



COLLEGE OF ENGINEERING
UNIVERSITY OF SOUTH FLORIDA

**Proposal for the NAE Grand Challenge
Scholars Program**

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1 Vision and Goals. Describe the vision and goals for your GCSP program with an explanation of how they fit with the institutional and contextual values and mission.

The University of South Florida (USF) is a high-impact, global research university dedicated to student success. USF was established in 1956 as a public university and is a comprehensive research university serving more than 48,000 students. The University of South Florida is one of only 40 public research universities nationwide with very high research activity (RU/VH) that is designated as "community engaged" by the Carnegie Foundation for the Advancement of Teaching. According to the National Science Foundation, USF ranks 45th in the nation for total research expenditures among all U.S. universities, public or private, and 28th in total research expenditures for public universities (2015). USF is one of 49 public research universities nationwide classified as both a Doctoral University with "Highest Research Activity" and as a "Community Engaged" institution by the Carnegie Foundation for the Advancement of Teaching. USF ranks 9th in the nation among public universities and 21st world-wide for granted U.S. patents, ranking among the Top 10 public universities for U.S. patents granted over the past 6 years (2010-2015) according to the Intellectual Property Owners Association and the National Academy of Inventors. USF Tampa is ranked 46th among public universities for social mobility, research and civic engagement, according to *Washington Monthly* (2016).

At the University of South Florida, our goal is to provide quality education to create a generation of future students ready to face the great challenges of our society. At the College of Engineering, we are aiming to move beyond the traditional way of learning and prepare students to solve these challenges by shifting our focus to a more practical, hands-on education incorporating a global perspective, entrepreneurship, and innovation into our program. Some of these challenges have been identified by the National Academy of Engineering as the Grand Challenges of the 21st century.

We have exceptional research in almost all of the 14 grand challenge areas, such as renewable energy, clean water and nitrogen cycle modulation, health informatics, urban infrastructure, and augmented reality. Tampa Bay has flourishing eco-systems in medical device companies and USF College of Engineering now holds the Department of Medical Engineering (only three of this kind exists in the nation). Apart from this, the College is a leading active member of a University-wide Cyber-security center and is launching a Bachelor's degree in Cyber-Security from the department of Computer Science and Engineering. We are significantly vested in these grand challenge research areas and, thus, well-suited to provide the NAE Grand Challenge Scholars a great curricular, co-curricular, and extra-curricular research experience. Besides extensive research, our vision embraces community engagement, global awareness, innovation, and entrepreneurship, which are all embedded in this program.

We intend to engage and enhance the existing framework of Engineers Without Borders, USF Office of Community Engagement and Partnerships, and USF World. Additionally, Peace Corps has announced that the University of South Florida ranked No. 18 among large schools on the agency's 2017 Top Volunteer-Producing Colleges and Universities list.

Integrating GCSP will have great benefits to the College and its students. Focusing on hands-on education with a global approach students will acquire greater knowledge and confidence that will widely reflect in their work. Through these elements, they will gain knowledge and experience to apply their skills to real life problems and gain leverage entering an increasingly competitive workforce.

In summary, many of our academic training goals match the vision of the NAE Grand Challenge Scholars Program. Also, the infrastructure and mindset are ripe to launch GCSP at USF. This proposal will consolidate all the efforts and serve as a foundation to create tomorrow's society-oriented innovators and out-of-the-box thinkers who can tackle the grand challenges facing the human race. The Grand Challenge Scholars Program would be a great addition to USF and would set it apart from many colleges and universities by producing scholars with greater knowledge, a higher level of experience, and the ability to become the greatest innovators of our century.

2 Steering Committee. Describe the recruitment and selection of the membership of your steering committee and their responsibilities.

A Steering Committee will be created with faculty researchers working in Grand Challenge research domains. We will solicit the Steering Committee members based on research expertise, mentoring evidence, global perspective, and cultural inclusiveness. Apart from this, we will add an officer from USF Office of Community Engagement and Partnerships to the team. We will also include entrepreneurial-minded faculty and other entrepreneurs from the Tampa-Bay region as well as stakeholders from globally connected organizations, such as USF World and the Global Citizens Project.

Responsibilities: Steering Committee members will (a) Act as a catalyst in connecting the fellows to research groups; (b) Be involved as judges in the local competition/presentation (c) Be speakers in the seminar series or solicit guest speakers for the seminar series (d) Mentor and provide guidance to the mentors and fellows (e) Help in annual assessment of the program and provide recommendations for further improvements (f) Be instrumental in selecting fellows and projects to be showcased nationally.

Committee members will have a three year term with a continuous rotation, so they will not begin and end their term at the same time. We will add 2-3 members to the team each year having a full committee by the third year as the number of GC scholars reach full potential (sophomore through senior year).

3 Recruiting. Describe your plans for recruiting GCSP students.

We are planning for the program to be highly competitive attracting the best students who are ready to take the next step and dedicate additional time and effort into learning. Students will be admitted into the program in their sophomore year. During their freshman year, multiple recruitment efforts will be made.

- We will invite high achieving students to the College's research day where senior students showcase their awards. This day hosts many research mentors as panelists. There are many events scheduled along with the main poster event and student faculty award luncheon. We plan to host a speed-interaction session with potential GCSP scholars and research faculty. We envision a 2 minute presentation from a potential REU (Research Experience for Undergraduates) followed by a social hour, so research mentors and mentees can discuss potential research involvement.
- Freshman year potential scholars will be invited to the GCSP Member Club (see section 11 Other), which will be set up as a community of practice (COP). Usually GC scholars will meet bi-weekly to discuss projects and bounce idea. This group will have mentors, USF World and local community partners in the center of the community. Immediate circles will be senior GCSP scholars. The next circle will be intermediate and beginning scholars. Potential scholars will be at the periphery of the community. Mentors will observe student engagement and drive at the periphery of the community (Figure 2). Special consideration will be made to potential scholars who exhibit interest, team spirit and work, and team ethics.
- Potential scholars will be invited to annual Steering Committee meetings and GCSP speaker series to get exposed to the NAE grand challenge areas.
- USF Office of National Scholarship will be involved to help potential students find opportunities such as Fulbright and other global REU/Study abroad programs.

Thus, there will be a great opportunity for potential GC scholars to get familiar with the program, learn about its purpose, and recognize its impact and benefits for society. We will also utilize other sources, such as catalogs, web outlets, and on-campus events for recruitment. Undergraduate student societies, such as Engineers Without Borders and USF World will be a great source of information.

Once the program is in place, our GCSP Member Club will be a significant point of reference for new coming students. It will be the place, where potential candidates can connect with existing members and have a closer look into the everyday life of a GC scholar. Recruiting events for junior and senior high school students will also be great opportunities to introduce the program.

4 Application and Selection. Describe your application and selection process for GCSP students, including how students will be mentored, if necessary, through this process, approximately how many students you anticipate admitting each year and the characteristics of those students, such as majors and whether first-year students can apply. Include the ways in which your recruitment processes are consistent with the institutional and contextual values as well as the goals and vision for the program and its diversity. Note that some institutions establish minimum GPA's for participating students while others do not in order to increase the odds of securing a diverse cohort. We encourage programs to aim for the goal of producing 20 GCSP graduate per year, as outlined in the White House pledge (although such a goal may not be practical for smaller institutions and as such should not be viewed as an absolute requirement, but rather a goal for those programs who can reasonably achieve it).

We will create a web-based application portal, where students can submit all the necessary information during their freshman year. The application deadline will be one month prior to the fall semester of their sophomore year.

We will heavily advertise through our freshman level classes targeting the brightest students with GPA's between 3.5 and 4.0. However, we will make exceptions for those with lower GPA's who show great interest in the program and have a desire and ability to participate in solving one of the grand challenge areas. Students with active participation in research labs and the GCSP Member Club would be such examples. Applicants' research or project experience will be a strong plus. USF College of Engineering is preparing to offer the freshman-level design course of Engineering Design with three credit hours beginning in Fall, 2018. The course will provide every

student with project experience, which they can document in their application. Research experience will be a plus, not mandatory. However, it will be given weightage, which might help students in the lower GPA spectrum. The exact weightage will change year to year depending on the application pool. Though we will favor students at the sophomore level, outstanding students at the freshman level will also be considered. Our target is recruiting between 20-25 students each year.

