences**

The value and life-long engagement of an undergraduate student’s experience in the UW-GCSP is based upon the completion of the five Grand Challenge curricular components. Scholars will be required to undertake requirements in each of the following competencies:

- Talent;
  - Research;
- Multicultural;
  - Including diversity, inclusion, and civility;
- Multidisciplinary;
- Viable Business / Entrepreneurship;
- Social Consciousness;
  - Including servant leadership.

UW-GCSP students will be expected to gain both breadth and depth through the array of opportunities available. Scholars will be expected to complete comprehensive experiences in research and servant leadership. Students must also complete one or more undertaking in multicultural, multidisciplinary, and entrepreneurship competencies. A least one activity in all five competencies is required to complete the UW-GCSP obligation. To add breadth to their program, student scholars will be encouraged to select components accentuating their topic focus/theme area.

**Talent Competency**

Each Grand Challenge scholar must develop capabilities for creative research to address the Grand Challenges. Scholars will participate in a substantial team or independent project and conduct research relating to a Grand Challenge theme. There are several existing mechanisms at the UW-Madison CoE to provide research experience related to the chosen Grand Challenge theme selected. These include:

- Undergraduate research or independent study through URS or independent programs focused on one of the Grand Challenges themes guided by a faculty mentor. Research results will typically be presented via poster at UW-Madison’s undergraduate research symposium;
- Capstone Design Project, either department or cross-disciplinary Capstone Design Projects offered by the UW-Madison CoE Makerspace ([https://making.engr.wisc.edu/](https://making.engr.wisc.edu/));
- Participation in the Undergraduate Research Scholars (URS) Program ([https://urs.ls.wisc.edu/](https://urs.ls.wisc.edu/));
- Summer Undergraduate Research Experience (SURE) ([https://www.engr.wisc.edu/academics/student-services/diversity-programs/engineering-summer-program/](https://www.engr.wisc.edu/academics/student-services/diversity-programs/engineering-summer-program/));
- Research internship experience at an external organization;
• Or, a pre-approved similar program.

Each UW-GCSP scholar will be required to complete at least one of the above activities, each spanning a minimum of one semester. It is expected that most if not all UW-GCSP scholars will participate in both a research and capstone experience.

**Multidisciplinary Competency**

The research conducted within UW-Madison CoE is often highly interdisciplinary in nature, spanning multiple colleges, schools and departments. In particular, the first-year interest group (FIG) programs and the capstone design projects offered through the CoE Makerspace provide hands-on cross-disciplinary experience in research and innovation. UW-GCSP scholars will be required to further develop this competency through the weaving of engineering and non-engineering curricular aspects through several interdisciplinary curriculum courses offered at UW-Madison broadening their experience beyond engineering.

Each UW-GCSP scholar must complete the following course:

• INTERENG 200 - Perspectives on the Grand Challenges for Engineers

This 1-credit on-line course developed specifically for the UW-GCSP will introduce scholars to the Grand Challenges and the competencies necessary for success.

A second requirement is to complete one interdisciplinary course that aligns with the selected Grand Challenges theme. An interdisciplinary experience that aligns with the selected Grand Challenges theme may also be considered. Experiences may include an internship outside of engineering or other dedicated experiences in areas such as public policy, law, business and medicine approved by the faculty mentor. Approved interdisciplinary curricular courses include:

**Health**

• NUTR SCI/AGRONOMY/ENTOM 203 — Introduction to Global Health
• MED HIST/ENVIR ST 213 — Global Environmental Health: An Interdisciplinary Introduction
• POP HLTH 370 — Introduction to Public Health: Local to Global Perspective
• MEDICAL HISTORY AND BIOETHICS 553 — International Health and Global Society

**Energy**

• ENVIR ST/BSE 367 — Renewable Energy
• ENVIR ST/GEOSCI 411 — Energy Resources
• EP 602 — Sustainable Energy Challenges and Solutions
• NE 571 — Economic and Environmental Aspects of Nuclear Energy
Education
- HISTORY OF SCIENCE 202 — The Making of Modern Science
- HISTORY OF SCIENCE 323 — The Scientific Revolution: From Copernicus to Newton

Security
- COMP SCI 642 — Introduction to Information Security
- MEDICAL HISTORY AND BIOETHICS 565 – The Ethics of Modern Biotechnology
- INTL ST 401 — Topics in Global Security
- POLI SCI 343 — Theories of International Security

