Auburn University Samuel Ginn College of Engineering

NAE Grand Challenges Scholars Program Operational Document

	7/5/18
Christopher Roberts	Date
Dean - Samuel Ginn College of Engineering	
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Director - Grand Challenges Scholars Program	

GCSP Director – Contact Information

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A. Vision and Goals

Auburn University, established in 1856, is designated as a land-, sea-, and space-grant university. It currently offers ~140 undergraduate majors through its 13 colleges and schools and serves approximately 24,000 undergraduates. The land-grant traditions of service to society and access for its citizens define Auburn University's mission, which, in part, reads:

"The University will serve the citizens of the State through its instructional, research and outreach programs and prepare Alabamians to respond successfully to the challenges of a global economy,"

and

"..the University will emphasize a broad and superior undergraduate education that imparts the knowledge, skills, and values so essential to educated and responsible citizens."

The Samuel Ginn College of Engineering is the largest of the university's colleges and schools serving ~5,000 undergraduates and offers 15 undergraduate majors and eight minors from its ten departments and programs. As a state-supported land-grant school, it has long been understood at Auburn that engineering education should be sufficiently broad to provide insights and perspectives that will enable graduates to fully realize practical solutions to the problems they will address during their careers. The Samuel Ginn College of Engineering's vision is to meet these goals through:

- 1. The best student-centered engineering experience in America
- 2. Leading research that improves the quality of life and fosters economic competitiveness
- 3. A dynamic faculty that exemplifies excellence and innovation

The Samuel Ginn College of Engineering is establishing a Grand Challenges Scholars Program (GCSP) to respond to 1) the growing desires of our students to make a real difference in society and the world, 2) the college's goal to enhance the student-centered engineering experience, and 3) the university's strategic plan to increase the "number of high-impact student experiences" available to our students. In recent years the desire of Samuel Ginn College of Engineering students to make a difference in the world has become more apparent as a more socially active generation begins their college careers. This desire has driven the development of several programs including the Auburn student chapter of Engineers Without Borders and a university-wide sustainability program and sustainability minor. A GCSP will enable students to explore how their efforts address the challenges of the next 100 years and how engineering impacts society. The college's goal of enhancing student engineering experiences includes continuous improvement of our programs, facilities, and student opportunities. These efforts include the construction of the \$44M Brown-Kopel Engineering Student Achievement Center which will house student maker spaces, project incubators, and offices for professional programs, the college's and departments' support of undergraduate research opportunities through additional funding available to engineering students, and the development of several international learning opportunities. The initiation of a GCSP also addresses a goal stated in Auburn's 2013 – 2018 strategic plan, "Increase the number of high-impact student experiences-such as internships, undergraduate research, cooperative education, or study abroad-that are available to all students."

The Samuel Ginn College of Engineering vision for the GCSP is that it will provide opportunities for broadening student education, enhance student's understanding of challenges facing society, and enhance student and graduate engagement in finding solutions to societal issues. The primary goal of the Auburn GCSP is to produce students with the skills, broad knowledge, and ideas to significantly contribute to the developing solutions to the world's most pressing technical issues in general and the engineering grand challenges in particular. It is equally important that the Auburn GCSP instill a desire to contribute to the development of these solutions. Participation in the Auburn GCSP will enhance understanding that solutions will require the input of multiple disciplines, that communication skills are critical to enable one to effectively advocate for, or against, an idea, and that both the challenges and solutions have impacts globally.