For application review, selected members of the Steering Committee will be solicited by the Director to the Selection Committee. The Selection Committee will consist of the Director, mentors and a select number of Steering Committee members. While the Director and mentors will be part of every Selection Committee, Steering Committee members will be rotated yearly, so that each member is serving in at least one of the application review cycles in their three year term. The Selection Committee will make every effort to balance the portfolios by selecting candidates from a diverse set of GC areas.

Application requirements:

- Completed online application form
- Identification of a grand challenge subject area that will be the theme for satisfying the five components
- Impact statement / letter of commitment with a clear interest in participating in the program
- Letter of recommendation by a mentor/faculty advisor
- Proven record of project/research experience is a plus.

- 5 Faculty Mentors. Describe how you will recruit, educate, support, and assign faculty mentors for your GCSP students. Include specific responsibilities that your mentors must commit to.

Students would work with their assigned mentor throughout the program, and, at the end, submit a portfolio describing their experience and demonstrating their knowledge in various areas of their study. Each student's mentor will oversee their progress and ensure the successful completion of the requirements. They would serve as general counselors to guide them throughout the program while being a motivational force to achieve the best results and meet all the required constituencies.

Each student will be engaged in research in one of the areas specified by the NAE as a grand challenge. They will have an assigned research mentor for that. We will also add 3-5 additional mentors for minor challenges. These mentors will meet with the cohort bi-weekly to create meaningful, relevant challenges each year.

Any faculty who works in a Grand Challenge area can be a research mentor. Assigned GCSP mentors will be selected by the Director's office and can overlap with the research mentors. Any faculty member interested in participating in open challenge/mini-grants project/national competition can be a minor challenge mentor working closely with the assigned mentors. Each newly assigned GCSP mentor will receive a training from ATLE as well as a workshop, where existing mentors will provide a training in GCSP components and requirements. The first round of mentors will be trained by the Director and the College's "Mini-Circuits Design for X" makerspace manager (Sr. Research Engineer and Lab Manager) as the Member Club will be hosted in the Design for X makerspace.

Mentors will be selected based on the following criteria:

- Track record of working with undergraduate students
- Hands-on connection with the student
- Familiar with global issues and community engagement
- Involved with ATLE (Academy for Teaching and Learning Excellence) and Engineers Without Borders.

6 Funding/Support. Describe how your program will be funded and supported. Note that there is no specific funding level required but if you plan for students to study abroad, travel to national GCSP events, engage in research or service or entrepreneurship activities which require funding; if you plan to schedule on-campus events for your students; if you plan for your director and/or dean to participate in national GCSP events, etc., please indicate how these efforts will be funded/supported.

Potential funding needs could include:

- a. Travel expenses for the GCSP Director and perhaps 1-2 faculty and 2-3 students to attend a national GCSP event each year.
College of Engineering will support travels up to eight members including GCSP Director, 1-2 faculty and 2-3 students to attend the national GCSP event meeting every year.
- b. Course release or stipend for the GCSP Director and/or active faculty.
We propose a mentor (thank you gesture) for a Professional Development/travel award.
- c. Food costs for GCSP meetings and events.
College will provide refreshments for the GCSP events.
- d. Guest speaker travel expenses and honoraria.
College will provide travel expenses and honoraria.
- e. Funds to enable GC Scholars to participate in service learning experiences.
USF Office of Service Learning will be engaged with this effort.
- f. Funds to enable GC Scholars to participate in research.
College of Engineering REU program will be utilized to match faculty mentor's funding.
- g. Part time Staff Assistant
College of Engineering will provide 10/15 hour support of a staff assistant to help in recruitment, application, maintain student portfolio, event planning and organization.

- 7 **Unique Aspects.** Describe any unique aspects of your program that allow for understanding of the context in which your program is designed and implemented. For example, will students receive scholarships? Will they participate in an on-campus program such as honors, student ambassador or other special program? In order for students to complete one or more aspects of your program, will you be partnering with EPICS, Engineers Without Borders, University Innovation Fellows, Habitat for Humanity, senior design, freshman engineering, study abroad, service learning, tutoring, or other local organizations or programs? Do you plan to target non-honors students, honors students or some other specific groups?

Research

USF and College of Engineering has created multiple research and innovation ecosystems. USF's strategic goals include a focus, through high-impact research and innovation, on changing lives for the better, improving health, and fostering sustainable development and positive societal change. With \$428 million in research expenditure, USF is ranked 43rd nationwide among all universities, both public and private, in total research expenditures, according to the National Science Foundation (NSF).

College of Engineering has *150* faculty performing cutting edge research. We have *26* faculties with highly prestigious NSF CAREER awards, *10* faculty Fulbright Scholars, *70* fellows of professional societies and *2* National Academy of Engineering members. We have eleven major research centers, many of which are solving grand challenge problems.

Innovation and Entrepreneurship

USF ranked 10th nationally and 13th among universities worldwide for U.S. patents granted in 2014, according to a new report released by the Intellectual Property Owners Association (IPO). USF is the home to the National Academy of Inventors®, a non-profit member organization comprising U.S. and international universities and governmental and non-profit research institutions with more than 3,000 individual

inventor members and Fellows from more than 200 institutions, and growing rapidly. In 2015, USF received **Innovation and Economic Prosperity University Designation Award** from Association of Public and Land-grant Universities (APLU). USF is also the home to **NSF I-Corps Site program**, one of the two in Florida, with 19 I-Corps teams, all from engineering, selected for national training and many more in consideration.

The course on Social Entrepreneurship from the College of Business is offered as part of the NSF Innovation Corps (I-Corps) Site Program at USF for students who have a passion and idea for making the world a better place. The prominent social entrepreneur and National Academy of Medicine Prof. Richard Berman leads this initiative. It is available for any undergraduate or graduate student. The objective of this course is to stimulate innovative solutions to society's most pressing social problems. The current enrollment in the course is about 40 students predominantly from non-engineering disciplines. Through GCSP, engineering student participation could increase and existing resources could be utilized by senior GC scholars, who would have the opportunity to test their prototype on the market.

Students will also have access to I-Corps Lean Launchpad training on campus in the Spring and Summer semesters each session spanning 6 to 8 weeks. Participation will be limited to only 8 teams per session, and the curriculum will follow Steve Blank's Lean Launchpad process.

The Student Innovation Incubator, housed in USF Research Park, is another great source for young entrepreneurs. It provides shared workspace and a collaborative business environment for USF students from all graduate and undergraduate disciplines to create and grow new businesses with access to mentors and business guidance to facilitate entrepreneurship.

Global Engagement

USF World: a premier hub for faculty and students, supports faculty and staff with information on the university's Global Academic Partners, funding for international research travel, global events on campus, Fulbright opportunities, and the Discovery Hub where you can connect across the USF system and access data on USF's global profile, partnerships with universities overseas and the proposal processes for seeking agreements. Everyone can enjoy the Going Global online resource for jobs and internships around the world as well as country and city guides. These activities support multiple aspects for GCSP as well as the Peace Corps Prep program, center for strategic and diplomatic studies. USF is the nation's leader in Fulbright Scholars, top ranking for Peace Corps Volunteers, and is a recipient of the 2017 Diversity Abroad Institution Award and the 2013 Senator Paul Simon Award for Campus Internationalization.

Global Scholars Circuit: As part of our Global Citizen's Project, students can join the Global Scholars Circuit in a way to engage in lively discussions about particularly interesting global topics, while exposing the USF community to the wide array of certified global courses offered across campus. Throughout the semester, various faculty will open their classroom to other students, faculty, and staff during a normally scheduled class period.

Service Learning

Office of Community Engagement and Partnerships (OCEP)

The mission of the Office of Community Engagement and Partnerships is to expand and strengthen university–community engagement locally and globally in support of USF's strategic priorities: student success, research and innovation, partnerships, and sound financial management.