Sustainability
- ENVIR ST/GNS 210 — Cultures of Sustainability: Central, Eastern, and Northern Europe
- ENVIR ST/M HR 310 — Challenges and Solutions in Business Sustainability
- ENVIR ST/GEOG 139 - Living in the Global Environment
- ENVIR ST/AECON 244 - Environment and Global Economy
- ENVIR ST 250 - Intro to Sustainability Science
- ENVIR ST/AE/CEE 561 - Energy Markets
- CBE 562 - Energy and Sustainability
- CEE 421 - Environmental Sustainability Engineering
- AOS 102 – Climate and Climate Change
- AOS 121 – Atmospheric Environment and Society
- AOS 171 – Global Change

Multicultural Competency
UW-GCSP student scholars must develop a global perspective to successfully address the global Grand Challenges and become innovative leaders in a global economy. To achieve this, two requirements are needed to fulfill the multicultural and global awareness requirement. Students must complete one course pertaining to multicultural and global awareness preferably related to their Grand Challenges theme. Second, students must take a second course in global awareness or complete a study abroad, international project through Engineers without Borders, or similar experience approved by the faculty mentor. Details on the proposed Engineers without Borders project or study abroad program and how it relates to the global component of the UW-GCSP should also be pre-approved by the faculty mentor.

Pre-approved courses for satisfying competency requirements:

Health
- ENVIR ST/GEOG 139 — Global Environmental Issues
- INTER-AG/A A E/AGRONOMY/NUTR SCI 350 — World Hunger and Malnutrition
To foster awareness in multicultural issues, including diversity and inclusion, UW-GCSP student scholars are encouraged to participate in programs such as Our Wisconsin program (https://apps.students.wisc.edu/ourwisconsin/) and the Multicultural Student Center (https://msc.wisc.edu/) at UW-Madison. MSC offers a variety of opportunities for students to gain multicultural experiences so that their technical solutions are conceived with cultural and global sensitivity. Some of the offered programs include:

- Cultural programs specific to Asia-pacific and southeast Asia, Latinx and Black
- Social justice programs, including the Social Justice 101 workshop series, social justice leadership retreat, and the LGBTQ+ Crossroads Initiative

In addition, the CoE Diversity Affairs Office at the UW-Madison offers several programs that are relevant to developing the multicultural competency including (https://www.engr.wisc.edu/academics/student-services/diversity-programs/):

- Leaders in Engineering Excellence and Diversity (LEEDS) Scholars Program
- Engineering Summer Program
Scholars interested in one of these programs should discuss with their mentor and determine which of these activities may serve as an enhancement or substitute for the global experience requirement.

**Business and Entrepreneurship Competency**

Scholars will have a number of pathways to develop business and entrepreneurial skills for translating their ideas or research into innovation and business opportunities. Specific emphasis is placed on the development of innovations within the selected Grand Challenges theme and with the potential for global solutions. The first requirement is to complete a course from the follow list:

- GEN BUS 311 - Fundamentals of Management and Marketing
- MHR 320 – New Ventures in Business, the Arts and Social Entrepreneurship
- MHR 321 – Social Entrepreneurship
- MHR 322 – Introduction to Entrepreneurial Management
- FINANCE 300 – Introduction to Finance

Second UW-GCSP scholars must complete an entrepreneurship experience that aligns with the selected Grand Challenges theme. These experiences include:

- Participation in the Discovery to Product (D2P) program (https://d2p.wisc.edu/) that provides resources to transform innovations into products and services including: direct mentorship, navigation of the UW-Madison entrepreneurial ecosystem, and workshops, training, lectures and education. In particular, the cohort-based courses Innovation to Market (I2M) (https://d2p.wisc.edu/programs/innovation-to-market/) and the Igniter (https://d2p.wisc.edu/programs/igniter/) are aimed at helping innovators move beyond ideas to informed implementation through hands-on learning and engagement.
- Participation in a Wisconsin Alumni Research Foundation (WARF https://www.warf.org/) program aimed at entrepreneurs, including Upstart – a multi-week course for women entrepreneurs and entrepreneurs of color.
- Obtaining a certificate in Entrepreneurship for non-business majors offered through the Wienert Center for Entrepreneurship at UW-Madison https://bus.wisc.edu/centers/weinert.