B. Steering Committee

The Auburn GCSP Steering Committee will consist of the GCSP Director, an Associate Dean of Engineering, at least five faculty members from the Engineering Departments appointed by the department chairs (each from a different department), at least one Samuel Ginn College of Engineering Alumni, and at least one faculty member or director associated with the following programs:

- 1. Auburn Sustainability program
- 2. University, or college, Outreach
- 3. Auburn University Undergraduate Research Program
- 4. Engineers Without Borders
- 5. Auburn study abroad programs
- 6. Auburn civic engagement programs

All Steering Committee members, except the GCSP Director, will serve on a volunteer basis and will not receive course release or financial remuneration. Steering committee members will serve at the pleasure of the Engineering Dean but will typically have a term of membership of three years. At the end of each three-year commitment, the departments from which advisory board members are selected will rotate to ensure full participation of all departments. The committee will meet 1-3 times per semester, either in person or by electronic means. Activities include:

- Reviewing achievement of the program's vision.
- Advising GCSP Director on strategy and operational issues.
- Reviewing student program applications and making accept or reject recommendations to the GCSP director.
- Helping to link scholars with opportunities for research within the department they represent or interdisciplinary group with which they collaborate.
- Advising the GCSP on how connections between the GCSP and other programs both within and external to the university can be developed and strengthened.
- Liaising with faculty and staff within the departments and programs they represent on GCSP matters.
- Approving and denying student requests to deviate from the recommended GCSP content as described below or to modify the recommended GCSP content.

C. Recruiting

Students will be introduced to the program through presentations in Introduction to Engineering courses, at student organization meetings, and at informal information sessions. All engineering

students at Auburn are required to take an Introduction to Engineering course; most do so their freshman year. Typically there are ~20 sections of this course each semester, with a total enrollment of approximately 1500 students per year. ENGR 1110 instructors will be asked to allow the program director and other members of the steering committee to present the program benefits and requirements to students enrolled in their course. In the fall semester, this will be done late in the semester while in the spring semester the presentation will be done in the first two weeks of class to allow interested students the chance to complete the application due in February. To enhance diversity the Program Director, or, as the program grows, the scholars will recruit applicants at student organization meetings such as the Academic Excellence Program, Society of Women Engineers, the National Society of Black Engineers, and Engineers Without Borders. Also, the GCSP will hold an information session in the Fall semester. This session will be advertised through undergraduate program directors of each major. Particular attention will be given to promoting the GCSP to transfer students.

D. Application and Selection

Application: An application form and instructions are attached to this document. Applications for the GCSP will be accepted in February of each year. The application will consist of a cover form, a statement of interest in the program, a proposed plan for how the student will meet the requirements of the program, and two recommendation letters. The cover form will be used to obtain demographic information (such as race and gender), scholastic achievements (awards and honors), GPA, anticipated graduation date, credit hours completed, and so forth. The statement of interest will be limited to 2 pages, 12 point Times New Roman with 1" margins, and students will be instructed to answer the questions "Why would you like to become a Grand Challenges Scholar?" and "What do you see as the biggest challenge in completing the GCSP program?" Students will also be asked to prepare a plan that details how they will meet the requirements of the program. This plan should identify the activities they plan on pursuing to fulfill the requirements of the program and how the activities selected are related to one of the grand challenge themes. Two letters of recommendation will be required from faculty, employers, or research advisors that attest to the student's abilities, desire, and unique attributes.

Characteristics of applicants: Students in the Samuel Ginn College of Engineering are expected to represent many diverse backgrounds. The college recognizes the benefits to society of improving diversity in the engineering profession. As such it is continually striving to increase the level of diversity in its student body. To maintain and reflect this commitment to diversity in the GCSP, applicants will be encouraged from all engineering students. The program will actively recruit students at the freshman and sophomore level, in recognition that completing the program requirements is a multiyear process. However, the number of students that transfer from two year technical colleges is growing. These students often transfer sufficient credits to be classified as a junior or senior and including these students in the GCSP will increase the diversity of experiences of students in the program. Thus, applications will be accepted from upperclassmen as well. There will be no GPA requirements for admission. However, GPA and transcripts may be used when comparing two candidates should spots be limited.

Anticipated size of the program: Around 5,000 undergraduate students are enrolled in 15 majors at the Samuel Ginn College of Engineering. The ultimate goal is to graduate \sim 30 GCS per year. In the first year, the program is targeting the acceptance of \sim 30 freshman and sophomores, and \sim 5 upperclassmen. In subsequent years the numbers of students accepted will be increased until the cohort size results in \sim 30 graduates per year.