- Produce well-educated and highly skilled global citizens through a continuing commitment to student success, including facilitating the design and delivery of high-impact community engaged learning opportunities that develop relevant applied skills, critical thinking and reflection, and civic responsibility.
- Improve health and quality of life, address critical societal issues, and foster sustainable development through research and innovation, including community-engaged scholarship and creative activities that contribute to the public good.
- Cultivate and nurture mutually beneficial partnerships locally and globally to promote reciprocal learning between the university and community; strengthen the Tampa Bay region in the global economy; and enhance student access to community engaged experiential learning, research conducted in real-world settings, and networking and employment opportunities.
- Ensure a sustainable economic base through sound financial management, including aligning fiscal resources with university priorities; leveraging resources and partnerships; promoting community engaged research and learning opportunities with potential for high return on investment; and enhancing the USF brand through strategic communications about the value and benefits of university–community engagement.

Co-curricular Experiential Learning

The Grand Challenge Scholars Program largely relies on co-curricular experiential frameworks, such as the GCSP Member Club and enterprise (see Other). Student organizations will take a key role in the progress of GC scholars providing the necessary tools to achieve the highest results.

The Mini-Circuits *Design for X Laboratory* (DFX) provides a collaborative, fun environment for undergraduate students to safely pursue meaningful

multidisciplinary engineering projects that expand their creative design and project management skills. The project teams are made up of engineering students, with opportunity to collaborate with non-engineering students, under the guidance of supportive faculty. Through these projects, students gain experience with teamwork and industry design and safety procedures. This place will be a hub for the GCSP Member Club. The scholars will benefit from the equipment that is housed <http://www.eng.usf.edu/dfx/equipment.html>. Additionally, there are student peer mentors constantly available to help train interested students.

Advanced Visualization Center: The Advanced Visualization Center staff assists students and faculty with the use of advanced technologies for the creation of visualizations for education and research. We also provide training on advanced software applications and data visualization techniques. The center supports the advancement of technology in education with an Ultra High Resolution Visualization Wall, with remote access to USF's High Performance Computing Cluster, a Rapid Prototyping Lab with over 40 3D printers and the Advanced Visualization Student Lab. We continue to explore and develop innovative practices in 3D Modeling, 3D Printing, Visual Graphics, Animation, Augmented and Virtual Reality, Data Analysis and Interactive Applications.

Engineers Without Borders (EWB) at USF is another great place for students to put their knowledge to practice. The USF student chapter of EWB-USA is undergoing a project in the Dominican Republic titled "Water for Miches". The goal of the project is to bring the 500 residents of Miramar, miches in the Dominican Republic a clean source of water. Here, the residents of Miramar travel to local sources including a polluted river and a broken water tower, fed by the river, to gather water. It is the goal of EWB-USF to work with the residents of Miramar to obtain the clean water that they need.

Florida Water Environment Association (FWEA): FWEA sponsors student chapters at five state universities, including UF, UM, UCF, USF, and FAU. Student activities include meetings featuring speakers from the water and wastewater industry, career fairs, and a design competition that enables student teams to receive credit and compete for a \$2000 scholarship, a \$500 cash prize and memberships in WEF. The design competition has been praised by students as an opportunity to work on "real world" problems, and has also resulted in job offers to several of the participating design team members. FWEA pays for the winning Student Design Competition to travel to and compete in the WEF national competition, which was started in 2002 and modeled after FWEA's student design competition.

International Solar Energy Society: People Organizing World's Energy Reforms (ISES: POWER): is the world's first student chapter of the International Solar Energy Society and the winner of the outstanding new student organization award. This is an

interdisciplinary student initiative. The organization is dedicated to working on advancing education, research and policy related to renewable energy.

Whitehatters Computer Security Club is a USF student organization that participates in Capture the Flag competitions and promotes cybersecurity awareness. The Whitehatters hold weekly meetings, participate in a variety of campus events, and give members the opportunity to build hands-on, resume-building experience in information security.

USF Student Green Energy Fund: The GCSP Member Club will work on proposals to pitch ideas that makes USF campus sustainable and environmentally green. If successful, the fund will provide support to implement the novel idea into practice. For example, a student group has received \$1.4 Million to design and install a small solar film system on the roof of the USF Marshall Student Center that will soon be joined by around 1,000 solar panels. With this, the entire student center can be powered solely by solar energy in a sunny day. A second grant is awarded to a thermal energy storage (TES) system that will be installed at the Solar Thermal Power generation facility at the USF Clean Energy Research Center (CERC). This improves the performance and efficiency of the solar facility by storing energy even when the weather is unreliable. Another example is the feasibility project that explores the reduction of CO₂ emissions from USF boilers using microalgae. It studies the amount of CO₂ consumed by microalgae to determine the feasibility of scaling up to help reduce USF's greenhouse gas emission and at the same time generating biofuel as a source of renewable energy.

- 8 [GCSP Requirements and the 5 Components.](#) Describe the specific activities, curricular and/or extracurricular, which your students must fulfill in order to satisfy each of the five components of your program, below. (You may want to provide 2-3 options of similar complexity for each component OR you may want to identify low, medium and high level activities for each component with an overall minimum number of high level and maximum number of low level activities OR you may elect to utilize some other structure).

The Grand Challenge Scholars Program will be a three year program at the University of South Florida beginning in sophomore year and ending in senior year. There is no specific timeline for the program; it will be the students' choice in which order they want to complete the requirements. They can finish the required and/or recommended components early, but they will have to stay with the Member Club for

the entire time. The reason for this is that our program will be modeled as a “Community of Practice” based on social learning scenario. Each scholar, whether they finished their pillars or not, will be required to attend a certain number of seminars, annual symposiums, and Member Club activities that have to be documented in their portfolio (see sections 8 and 11). Every semester students will register for a “Zero credit” portfolio class, where they will upload a checklist of requirements completed thus far, and, at the end of the semester, the Director’s office will track the student’s progress. Each student will submit the complete portfolio at the end of senior year, when they will be certified as GCSP scholar.

In order to fulfill the requirements, students will be able to choose from two levels, required or recommended, for each component. In most areas, they will have multiple options for selection on each level (see Table 1). The only exception will be research, which cannot be substituted or satisfied by the completion of any coursework. Students will be required to pursue at least one area on the recommended level. Students completing three or more components as recommended will get special recognition at graduation.

We will be incorporating the five core components in the following ways:

1. *Research or hands-on project*

We will leverage already-existing College-wide REU (Research Experience for Undergraduates) program/design projects. Students will have to conduct research in a grand challenge area of their choice with the approval of their mentor and oversight of the Steering Committee. The research will be interdisciplinary in nature and may overlap with more than one component. It will be required for at least two semesters. If students choose to pursue this phase on a higher level, a minimum of three semesters will be required. Upon completion, students will have to present their research outcome at the College’s Research Symposium. This cohort will also be encouraged to compete nationally at various professional-society organized events.

2. *Interdisciplinary studies*

This area will be strongly connected to research in a way where the GCSP cohort will conduct research in an interdisciplinary framework in at least one or more disciplines. Additionally, courses will be required in three or more disciplines outside of engineering. After the selected Grand Challenge is approved, the student’s mentor will provide a list of interdisciplinary courses that are related to the Grand Challenge area of their choice. For each broad Grand Challenge theme: sustainability, health, security, and joy of living, a pre-determined set of courses will be created and updated annually consulting with members of the Steering Committee. The student would then pick three courses out of those recommendations with the mentor’s approval. As an alternative, students could suggest a course, but the Director’s approval will be required.

3. *Entrepreneurship*

Scholars will be directed to workshops and boot camps through USF I-Corps site. They also can intern for an enterprise or start-up company for the length of one semester. Alternatively, students could opt for a course on creativity, innovation and entrepreneurship or, for deeper involvement, get the Minor in Entrepreneurship.

4. *Global dimension*

The University has a strong study abroad program. We have a wide range of overseas academic programs offered at USF through the Education Abroad office, and international students can access the Office of International Services, Office of International Admissions, and INTO USF, as well as other wonderful opportunities, such as the Fulbright program and the Peace Corps. Moreover, we have multiple global partner universities, where students could potentially participate in an exchange program to get a transformative perspective in another culture. Students can also engage with the Global Citizens Project, which encompasses a wide range of issues on a global level including social justice, gender equity, environmental sustainability, economic equality, and equal opportunity for quality education and healthcare. As another option, GC scholars could take a course on human and cultural diversity (global and domestic) to increase cultural competency and promote inclusion.