The Weinert Center offers many resources and programs that the GC scholars may consider, including:

- Wisconsin Entrepreneurship Showcase that provides an opportunity for GC scholars to network with local entrepreneurs, venture capitalists, and experts https://bus.wisc.edu/centers/weinert/wisconsin-entrepreneurship-showcase
• Business and Entrepreneurship Clinic that provides free business advice and services for Wisconsin based entrepreneurs [https://bus.wisc.edu/centers/weinert/business-and-entrepreneurship-clinic](https://bus.wisc.edu/centers/weinert/business-and-entrepreneurship-clinic)

A certificate in business administration, economics, or management can be used to fulfill this competency requirement.

**Social Consciousness and Servant Leadership Competency**

The concept of Social Consciousness and Servant Leadership is essential to the *Wisconsin Idea*. The hallmark for this competency is participation in the Pieper Servant Leadership program. The mission of the Pieper Servant Leadership program is to help prepare future leaders in their chosen fields to live lives of service to others by teaching and exemplifying character and moral values. Through the Suzanne & Richard Pieper Family Foundation Servant Leadership endowment, UW-GCSP will understand the core philosophies of servant leadership, that is, a set of practices that enriches lives, builds better organizations and communities, leading to a better world. UW-GCSP must complete:

• INTEREGR 303 : Applied Leadership Competencies in Engineering

Student scholars are also required to complete a philanthropic experiential program such as:

• Engineers Without Borders [http://ewbuwmadison.weebly.com/](http://ewbuwmadison.weebly.com/)
• Engineering World Health [https://win.wisc.edu/organization/ewh](https://win.wisc.edu/organization/ewh)
• UniverCity Alliance [https://univercity.wisc.edu/](https://univercity.wisc.edu/)
• Engineering Expo (Leadership role) [https://engineeringexpo.wisc.edu/](https://engineeringexpo.wisc.edu/)

In lieu of an experiential program, students must complete at least two additional academic credits of courses that deepen their social awareness and builds on servant leadership. Preapproved courses include:

• INTEGSCI 230 – Exploring Discipline-Based Leadership and Mentoring
• INTEGSCI 240 – Service with Youth in STEM
• INTEGSCI 341 – Service with Youth in STEM Practicum

Participation in Pieper Servant Leadership lectures, events and roundtables is strongly encouraged throughout the program.

**Thematic Continuity and Connectivity**

The Grand Challenge student scholars are expected to undertake activities in the above five competency areas that are synergistic and complementary to fulfilling the goals of the program in relation to their
chosen Grand Challenges Theme and Grand Challenge(s). At the end of the program, the student scholars will be required to submit a report (approximately 10 pages, single-spaced) summarizing:

- Their work in the different competency areas (1-2 pages for each area);
- How the work in the different areas relates to their chosen Grand Challenges theme and Grand Challenges topic (1-2 pages);
- How the different areas link;
- Their impressions on experiences in the UW-GCSP and how it may impact/inform their career plans.

Programmatic and Individual Student Assessment

Each scholar will be assigned to a UW-GCSP faculty mentor to guide them through the selection of various activities and courses related to the chosen UW-GCSP theme and to facilitate their progress towards successful completion of the program. Activity selection must meet the goals identified at the beginning of this document and fulfill the primary objective of providing undergraduate students with a new avenue for exploring the most pressing societal problems through multidisciplinary education, training, research and hands-on experience. Faculty mentors will also be asked to participate in an annual meeting to discuss best methods for supporting students in the UW-GCSP and to help recruit additional faculty participants.

All activities undertaken by the student scholar will require prior approval from the faculty mentor. The faculty mentor and the student will work together to assess the students’ progress over the course of the program and make any adjustments as needed. Student UW-GCSP plans will be satisfactory if a Grand Challenges Theme and topic is defined, a program is developed around this theme and Grand Challenge, the plan identifies how activities within each theme are met and the student commitment is clear. Desired outcomes of UW-GCSP program will be met through the completion of the program. To assess the students’ performance and confirm completion, UW-Madison’s Academic Program Assessment Plans will be used (https://assessment.provost.wisc.edu/academic-program-assessment-plans-guidelines-and-templates/). Learning goals and objectives will be identified for each competency area and will be adopted and/or adapted to support program assessment. A rubric will be established to quantify the outcome assessment. Using a Likert scale of 1 to 5, a minimum of 75% of the rubric points are required for a passing assessment.