Selection Process: The GCSP Director will review applications for completion, check that recommendation letters have been received, confirm GPA, and ensure the proposed plan includes the GCSP components and meets the requirements. Complete applications will be evaluated by Steering Committee members individually, and comments, including recommendations for acceptance or rejection, provided to the GCSP director. The director will compile a list of candidates recommended for acceptance by a majority of the steering committee. If the number of candidates recommended for acceptance equals or is less than the target cohort size, all recommended students will be accepted. If more students are recommended for admission than the target cohort size the steering committee will be consulted to determine if the number of acceptances should be limited and if so which students will be accepted, or if the target cohort size should be increased in that year. Regardless of the cohort size, care will be taken to ensure that fair and consistent evaluation criteria will be used to determine admission to the program.

Notification: The selection process will be completed by late March and students notified of acceptance or rejection in early April.

E. Faculty Mentors

During the first two years of the program, the GCSP Director will serve as the faculty mentor. As the number of students involved in the program grows, additional mentors will be selected amongst the current or previous Samuel Ginn College of Engineering Faculty Members who are serving/have served on the steering committee. Also, it is anticipated that a part-time staff member will eventually support these activities. The need to expand the number of faculty mentors will be assessed in August of each year.

F. Funding/Support

Financial Commitment: The College of Engineering has budgeted \$50,000 to support the initiation and growth of the Auburn GCSP. The funds will be used in the following fashion.

Personnel: Funds will be used to provide 1 month of support per year for the Program Director during the program inception. As the program becomes established a staff member, full or parttime, will be funded to support the scholars and the expansion of the program.

Direct Support for Scholars: As described below undergraduate research fellowships are one avenue for scholars to experience the research component of the program. To support the growth of the program and help ensure that interested scholars can obtain research fellowships a portion of the budget will be used to provide supplemental URF opportunities to Auburn GCS. Also, to reduce the number of scholars that are financially unable to participate in study abroad and other international experiences some funds will be used to provide stipends to some scholars participating in these programs. In both cases, funds will be awarded on a competitive basis that considers financial situations of the students as well as merit of the activities.

Space: The GCSP will also be provided a dedicated office for the GCSP Director to meet with Scholars, store documents, and conduct other GCSP related business.

G. Unique Aspects

Auburn University has a total enrollment of \sim 24,000 students pursuing more than 100 distinct undergraduate degrees. The active interest of the large student body in improving the world has resulted in the presence of a plethora of student organizations and programs related to sustainability, service, and environmental conscience. For example the University has chapters of

All for Inclusion, Alternative Student Breaks, American Red Cross Club, Auburn for Water, Auburn Student Center for Public Trust, Best Buddies, Community and Civic Engagement Club, Engineers Without Borders, Filter of Hope Auburn, Habitat for Humanity, Honors Serves, IMPACT, International Buddy Program, More Than Auburn, and Society For Natural Resources. These student organizations participate in outreach focused on issues including water scarcity, housing, recycling, diversity, and multicultural understanding. Also, many of the social clubs, sororities, fraternities, and support organizations for minorities at Auburn are involved with philanthropic and humanitarian activities that address local, national, and international needs. For this reason, Grand Challenge Scholars at Auburn University will have a large number of options for developing the service component of the program.

Auburn University operates approximately 115 study abroad, student exchange, or service abroad programs. Twelve of these programs are open to engineering students; an additional three are open to Engineering students enrolled in the Honors College. The rest of these programs are open to students pursuing a minor in specific majors from the Business school, the college of sciences and Mathematics, Liberal Arts, and others. In addition to the programs Auburn maintains, the university supports students that desire to pursue one of the many international study abroad experiences available through third-party providers. Involvement in these programs is a unique way for students to strengthen their global perspective.