5. *Community Engagement and Service Learning*

Our Center for Leadership and Civic Engagement (CLCE) develops students into leaders that will make a positive difference in the world. They help students discover their passion and talent developing their skills and understanding of leadership and active citizenship. Example of activities that would meet service learning requirements are completion of the LEAD week program, taking a course related to service learning, participate in the Mini Grants Project through the USF Office of Community Engagement and Partnerships (see appendix), and having a service/leadership role at a student organization with strong community outreach for at least one semester, such as ESTEAM, Engineers Without Borders, and Florida Water Environment Association (FWEA). Other examples are outreach committees of technical organizations, such as IEEE, ACM, AIChE, ASCE, ASME, SWE, EXPO, SHPE, and NSBE.

GCSP scholars could also opt for courses in ethical reasoning and civic engagement.

Table 1: Five Pillars of Scholarship

	Research/ Hands-on Project	Inter- disciplinary Studies	Entrepreneur- ship	Global Dimension	Service Learning
Required	Inter-disciplinary research in a grand challenge area; Presentation of the research outcome as an oral/poster presentation in College’s research symposium	Interdisciplinary research + three courses outside of engineering (Typical selections are from natural sciences, humanities, social sciences, quantitative reasoning)	Course on entrepreneurship /innovation/ creative thinking/ social entrepreneurship (see syllabus in appendix)	Course on human, cultural diversity (see appendix)	Course in ethics and civic engagement
			Participate in USF I-Corps site boot camp/workshops (see appendix)		
Recommended	Research showcased in local, national, and global challenges above and beyond the College	Interdisciplinary research involving more than one discipline	Deep immersion into a semester-long involvement with an enterprise or a startup company	Study abroad/ exchange programs/ Fulbright scholarship programs	Course + LEAD Week certificate program through CLCE (see appendix)
	University level competitions and poster presentations	More than three electives from another discipline	Minor in Entrepreneurship (see appendix)	Global Citizens Project (see appendix)	Service/ Leadership role at a student organization with community outreach (see appendix) Work on USF service-learning mini-grants projects (see appendix)

Other USF College of Engineering GCSP Requirements:

1. GCSP Member Club: Attendance of at least six meetings per semester will be required. Meetings will be held weekly, and attendance will be documented in the portfolio.
2. Annual symposium: Students will need to attend at least one symposium per academic year. By the end of the program, each student will have three symposiums in their portfolio.
3. GCSP seminars: There will be five-six seminars per academic year. Sophomores will be required to attend all of them, while juniors and seniors will have to attend two each year.

Figure 1 summarizes all necessary pillars of GCSP at USF. As shown, there will be a heavy emphasis on social learning and co-curricular activities throughout the program.

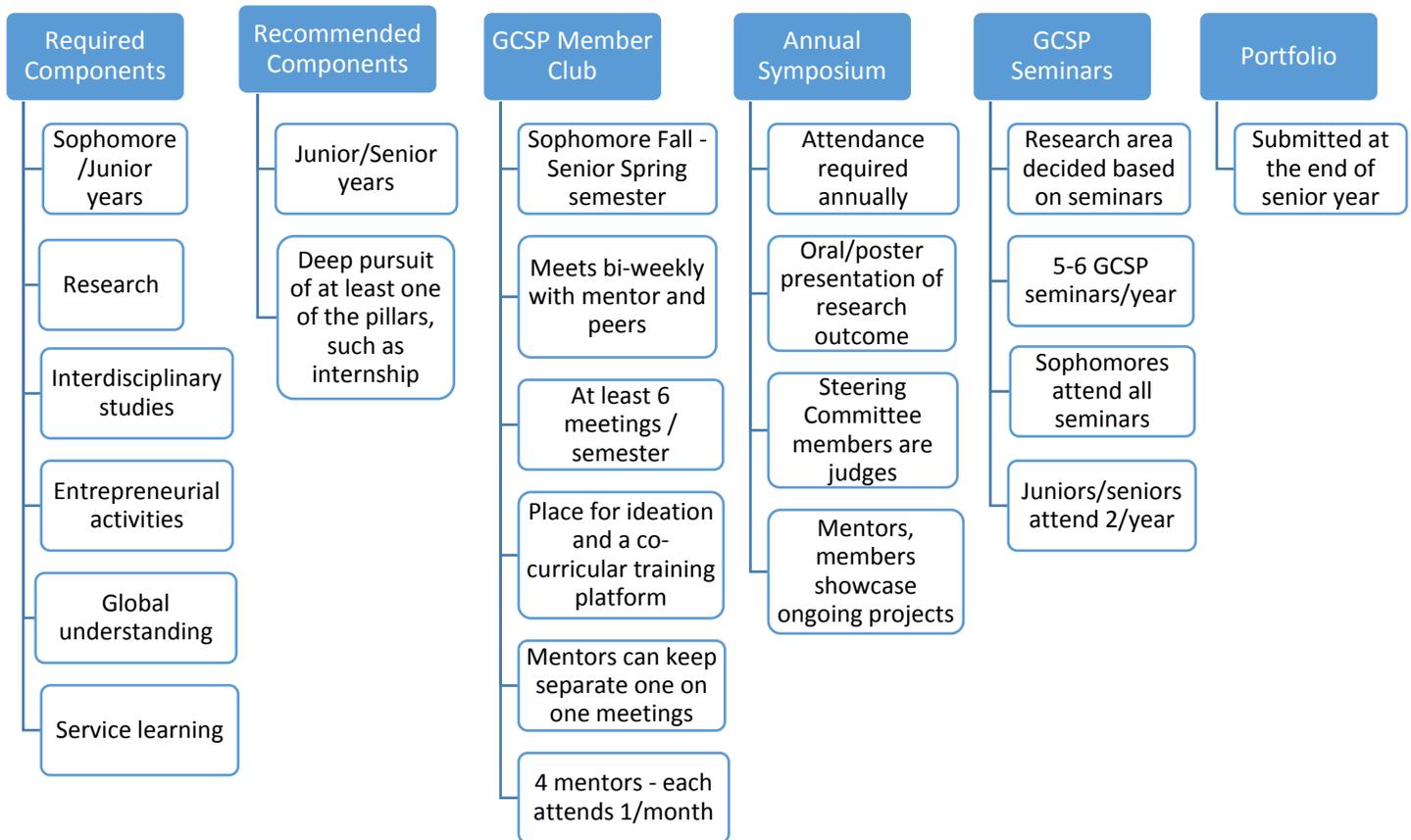


Figure 1: Timeline and Completion of Requirements

9 Mentorship, Support, Tracking and Assessment. Describe how students will be mentored and supported throughout the program, include the ways in which their progress will be tracked and assessed for completion of your program requirements.

Director: The Director will select the Steering Committee members, the GCSP mentors and the members of the Selection Committee. The Director will also play a role in the recruitment process of future GC scholars by attending freshman design courses and Member Club activities, where freshman students will be frequently invited. They will also approve course selection. The Director's office will be in charge of tracking the portfolios and validating the students' progress at the end of each semester. We will create a digital framework, where tracking the scholars can be interfaced with CANVAS (University's Learning Management System (LMS)), such that tracking is aided by automatization.

Mentors: During the research phase, students will work closely with their research mentor, who will focus on the chosen Grand Challenge research theme. For all other components, students will have an assigned mentor to guide them through the program, ensure they meet the required constituencies, and be a motivational force to achieve the best results. Assigned mentors would also verify attendance to co-curricular activities, such as seminars and Member Club activities, by documenting it in the student's portfolio. The assigned mentor would be assisted by the minor challenge mentor for additional support.

Staff: A staff member will handle the administrative work related to GCSP (15 hours/week) including managing the application process, providing guidance with program requirements, and informing students about the selection criteria. They will assist students with administrative related questions and inquiries. They will also assist the Director with the review of the portfolio at the end of each semester.