Assessment criteria will include:

- Completeness of the program and quality of the final report
  - 1 – Most criteria not met
  - 5 – All criteria met
• Commitment – actively participated in the UW-GCSP when commitment was made**
  o 1 – Limited activity and participation
  o 5 – Active each semester and throughout the program
  **It is fully expected that academic workload, internships and co-ops, and other academic or personal commitments may warrant a reduced or suspended level of commitment for a given semester and shall be considered in assessing this metric

• Demonstrated program outcomes
  o 1 – program activities and final report does not demonstrate the vision of the Grand Challenges Scholars Program
  o 5 - program activities and final report clearly demonstrates successful achievement of the Grand Challenges Scholars Program vision and mission

• Servant Leadership
  o 1 – No demonstration of servant leadership principles
  o 5 – Clear understanding a demonstration of servant leadership principles

Additionally, learning objectives and outcomes assessment rubrics will be developed for each of the competency areas. For example, the Talent competency (research) rubric, with a Likert Scale range of 1 – does not meet expectation to 5 – exceeds expectations, may include:

• Identification of Grand Challenge
  o Understanding of Grand Challenge
  o Understanding the problem, issues, and needs

• Research Scope
  o Formulate question

• Relevance
  o How does research relate to the Grand Challenges theme and/or Grand Challenge

• Concept Generation
  o Consider multiple research strategies
  o Research plan developed

• Tasks Identified
  o Research plan continuity

• Research Execution
  o Data development plan, data collection and analysis
  o Research results

• Research Outcome
  o Documentation of research findings
  o Presentation of research results
  o Contribution and lessons learned

Other assessment criteria will be developed by the Faculty Steering Committee and UW-GCSP leadership team.
All UW-GCSP student plans, individual student activities, student program goals, and student assessments will be submitted to and approved by the UW-GCSP Program Director before the feedback and results are returned to the student scholar. The purpose of this final step in the review process is to:

- Assure that each UW-GCSP student is held to consistent and comparable program standards and expectations;
- Assure mentors are applying consistency in program expectations; and
- Assure that all metrics within the rubric, including the commitment metric, are being applied consistently.

It is fully expected that the level of UW-GCSP students’ activities will vary by semester. This variance may be the result of large course loads, internships or co-ops, and any number of other academic and personal experiences. Students may also decide to suspend activities for a semester. Flexibility in the UW-GCSP is certainly provided and will be appropriately reflected in the commitment evaluation.

In situations where an arbitrating evaluation related to a student assessment is required, the UW-GCSP Program Director will ask for additional review from the Faculty Steering Committee. The findings of the Steering Committee will represent the final outcome of the student assessment.

It is important to note that the student assessment is not intended to be penal; rather, it is intended to reflect on accomplishments, provide a consistent and fair assessment of progression for all UW-GCSP students, and to encourage student participation in future activities. The overriding goal of the UW-GCSP is to strengthen and enhance the students’ academic experiences while ensuring the integrity of the UW-Madison program.

**Institutional GCSP Governance and Sustainability**

The UW-Madison UW-GCSP will be governed by the following team:

- Program Director
- CoE Executive Associate Dean (integrate UW-GCSP with CoE leadership)
- Faculty Steering Committee consisting of at least three faculty (volunteer service 3-year term) and one student member (2-year term); and
- UW-GCSP faculty mentors who will work with the scholars.

The Director and Faculty Steering Committee, with input from the faculty mentor, will be responsible for selecting the cohort of scholars each year and for certifying successful completion of the program by the scholars.

UW-GCSP is supported financially through the Pieper Servant Leadership endowment, Stueber endowment and through previous CoE investments with a commitment to program success. UW-
Madison resources are also available for international programs including study abroad and Engineers without Borders. Resources are available for travel to national GCSP events; student engagement in research, service or entrepreneurship activities; on-campus events for students; participation in annual national GCSP events; food costs for GCSP meetings and events; guest speaker travel expenses and honoraria; printing expenses to market the GCSP, and other related expenses. The UW-GCSP Director will meet with faculty mentor and scholars to develop program budgets.

**Mentorship for GCSP Faculty and Students**

The Director and Faculty Steering Committee will serve as the initial set of mentors for UW-GCSP faculty mentors and students. Over time, some faculty mentors and UW-GCSP students will also take part in the mentoring of future faculty and students involved in the program. As mentioned, faculty mentors will also be asked to participate in an annual meeting to discuss best methods for supporting students in the UW-GCSP and to help recruit additional faculty participants.