The Samuel Ginn College of Engineering Alumni Council (and the school's alumni in general) are very active in providing students enrichment experiences. As a result, there are several programs unique to the Samuel Ginn College of Engineering that provide enrichment experiences and additional mentoring to students in the GCSP. One example is the Student Leadership Dinners hosted by an Alumni Council subcommittee of corporate CEOs. Officers of student organizations sponsored by the Samuel Ginn College of Engineering participate in workshop dinners with alumni to discuss issues ranging from leadership to career preparation. Many alumni actively support this program resulting in a ~2:1 ratio of students to alumni at the dinners providing for meaningful direct dialog and mentoring of participating students. A second example is Auburn's 100+ Women Strong organization which is made up of alumni and friends of the college who support the vision to recruit, retain and reward women in engineering. Members of this organization actively participate in mentoring and leadership development of both female faculty and students. "100+ Women Strong members recognize the importance of connecting with the next generation of female engineers – those who will bring innovation and discovery to bear on the quality of life for people throughout the world." Finally, the Alabama Power Academic Excellence Program (AEP) focuses on retention and success of underrepresented students in the college. The AEP program supports the development of scholars through workshops, learning communities, and activities focused on academic success, personal development, and career exploration. The GCSP will work with these and other programs to learn best practices and develop additional support for the students in the GCSP.

H. Five GCSP Components

The goal of the Auburn University GCSP is to provide impactful and scholarly experiences in each of the five GCSP components. GCS will demonstrate competency in each of the program elements by completing at least one activity described under each component below. To enhance flexibility and recognize the diverse interests and talents of the GCS, the following guidelines apply in selecting the activities.

- 1. GCSs must have completed at least one activity related to each of the five GCSP components.
- 2. No activity will be counted toward more than one component.
- 3. The GCS must describe how completion of each activity will contribute to their understanding of or ability to contribute to addressing the Grand Challenge Theme they selected for focus.
- 4. All activities that are not course related (for example internships, REUs, student organizations, fellowships, and community service organizations) will have the following additional requirements:
 - a. A minimum of 90 hours of effort should be involved in completion of the activity.
 - b. At the conclusion of the activity the following items will be required before the activity is accepted by the GCSP.
 - i. A log book of effort demonstrating a minimum of 90 hours of effort.
 - ii. A brief report detailing what the GCS learned through the activities, the specific contributions of the GCS to the organization, and the results of the effort.

Research Component:

- 1. Participation in an Auburn Undergraduate Research Fellowship (AURF) Grand Challenges related project. The AURF has semester and twelve-month fellowships that support undergraduate research experiences in Auburn faculty research labs. Fellows receive a stipend and funds to defray material and supply expenses associated with the research project. Participation requires a separate application process and is a competitive process. In recent years the Samuel Ginn College of Engineering has made an effort to increase the number of fellowships by providing funding to support additional fellows from the college. Students will be required to provide the program director a summary of the research activities and how they are related to the Grand Challenges.
- 2. Participation in a summer Research Experience for Undergraduate (REU) program. These experiences are competitive, and Auburn does not control acceptance or rejection. While REUs are organized around a research theme, the specific research topic is typically unknown to the student until they arrive for the summer training. However, these experiences provide a unique opportunity for undergraduates to explore research through an intensive summer program. Often the programs also include additional professional development opportunities. Auburn GCSP recognizes the benefit of these programs and will encourage GCS to explore these opportunities. Students will be required to provide the program director a summary of the activities as evidence of completion.
- 3. Honors College research and thesis project related to the Grand Challenges. It is expected that many of the accepted applicants to the GCSP will also be enrolled in the Honors College. One requirement of graduating with Honors at Auburn University is the completion of an Honors thesis. To encourage participation of Honors students in the GCSP, credit toward the research component will be granted for Honors thesis related to the Grand Challenges. Students will be required to provide the program director a copy of the accepted thesis.
- 4. *Independent Study with a faculty member related to a Grand Challenge*. In addition to formal fellowships, REUs, and Honors College thesis, many faculty actively encourage students to participate in research in their labs either as student employees or volunteers.