10 Recognition. Describe how graduates of your program will be recognized by your institution. (Your director will be required to report all graduates of your program each May to the national GCSP steering committee. Your students will be included in the national press release, as well as receive a letter from the NAE President. You may elect to recognize them in additional ways).

Graduates of the Grand Challenge Scholars Program will get special recognition at graduation. We will add a designation on their transcript and award them with a medallion as part of their regalia at graduation. We will host the scholars in a special reception with our industry-advisory boards. Students with completion of three or more components on the higher/recommended level will get special recognition on their transcript and in future recommendations.

11 Other. Describe any other aspect of your program not included above.

GCSP Member Club: At the College of Engineering, our goal will be to create a network of GC scholars that will enable them to connect with each other throughout their academic career. To attain this, we will establish the GCSP Member Club parallel with the implementation of the program.

Students who participate in the program should be able to get to know each other and connect in a setting that is unique only for its members. It would be a place where they could exchange ideas, share experiences, and work on projects together they find mutually engaging and beneficial.

As we will implement the program based on a social learning scenario, the GCSP Member Club will be a central part of students' life as a GC scholar. Meetings will be held weekly led by a mentor, and students will be required to attend at least six meetings each semester. However, the purpose of the Club would go beyond social learning and it would enable, track progress, and create pathways to GC scholars' goals. As an example, students would work together on group research projects and share their research experience; they might have to learn a few practical skills (outside of the classroom), such as designing a PCB, using prototyping tools as the FPGA, using laser cutter, designing 3D printers, etc. Moreover, engineering students at USF are replica of the world; we have students from 145 countries, which, with the help of the Grand Challenge Scholars Program, will make them a self and globally aware 21st century engineering taskforce.

GC Scholars

For existing scholars, its purpose would be twofold. On one hand, students would be involved in each other's academic progress exchanging ideas and collaborating on various projects together, while, on the other hand, they would expand their social network and be engaged with other similar-minded individuals that share their views and beliefs. Thus, the GCSP Member Club would go beyond the social scenario and also link students in their academic career. As an example, scholars would work together on group assignments, share their research experience, and, having many international students, would team up for projects benefiting from each other's global experience. This affiliated network could be a helpful and motivating force for its members to complete the program and form a community that not only shapes them individually, but distinguishes the College as a destination for highly achieving students.

Future GC Scholars

Another function of the Club would be the introduction of the program to prospective GC scholars. Members would actively be involved in the recruitment process by playing a key role in engaging potential members in their academic progress. Through our Member Club, prospective students would be able to attain the following:

- Gain insight into the everyday life of a GC scholar
- Learn in-depth the necessary steps and requirements for the successful completion of the program
- Pick and follow a member who would serve as their student mentor with the same Grand Challenge subject area they have in mind to pursue
- Participate in discussions and research in the area of their interest by completing small projects in collaboration with their student mentor
- Attend seminars and boot camps

Figure 2 describes the structure of the GCSP Member Club. As shown, progressing from potential scholar to senior member, there will be a deeper level of engagement with senior members playing a key role in the recruitment process.

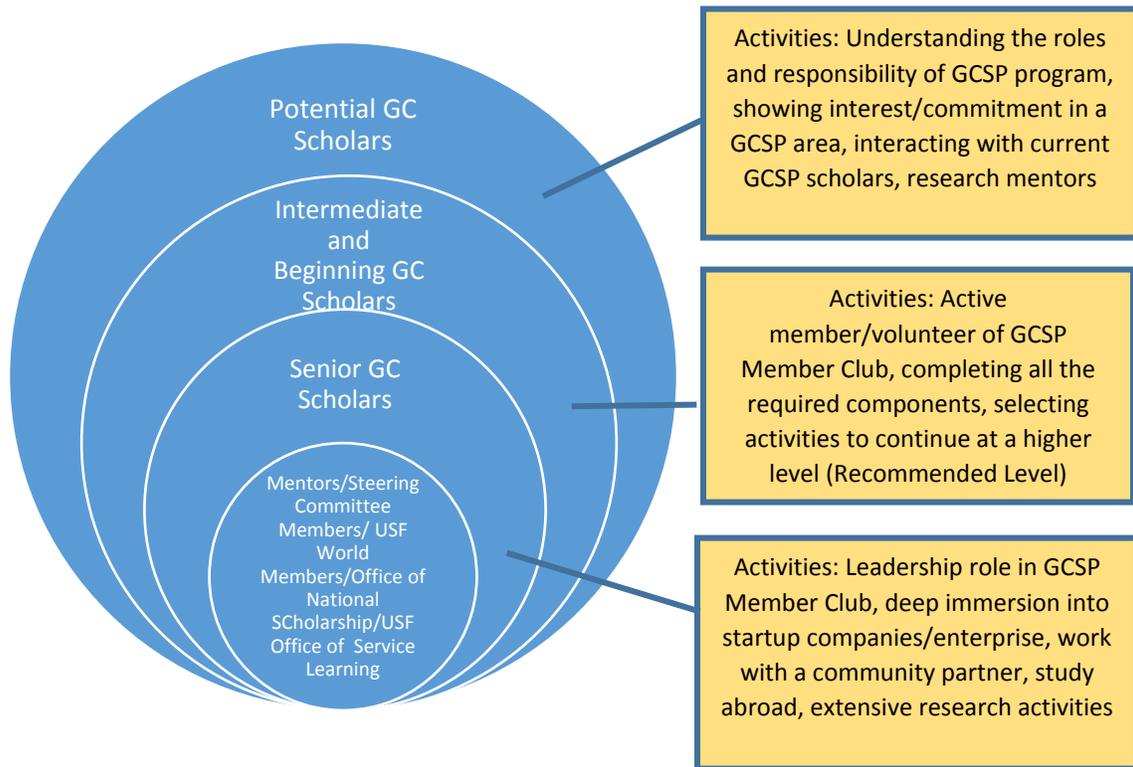


Figure 2: GCSP Member Club as Communities of Practice

12 Appendix

12.1 Research Area and Expertise

The College of Engineering hosts outstanding faculty in multitude of NAE Grand Challenge areas. Here we document a few of the research topics pursued by our faculty.

Energy and Environment GC Theme: This theme has faculty members from Electrical, Chemical, Mechanical Engineering, Civil and Environmental Engineering.

In energy domain, a team of researchers led by Prof. Yogi Goswami investigates and has invented nano-scale antenna technologies to convert sunlight to power and thermal energy storage technologies. Dr. Goswami advises the US Congress and the Indian government on energy policy and the transition to renewable energy, thus will serve as a great mentor connecting research with public policies. Another example would be the work by Dr. Ferekides, where Cadmium Telluride (CdTe), a member of the II-IV family of semiconductors, is proposed for Thin-Film Photovoltaics (PV) because of its large optical absorption coefficient, its ability to be doped, and its near optimum band gap for solar energy conversion. Because of this large optical absorption coefficient, a CdTe film only needs to be 1-2 micrometers thick in order to absorb essentially 100% of the incident solar radiation. These thin-films can then be placed on numerous types of substrates such as plastic, metal, or glass; however the most commonly used substrate is soda-lime glass.

In Environmental Engineering, pioneering researchers Prof. Mihelcic, Prof. Ergas, Dr. M. Trotz, Norma Alcantar, and Qiong Zhang work on sustainability, impact of anthropogenic stressors on water resources, water supply; water reuse, water-energy nexus, coupled nature-human system modeling, environmental fate and transport modeling; water/sanitation/hygiene (WASH) in the developing world. Additionally, there is work on: Carbon sequestration methods – algal biofuel production using wastewater as a nutrient source; Manage the nitrogen cycle – sulfur oxidizing denitrification, N removal from storm water and domestic, and agricultural (fish and livestock production) wastewaters; Providing access to clean water – improving biosand filters for household treatment of drinking water in the developing world and biological treatment of perchlorate and nitrate contaminated groundwater; Restore and improve urban infrastructure – decentralized wastewater treatment, low impact development for storm water management, bioenergy from agricultural and municipal solid waste; Research harnessing surface active properties of green materials such as cactus mucilage and its effect in reacting with heavy metals to clean contaminated drinking water.