**Student Recognition**

The successful completion of the program by a UW-GCSP scholar will be publicly recognized through a program completion award presented at an annual UW-GCSP event and through acknowledgement at the College of Engineering graduation ceremony.

**Other**

Attached in the following appendices are a program summary, draft student application form and application requirements, and draft program management documents.
## Appendix A. UW-GCSP Program Summary

<table>
<thead>
<tr>
<th>GCSP Curricular Components</th>
<th>UW-GCSP Fulfillment Options**</th>
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<tbody>
<tr>
<td><strong>Talent Competency</strong></td>
<td>Must complete a project, either independent, or a substantial contribution to a team effort, targeting one of the 14 Grand Challenges, and must include one of the following activities for at least one semester:</td>
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<td>• Undergraduate research or independent study experience guided by a faculty mentor.</td>
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<td>• Capstone Design Project, either offered by a department or through the UW Makerspace (<a href="https://making.engr.wisc.edu/">https://making.engr.wisc.edu/</a>).</td>
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<td></td>
<td>• Participation in the Undergraduate Research Scholars Program (<a href="https://urs.ls.wisc.edu/">https://urs.ls.wisc.edu/</a>), or similar program.</td>
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<td>• Research Internship experience at an external organization.</td>
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<td><strong>Multidisciplinary Competency</strong></td>
<td>Must complete the following course:</td>
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<td>• INTERENGR 200 - Perspectives on the Grand Challenges for Engineers</td>
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<td>Additionally, must complete one interdisciplinary course, approved by the faculty mentors, that aligns with the selected Grand Challenges theme. Or, an interdisciplinary experience that aligns with the selected Grand Challenges theme.</td>
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<td><strong>Multicultural Competency</strong></td>
<td>Must complete one course pertaining to multicultural and global awareness preferably related to their Grand Challenges theme.</td>
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<td>Additionally, scholars must take a second course in global awareness or complete a study abroad or international project.</td>
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<td><strong>Entrepreneurship</strong></td>
<td>Must complete a course from the following list:</td>
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<td>• GEN BUS 311 – Fundamentals of Management and Marketing for Nonbusiness Majors.</td>
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<td>• MHR 320 – New Ventures in Business, the Arts and Social Entrepreneurship</td>
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<td>• MHR 321 – Social Entrepreneurship</td>
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<td></td>
<td>• MHR 322 – Introduction to Entrepreneurial Management</td>
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<td>Additionally, must complete an entrepreneurship experience aligned with the selected Grand Challenges theme.</td>
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</table>
| Social Consciousness Competency and Servant Leadership | Must complete the following course:  
- InterEgr 103, Core Competencies for Engineering Leaders.  

Additionally, must complete an international experience  
In lieu of an international experiential program, must complete at least two academic credits of courses that deepen social awareness and build on servant leadership. |

**No curricular or non-curricular requirement shall satisfy more than one competency requirement**
Appendix B. Draft Application Form and Instructions

UW Madison  
College of Engineering  
NAE Grand Challenges Scholars Program  
Application - Cover Page and Instructions

**Contact Information:**

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<tr>
<th>Last Name</th>
<th>First Name</th>
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**Scholastic Information:**

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Anticipated Graduation Date (Year and Semester)

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**Top 5 Awards and Honors:**

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UW-GCSP Application Instructions:

1. Complete Cover Page
2. Select a theme and one or more Grand Challenges
3. Complete the “UW-GCSP Plan for Completion.” Please see the UW-Madison Grand Challenge Scholars Program Web Site or the Program Director for a list of the activities approved to address each competency. You are free to propose activities that are not on the approved list. However, they will need to be approved by your faculty mentor and the UW-GCSP steering committee before becoming a formal part of your program.
4. Prepare an essay response to the questions, “Why would you like to become a Grand Challenges Scholar?” and “What do you see as the biggest challenge in completing the UW-GCSP program?” The entire essay is limited to 2 pages using a 12-point font.
5. Submit this completed form and the essay to the UW-GCSP Director at UWGSCP@wisc.edu.
6. Include two letters of recommendation (one from your GCSP faculty mentor).
Appendix C. UW-Madison Grand Challenge Scholars Program (UW-GCSP) Plan for Completion

### Scholar Information

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<th>Initial Meeting with Director:</th>
<th>Initial Plan Approval:</th>
<th>Program Completion:</th>
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### Status Review Meetings

Both the Scholar and the Director should initial at each meeting. If plan is adjusted fill out and attach copy of second page of this form.

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