- Students will be required to provide the program director a summary of the independent study activity that includes the relationship of the work to a Grand Challenge.
- 5. Other undergraduate research opportunities, in which the project is related to a Grand Challenge, subject to GCSP steering committee approval.

Multidisciplinary Component:

Students are required to complete 6 hours of interdisciplinary course work and either an additional 3 hours of course work or participate in an interdisciplinary related experience.

- 1. Courses outside engineering and the standard science curriculum. For example, business, arts, humanities, or social science courses. Examples are:
 - a. ENVI 5100 Climate Change Impacts
 - b. CCEN 3100 Cultural Competence or other CCEN course
 - c. ENGR 5540 Entrepreneurship and Strategic Management of Technology and Innovation
 - d. CSES 5040 Fertilizer Technology and Soil Fertility
 - e. POLI 3110 Gender and Global Politics
 - f. ISMIN 6770 Information Systems Ethics
 - g. MECH 6056 Renewable Energy Resources and Applications
 - h. BSEN 4260 Renewable Energy in Biosystems Process Operations
 - i. BATM 2110 Solving Technology Problems
 - j. BSEN 4520 Watershed Modeling
 - k. BIOL 5550 Wetland Biology
 - 1. PHIL 1110/1113 Ethical and Conceptual Foundations of Science
 - m. PHIL 3510 Philosophy of Science
 - n. PHIL 3530 Philosophy of Physics
 - o. IDSC 2190/2193 Foundations of Interdisciplinary University Studies
 - p. IDSC 3210 Advanced Interdisciplinary Problem Solving
 - q. IDSC 4920 Interdisciplinary Capstone Experience
- 2. Interdisciplinary related experience through internships or volunteering in the areas of law, policy, business, medicine, etc. Examples include:
 - a. Interning at the University Technology Transfer Office
 - b. Participation in a multidisciplinary student organization related to a grand challenge, 90 hours minimum commitment toward furthering the organizations goals.

Entrepreneurship Component:

- 1. Entrepreneurship focused course. Examples include:
 - a. ENFB 4140 Essentials of Entrepreneurship
 - b. ENFB 4190 New Venture Creation
 - c. ENFB 4170 Managing Entrepreneurial Start-Ups
 - d. MECH 4700 Integrated Engineering Theory and Practice
- 2. Entrepreneurship related experience. Examples include:
 - a. Internship at the University Technology Transfer Office
 - b. Participation as a team member in a student business model competition
- 3. Completion of the BET (Business Engineering Technology) academic minor.
- 4. Participation in a business or entrepreneurial related student professional organization. Examples include the National Association of Inventors student chapter.

- 5. Participation in entrepreneurial workshop or short course. Subject to GCSP Steering committee approval who may require additional reports or activities to supplement experience.
- 6. Internship or co-op experience with a company or organization that focuses on a Grand Challenge.

Global Component:

- 1. Completion of a study abroad program.
- 2. Internship in another country.
- 3. Engineers Without Borders project or travel team member.
- 4. Another project with a global component, subject to steering committee approval.
- 5. Auburn Global participant.
- 6. Serve as a host buddy in the International Buddies Program or similar mentoring program through the Office on International Studies.
- 7. Participation in a student organization with global and multicultural focus.

Service Component:

- 1. Participation in community service organizations and projects.
- 2. Leadership in Engineers Without Borders or other service-oriented student organization.
- 3. Completion of a service learning-oriented course that includes a requirement for service work, such as the CCEN 3000 capstone course.
- 4. Internship for a service or public policy organization.
- 5. Other service learning opportunities (STEM Discovery Day, BEST Robotics, Science Olympiad Coach, projects at local schools, etc.), subject to steering committee approval.
- 6. Development of a video or other publicity that informs the public about the importance of the Grand Challenges. This item recognizes that other creative activities can serve to develop creative skills in GCS and the need to continuously develop publicity for the program and the Grand Challenges in general. Several Auburn student teams entered the NAE's 2015 Engineering for You 2 video contest.