Health Grand Challenge Theme:

The USF College of Engineering is a pioneer in the Health Grand Challenge domain. It partnered with the Morsani College of Medicine to form a new Department of Medical Engineering jointly sponsored and governed by the colleges of engineering (COE) and medicine (MCOM). A few research directions are: Continuous Acquisition of Brain Signals and Neuroplasticity on real-time systems for numerous applications including hearing and speech processing problems (Drs. Ann and David Eddins); Assistive Listening Systems and Sound Processing Algorithms for The Hearing Impaired (Drs. Ann and David Eddins); Manipulation of Neural and Cardiac Cell Activity by Light and Nanoparticles, especially visible laser light manipulation of neural cells expected to lead to the next generation of devices, for example, cochlear implants to supplant the current electrical stimulation (Drs. Robert Frisina, Venkat Bhethanabotla and Joseph Walton); Biomedical Data Processing and Wireless Communication intended to create a paradigm shift in disciplines such as minimally invasive surgery, cyber-physical healthcare systems, and sensor networks (Dr. Richard Gitlin); Biotechnology and Drug Discovery including projects where tumoroids designed in the lab and sold to researchers worldwide for more effective drug development and efficacy (Dr. Shyam Mohapatra); Biomedical Imaging and Computing with Medical Image Analysis, Image and Video Processing, Computer Vision and Pattern Recognition, Ethics and Computing, Bioinformatics and Bioengineering (Dr. Dmitry Goldgof).

The Industrial and Management Systems Engineering (IMSE) department and the College of Engineering have done an outstanding job in the past assisting the State of Florida in the educational environment. The center that is located in IMSE, has the potential to draw broadly from the research disciplines represented within the College of Engineering including Biomedical Engineering, Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Industrial & Management Systems Engineering. The USF-Tampa campus is also home to the Shriners Hospital for Children, as well as the nationally recognized H. Lee Moffitt Cancer Center and Research Institute. Also affiliated with USF are Tampa General Hospital and the James A. Haley VA Medical Center.

Security Grand Challenge Theme:

Cybersecurity Research: The Florida Center for Cybersecurity (FC2) is dedicated to expanding cybersecurity research through the combined assets of the state's vast research community. FC2 supports and encourages collaboration across the State University System (SUS) to promote research innovation and productivity in cybersecurity. The competitive FC2 Collaborative Seed Grant Program advances that objective by funding research teams with investigators from at least two different SUS institutions for projects that align with FC2 strategic priorities and have strong potential to attract external funding. USF College of Engineering hosts a significantly

large team of security researchers, such as Dr. S. Chellappan, Dr. Robert Karam, Jay Ligatti, Yao Liu, Mehran Mozaffari Kermani, Xinming (Simon) Ou, S. Kose and N. Ghani. A few key research directions are: Hardware security, reconfigurable computing, bio implantable devices (algorithms & digital hardware; socio-technical systems, cyber security, smart health, mobile networking, cyber-physical systems, mobile and wireless computing; Software security and programming languages, including: attacks on software (such as buffer overflows and SQL injections), runtime defense mechanisms (such as CFI, firewalls, and other monitors), theories of security (such as security models, approaches to composing security policies, and enforceability theory), strong type systems for programming languages, and tools for specifying and managing complex security policies; Network security with an emphasis on designing and implementing defense approaches that protect emerging wireless technologies from being undermined by adversaries, fault diagnosis and cryptography; Cyber defense technologies, especially human-centered approaches to understanding/improving security operations, intrusion/forensics analysis, cloud security and moving-target defense, mobile system security, and cyber physical system security.

Joy of Living Grand Challenge Theme:

USF College of Engineering is home for numerous faculty members pursuing research in this Grand Challenge theme. Here we highlight the research in augmented reality and understanding and engineering the brain.

Drs. Stephanie Carey and Rajiv Dubey at the Center for Assistive Rehabilitation Robotics Technologies (CARRT) are focusing on integrated, multidisciplinary prosthetics and orthotics research, education and service in assistive and rehabilitation, and robotics technologies in collaboration with clinicians, government and industry partners. A current project at CARRT is Using Virtual Reality and Robotics Technologies for Vocational Evaluation, Training and Placement. The goal of this project is to improve the effectiveness of vocational rehabilitation services by providing an environment to assess and train individuals with severe disabilities and underserved groups in a safe, adaptable and motivating environment. Using virtual reality, simulators, robotics, and feedback interfaces, this project will allow the vocational rehabilitation population to try various jobs, tasks, virtual environments and assistive technologies prior to entering the actual employment setting. This will aid job evaluators and job coaches assess, train and place persons with various impairments. Using virtual reality, simulators, robotics, and feedback interfaces the proposed project will: Develop layered 3D virtual reality simulation and controlled physical environments for several job-related tasks (customer service, hospitality industry, and production environments); Assess DVR clients' work abilities with their trainers and find possible work venues using virtual reality and controlled physical

environments; Train DVR clients on the job of their choice of possible job environments based on the conducted assessments; Provide job placement and follow-up for feedback and adjustments. The proposed project will simulate job environments such as a commercial kitchen, an industrial warehouse, a retail store or other potential locations that an individual will likely work. Features of the simulator could include layering of colors, ambient noise, physical reach parameters and various user interfaces.

Active research is also on research concentration on Affective Brain-Computer Interfaces where Dr. Marvin Andujar focuses on measuring and decoding the user's affective state during human-machine interaction or while users perform real-world tasks; human-level and logical reasoning; particularly, the kind of reasoning that we normally refer to as cognitive. This encompasses the following topics: Computational modeling of cognitive reasoning; Cognitive science and robotics; Computational cognitive architectures; Automated theorem provers; Artificially intelligent reasoners; Analogical, deductive, and hypothetico-deductive reasoning; Artificial reasoning with highly-expressive (e.g. second-order, modal, etc.) logics (Dr. John Licato).

12.2 Interdisciplinary Centers and Activities

The Patel College of Global Sustainability develops research that creates solutions for sustainability development in a rapidly-changing world. Its research is based upon USF's broad, interdisciplinary expertise in the areas of water, public health, energy, global security, and social equity. This interdisciplinary approach provides a fertile foundation for the development of unique solutions to emerging and existing problems. The Patel College of Global Sustainability provides cutting-edge research and emphasizes developing appropriate transfer mechanisms so that it can be applied on the ground. Focus areas include challenges surrounding the development of resilient, livable, and healthy cities of the future, particularly in the developing world. Research generated at the College is key to the development of the global sustainable cities agenda.

Nanotechnology Research and Education Center (NREC): Nanotechnology is an enabling technology for diverse fields and applications, and is expected to be the revolutionary force for industrial and economic development in the 21st century. This revolution will lead to significant benefits for society, such as powerful miniaturized electronic and optical systems, development of new alternative energy sources and materials, development of novel drug delivery schemes, new medical and environmental technologies, and more.

The Nanotech1 building is a shared facility for all University of South Florida faculty and students conducting multidisciplinary research. It contains a whole suite of state-of-the-art measurement instruments as well as sophisticated fabrication equipment that is loaned to researchers for their individual projects.

Research at the NREC deals with diverse fields of nanoscience, such as new materials, molecular and nano-electronics, nano-electrooptics, nano-medicine and nano-biology. The research will enable technological development of new transistors, memory elements, sensors and biosensors, renewable energy sources, directed drug delivery schemes, and more. The research done at the NREC already has made significant scientific impact both at national and international levels and it also serves to create a new nanotechnology based industry in the USA.

Center for Applied Research Medical Devices: The mission of CareMed is to improve the overall effectiveness of the medical devices and equipment (MDE) industry across its entire value chain. CareMed will provide the organizational structure to link interdisciplinary researchers, industry organizations, and government regulatory agencies, and enable the domestic and global medical devices industry to better deliver products and services that increase societal welfare.

Clean Energy Research Center: CERC pursues research and development of environmentally clean energy systems, such as photovoltaics (PV), concentrating solar power (CSP), energy storage (thermal storage, batteries, supercapacitors), photocatalytic detoxification/disinfection technologies, hydrogen production and solid state storage, new efficient thermodynamic cycles, solar energy conversion/rectifying antenna (rectenna), and biomass conversion/biofuels.

[12.3 University of South Florida Center for Entrepreneurship](#)

The USF Center for Entrepreneurship is a nationally-ranked, multidisciplinary, campus-wide center focusing on entrepreneurial education, training, and research. By using innovative, interdisciplinary approaches, the center provides opportunities for graduate students in the fields of business, engineering, health sciences, and sustainability through the Master of Science in Entrepreneurship, several graduate dual degree programs, and the Certificate in Entrepreneurship. The center also enhances undergraduate studies by offering two minors.

Entrepreneurial Activity Certificates/Minors/Majors

The nationally ranked USF-Center for Entrepreneurship offers two entrepreneurship minors available to all undergraduate USF students (who meet qualifications). Most courses in the minor program are offered online. Whether students would like to increase their entrepreneurial business skills, pursue their own business ideas, or

learn ways to bring innovation into existing positions and businesses, an entrepreneurship minor teaches valuable skills. At least nine hours of the required 12 credit hours must be taken in residence at USF Tampa.

For Business & Industrial Engineering Majors (12 hours)

Required courses:

- ENT 4014 Venture Formation,
- ENT 3613 Creativity & Innovation in Entrepreneurship OR EIN 4933 Selected Topics: Creativity in Technology

Two electives from the following:

- EIN 4933 Selected Topic: New Product Development
- ENT 4424 Venture Capital
- ENT 4024 Small Business Management/Entrepreneurship OR MAN 4802 Entrepreneurship/Small Business Management
- MAN 4804 Small Business Management Counseling

For Non-Business/Non-Industrial Engineering Majors (15 hours)

Required courses:

- ENT 3003 Principles of Business
- ENT 4014 Venture Formation
- ENT 3613 Creativity and Technology OR EIN 4933 Creativity in Technology

Two electives from the following:

- EIN 4933 Selected Topic: New Product Development
- ENT 4424 Venture Capital
- ENT 4024 Small Business Management/Entrepreneurship OR MAN 4802 Entrepreneurship/Small Business Management
- MAN 4804 Small Business Management Counseling

USF NSF I-Corps Site awardees will complete a 6-week workshop course. At the end of the workshop, they will have a stronger understanding of the market opportunity, product and market validation, the path to market for their technology, and the overall competitive landscape. Participation in the I-Corps program could lead to potential outcomes ranging from significant industry contacts, ongoing research, opportunities for commercialization funding to form a company.



What is I-Corps at USF?

I-Corps is the National Science Foundation's program to help move academic research out of the lab and into the world. USF was recently designated as an I-Corps Site—only the second one in Florida and among just three dozen around the country.

How Does the I-Corps at USF Program Work?

This revolutionary program is an intensive immersion in how to launch your product or service idea into the marketplace, with hands-on, real world experience.

You'll be provided with up to \$2,500 and matched with a team, including a mentor and a faculty expert, to give you personalized help to:

- Find and talk with potential future customers
- Develop a successful business model canvas
- **Build your skills and toolsets for your future career path**
- Fine-tune your idea into a commercially viable product

At the end of the program, you'll have the opportunity to compete against other teams for the chance to further refine your business model in the NSF national training program using a \$50,000 grant, or explore further funding opportunities to build your proof-of-concept.

I-Corps at USF can help your ideas become a springboard to your future.



Find Out More about I-Corps at USF

Visit our website:
innovation.usf.edu/icorps



Attend one of our Road Shows

Hear from successful past participants about why they participated and how the program works. Check our website for upcoming dates.



Plan to enroll in an upcoming course

Check our website for a list of courses and schedules



Questions?
(813)974-0466



Get Your Research *Out Into the World*



12.4 Activities and Courses in Global Diversity and Cultural Competencies:

Global Citizens Project: The Global Citizens Project is a university-wide initiative aimed at enhancing undergraduate students' global competencies through the development of new and improved curricular and co-curricular experiences. USF envisions itself as a global research university dedicated to student success. Goal #1 of our 2013-2018 Strategic Plan is to prepare "well-educated and highly skilled global citizens through our continuing commitment to student success." The Global Citizens Project is one of the ways in which USF is advancing this goal.

The Global Citizens Project is using the United Nations (UN) Sustainable Development Goals as one way to identify the global nature of the various experiences USF offers students. Such goals include Clean Water and Sanitation and Affordable and Clean Energy. For the purposes of the Global Citizens Project, USF has identified three primary qualities possessed by a global citizen: global awareness, global responsibility and global participation.

The following behavioral indicators can be used to assess the degree to which students are achieving Global Citizens Project objectives:



Global Dimension Courses:

AMH 3342 Globalization and U.S. Culture

ANT 3610 Linguistic Anthropology

CPO 4034 Politics of the Developing Areas

LAH 3200 Modern Latin America

ORI 4019 Performing Identity and Culture

GEY 4104 Healthy Global Aging

ISM 4041 Global Cyber Ethics

SOW 4522 Multicultural America in a Global Society

EDG 3801 Cybersecurity and the Everyday Citizen

SSE 4380 Global and Multicultural Perspectives in Education

IDS 4239 Intro to Global Sustainability

HSC 4624 Foundations of Global Health

12.5 [Service Learning](#)

Lead Week includes five days of engaging workshops and programs hosted by the Center for Leadership and Civic Engagement (CLCE) and campus partners. These programs are based on the five themes of the Leadership Challenge as well as the CLCE values, encouraging students to become engaged, ethical citizens committed to positive change.

Mini Grants Project: Service-Learning High-Impact Practice Mini-Grants are designed to provide funding for courses incorporating service-learning. Service-learning is defined as a method of teaching that includes experiential learning, classroom instruction, and reflection. Typically service-learning courses work in cooperation with a community partner and students engage in at least 10 hours of service during the semester.

Service/Leadership: Having a service/leadership role at a student organization with strong community outreach for at least one semester, such as ESTEAM, Engineers Without Borders, and Florida Water Environment Association (FWEA). Other examples are outreach committees of technical organizations, such as IEEE, ACM, AIChE, ASCE, ASME, SWE, EXPO, SHPE, and NSBE.

Service-Learning Courses

Arts and Sciences

- [ANG 5937 Environmental Justice](#)
- [REL 3936 Agrarianism and the Sacred](#)
- [PAD 6275 Political Economy for Pub Mngr](#)
- [URP 6115 Planning, Policy & Politics](#)

Behavioral and Community Sciences

- [INT 4235 Advanced Receptive Voicing](#)
- [IDS 2600 Research in Community Settings](#)
- [SPA 5403 Language Learning-School Age Year](#)
- [SPA 6930 Bilingual Assessment & Intervention](#)

Public Health

- [PHC 6505 Program Planning in Community Health](#)

The Arts

- [ART 4806 Art Education Community](#)
- [THE 4930 Community Based Theater](#)

Career Services

- [Academic Foundations](#)

Education

- [Tutor-a-Bull](#)

Undergraduate Studies

- [IDS 2912 Undergraduate Research Experience](#)

Response to the Reviews

Requested Revision

*“Is the Selection Committee and the Steering Committee one and the same? It was not clear who the application reviewers would be. When describing Steering Committee roles, it is mentioned that they would be judges in the “local **completion**/presentation.” What is the “local **completion**/presentation”? There was no mention of a presentation requirement anywhere, although a portfolio is mentioned somewhere. Is this related to the presentation?”*

Selection Committee and Steering Committee are not the same. For application review, selected members of the Steering Committee will be solicited by the Director to the Selection Committee. The Selection Committee will consist of the Director, mentors and a select number of Steering Committee members. While the Director and mentors will be part of every Selection Committee, Steering Committee members will be rotated yearly, so that each member is serving in at least one of the application review cycles in their three year term.

“Completion” is misspelled—we meant “competition”, and it has been corrected in the proposal. Every student has to submit a portfolio upon completion of the program, but presentation of the portfolio is not required. However, once students complete their research, it is required that they do an oral/poster presentation of the research outcome at the College’s Research Symposium, where Steering Committee members will serve as judges.