I. Mentorship, Support, Tracking and Assessment

Mentorship and support: The GCSP director will serve as the primary mentor for students in the program. However, as students identify individual aspects on which they wish to focus additional faculty will serve as technical mentors to the students.

Tracking: Each GCS will meet with the director or faculty mentor each semester to review progress against the approved GCSP completion plan. The meeting will be documented using the "Plan for Completion" form. A copy of this form is attached to this document. When changes are required, for example if a student planned on doing an Auburn URF to fulfill their Research/Creative component requirement and are not accepted to that program, the program director will approve direct substitution from the approved list of experiences. When entirely new elements are proposed by the students, for example a course not explicitly listed as "approved" by the program to meet the interdisciplinary requirement, the steering committee would be consulted before approval. In all cases where participation in a general program is acceptable if the topic is related to one of the Grand Challenges, the program director is empowered to determine whether or not the topic is suitably connected. Completion of the GCSP will be certified by the Program Director.

Assessment: Program assessment will be conducted yearly. The Program Director will compile data regarding the number and demographic breakdown of current GCS and applicants. This data will be reviewed to ensure the program is meeting goals of impact, inclusivity, and growth. The previous year's activities to publicize the program and recruit GCS and program benefactors will also be reviewed and a plan for the following year developed.

J. Recognition

Students completing the Grand Scholars Program will

- 1. Be recognized at the annual Engineering Award Ceremony.
- 2. Receive a certificate from the College of Engineering upon graduation.

K. Other

Please find attached a copy of the AU GCSP application form and instructions, and a copy of the status tracking document "Plan for Completion" that will be used to track the progress of Scholars. The tracking form will be reviewed and updated each semester during a meeting between the scholar and the AU GCSP director.

Auburn University Samuel Ginn College of Engineering

NAE Grand Challenges Scholars Program Application – Cover Form and Instructions

Contact Information:

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Top 5 Awards and Honors:

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- 2 Click or tap here to enter text.
- 3 Click or tap here to enter text.
- 4 Click or tap here to enter text.
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Auburn GCSP Proposed Plan for Completion of Program

Interdisciplinary	Planned Activity	How activity is related to the Choose an item. Grand Challenge Theme.			
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Instructions: (Use Tabs or Mouse to Navigate Form.)

- 1. Complete cover page.
- 2. Complete the "GCSP Plan for Completion." Please see the Auburn 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 the GCSP steering committee before becoming a formal part of your program.
- 3. 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 GCSP program?" The entire essay is limited to 2 pages using a Times New Roman 12 point font.
- 4. Submit this completed form and the essay to the Auburn GCSP Director at AUGCSP@auburn.edu.
- 5. Have two letters of recommendation sent to AUGCSP@auburn.edu.

Samuel Ginn College of Engineering Grand Challenges Scholars Program Plan for Completion

Scholo	ar Information		Date of	
Nam	e:	GCSP Acceptance:		
Ema	nil:	Initial Meeting with Director:	Initial Meeting with Director:	
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		Status Review Meetings should initial at each meeting. If plan is adjusted fill out and attach copy of second pag	e of this form.	
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Planned Activity	Comments	Steering Committee Approval	Application
Interdisciplinary			
Primary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Secondary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Research			
Primary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Secondary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Entrepreneurship			
Primary		☐ Not required ☐ Received	□ Not required □ Submitted □ Approved
Secondary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Global			
Primary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Secondary		☐ Not required ☐ Received	☐ Not required ☐ Submitted ☐ Approved
Service			
Primary		□ Not required □ Received	☐ Not required ☐ Submitted ☐ Approved
Secondary		☐ Not required ☐ Received	□ Not required□ Submitted□ Approved