Since the student's mentor oversees the annual program progress, is there any scheduled/written annual requirements or a timeline established for completion? Can they finish the program in one year? Perhaps an example of one student's progress through the program might be helpful in communicating expectations to your students and mentors. What is used to show pillar completion?

The Grand Challenge Scholars Program will be a three year program at the University of South Florida beginning in sophomore year and ending in senior year. There is no specific timeline for the program; it will be the students’ choice in which order they want to complete the requirements. They can finish the required and/or recommended components early, but they will have to stay with the Member Club for the entire time. The reason for this is that our program will be modeled as a “Community of Practice” based on social learning scenario. Each scholar, whether they finished their pillars or not, will be required to attend a certain number of seminars, annual symposiums, and Member Club activities that have to be documented in their portfolio (see sections 8 and 11). Every semester students will register for a “Zero credit” portfolio class, where they will upload a checklist of requirements completed thus far, and, at the end of the semester, the Director’s office will track the student’s progress. Each student will submit the complete portfolio at the end of senior year, when they will be certified as GCSP scholar.

There are multiple student mentors in this program (an assigned mentor, a research mentor, and a minor challenges mentor), which is a great idea. Will each student have a research mentor and another mentor to monitor progress in GCSP or will the research mentor fulfill both of those roles? How will mentors be trained in GCSP completion? Who is ultimately responsible for the student's progress? How do the various mentors link?

During the research phase, students will work closely with their research mentor. For the rest of the components, they will have an assigned mentor to guide them through the program, ensure they meet the required constituencies, and be a motivational force to achieve the best results. Assigned mentors would also verify attendance to co-curricular activities, such as seminars and Member Club activities by documenting it in the student's portfolio. The assigned mentor would be assisted by the minor challenge mentor for additional support, if needed. Tracking students' progress and making sure the requirements are met would be done by the Director's office at the end of each semester.

Any faculty who works in a Grand Challenge area can be a research mentor. Assigned GCSP mentors will be selected by the Director's office and can overlap with the research mentors. Any faculty member interested in participating in an open challenge/mini-grants project/national competition can be a minor challenge mentor working closely with the assigned mentors. Each newly assigned GCSP mentor will receive a training from ATLE as well as a workshop, where existing mentors will provide a training in GCSP components and requirements. The first round of mentors will be trained by the Director and the College's "Mini-Circuits Design for X" makerspace manager (Sr. Research Engineer and Lab Manager) as the Member Club will be hosted in the Design for X makerspace.

With respect to the GCSP Components (p.12-15): For the Research/Hands-on Project, how much research will be required? Does the research experience need to be 1 semester or 2 semesters working on the same project? Or completing one semester of research and presenting their work? You will quickly find that students and faculty mentors need to be able to determine how to meet your program requirements.

To satisfy this component, research will be required for at least two semesters. If students choose to pursue this phase on the higher level, a minimum of three semesters will be required. Upon completion, students will have to present their research outcome at the College's Research Symposium.

With respect to Interdisciplinary Studies, can the courses be any 3 courses outside of engineering? How will you ensure that they relate to the Grand Challenge area/problem on which the student is working and connect to the student's other experiences in the program? One possibility would be to provide some guidelines to ensure the courses connect to the student's selected Grand Challenge, and perhaps identify some pre-approved courses or examples to provide students with some examples of what types of courses will count.

After the selected Grand Challenge is approved, the student's mentor will provide a list of interdisciplinary courses that are related to the Grand Challenge area of their choice. For each broad Grand Challenge theme: sustainability, health, security, and joy of living, a pre-determined set of courses will be created and updated annually consulting with members of the Steering

Committee. The student would then pick three courses out of those recommendations with the mentor's approval. As an alternative, students could suggest a course, but the Director's approval will be required.

Entrepreneurship: The wide variety of options here is great, but there appears to be a mismatch between text descriptions (p.12) and table (p.13) – should they both say 'minor in Entrepreneurship'?

Thank you for pointing out the mistake. We corrected it, and now we have "Minor in Entrepreneurship" in the text as well.

Service Learning: When communicating requirements for this component to students, the Committee would suggest that you provide examples of the types of activities that meet this requirement (e.g. working a project with Engineers without Borders or other community organizations). While the minor in Leadership Studies sounds fantastic, it is not clear why it meets the goals of service learning. Could you please clarify?

We have removed "Minor in Leadership Studies" from this area as it might not be the best match for service learning. Example of activities that would meet service learning requirements are completion of the LEAD week program, taking a course related to service learning, participate in the Mini Grants Project through the USF Office of Community Engagement and Partnerships (see appendix), and having a service/leadership role at a student organization with strong community outreach for at least one semester, such as ESTEAM, Engineers Without Borders, and Florida Water Environment Association (FWEA). Other examples are outreach committees of technical organizations, such as IEEE, ACM, AIChE, ASCE, ASME, SWE, EXPO, SHPE, and NSBE.

The requirements for completing the program need to be clearer. What are minimum requirements for completing GCSP? If student just completes 'required' in each area, is that enough? Or do they have to do some recommended? Many institutions require students to complete some minimum (say 2 out of 5) of the components at the higher recommended level, to prevent students from trying to complete the program with the least amount of effort and thereby failing to glean the anticipated value and connections of participating in the program.

To complete GCSP at USF, students will have to finish all components on the required level, and at least one component on the recommended level. It is the student's choice which area they will pursue on a higher level. Attendance of the Member Club, seminars, and research symposiums will also be required. Students completing three or more components on the recommended level will get special recognition at graduation.

Suggested Revision

What is the function of the Director? There is no mention of the duties of this position. You might find it helpful to think about this ahead of time.

The Director will select the Steering Committee members, the GCSP mentors and the members of the Selection Committee. The Director will also play a role in the recruitment process of future GC scholars by attending freshman design courses and Member Club activities, where freshman students will be frequently invited. They will also approve course selection. The Director's office will be in charge of tracking the portfolios and validating the students' progress at the end of each semester. We will create a digital framework, where tracking the scholars can be interfaced with CANVAS (University's Learning Management System (LMS)), such that tracking is aided by automatization.

"You will be admitting students before their 2nd year. One of the application requirements is "proven record of project/research experience." Is this a reasonable expectation at your institution for students who have just completed their freshmen year? How likely is it that students will gain research experience in their first year? Might this limit who can participate in your program?"

USF College of Engineering is preparing to offer the freshman-level design course of Engineering Design with three credit hours beginning in Fall, 2018. The course will provide every student with project experience, which they can document in their application. Research experience will be a plus, not mandatory. However, it will be given weightage, which might help students in the lower GPA spectrum. The exact weightage will change year to year depending on the application pool. (Section 4 "Application and Selection" has been adjusted in the proposal.)

There is one staff member who will have to "guide the students through all the pillars." The Committee noted that this could become an extensive workload with 20-25 new students a year. You might want to consider ways to make this workload more manageable.

We did not phase this correctly. Rather than guiding them through all the pillars, the staff member would assist students with administrative questions and inquiries. They would provide guidance in areas such as program requirements, application process, and selection criteria. They would also assist the Director with tracking the students' progress at the end of each semester.

GCSP Member club (p.4): Again, this sounds like a great idea to build a community of GCSP scholars who can support each other. It is not clear what they will do. Will they be a student organization? And would they actually work on projects together (provided by mentors and community sponsors), or would they just share their experiences with each other?

As we will implement the program based on a social learning scenario, the GCSP Member Club will be a central part of students' life as a GC scholar. Meetings will be held weekly led by a mentor, and students will be required to attend at least six meetings each semester. However, the purpose of the Club would go beyond social learning and it would enable, track progress, and create pathways to GC scholars' goals. As an example, students would work together on group research projects and share their research experience; they might have to learn a few practical skills (outside of the classroom), such as designing a PCB, using prototyping tools as the FPGA, using

laser cutter, designing 3D printers, etc. Moreover, engineering students at USF are replica of the world; we have students from 145 countries, which, with the help of the Grand Challenge Scholars Program, will make them a self and globally aware 21st century engineering taskforce.