

## **NAE Grand Challenge Scholars Program**

### **What is the NAE Grand Challenge Scholars Program?**

The National Academy of Engineering has identified 14 Grand Challenges for Engineering in the 21st century. The Grand Challenges are a call to action and serve as a focal point for society's attention to opportunities and challenges affecting our quality of life. (See [here](#) for a list of the challenges).

George Fox Engineering has joined a select group of engineering schools who have taken on the mission to educate a new generation of engineers expressly equipped to tackle these pressing issues facing society in the 21st century. (A complete list of GC schools is found [here](#)).

### **What does it mean to be a Grand Challenge Scholar?**

As a GFU Engineering Grand Challenge Program Scholar (GCPS) you will be part of a select cadre of students across the country uniquely prepared and motivated to address the most challenging problems facing our nation and the world. Upon successful completion, GC scholars will receive:

- **National Academy of Engineering recognition**
  - Grand Challenge Scholar letter from the President of the National Academy of Engineering
  - Inclusion in the annual NAE Grand Challenge Scholar press release & web listing of all scholars.
- **GFU Transcript will denote your GCPS status upon graduation (TBD)**
- **Engineering Department graduation recognition**
  - Medallion to wear with your regalia at commencement.
  - Notation in the graduation program

### **What are the requirements to become a Grand Challenge Scholar?**

In an effort to acquire and integrate the engineering and non-engineering expertise necessary to tackle a GC problem, students are required to complete the following five curricular components (within the context of their GFU coursework):

- Hands-on project/research related to the selected challenge
- Interdisciplinary curriculum complimenting engineering fundamentals with courses in other fields (business, arts, ethics, sciences, etc.)
- Entrepreneurship experience
- Global dimension experience related to selected challenge
- Service Learning experience related to selected challenge

*See table below for details of curricular components*

### **How do I become a Grand Challenge Scholar?**

The GC Scholar program is open to all sophomore and above engineering or computer science majors with a cumulative GPA of 3.2 or above (Note: students with a GPA below 3.2 may apply for provisional acceptance). GC applicants should submit a completed Plan of Study form (included below), along with a brief personal essay, and recommendation letter from the proposed GC Faculty Mentor. Application deadlines are Oct.15 (fall semester) and Feb. 15 (spring semester), with acceptance decisions and notifications by Nov. 1 and Mar. 1 respectively.

### Summary of GC Curricular Components and GFU Requirements

GC Curricular Components	GFU Requirements	
<b>Research Experience</b>	GEED 490 course senior capstone research project, <b>or</b> independent Richter, Holman, Industry sponsored (or other) research project - related to a GC theme or problem.	
<b>Interdisciplinary Curriculum</b>	ENGR 151*, 152* MATH 201, 202, 301 and CHEM 211, PHYS 211, 212  *CSIS201 and 202 for CSIS majors	An approved set of four Social Science and Humanities electives (or independent study course) related to student's focus Grand Challenge, <b>plus</b>  One of the following courses: <ul style="list-style-type: none"> <li>• BUSN 360 (Business Law)</li> <li>• ECON 340 (Public Economics)</li> <li>• SOCI 373 (Social Theory)</li> <li>• INTL 230 (Introduction to International Affairs)</li> </ul>
<b>Entrepreneurship</b>	GC-related entrepreneurial project in ENGR 381 and 382, or ENGR 481 and 482	
	<b>Or</b>	
	Complete the Entrepreneurship I and II courses (ENTR 300,400)	
	<b>Or</b>	
	Participate in George Fox's University Innovation Fellows Program (UIF)	
<b>Global Dimension</b>	<a href="#">George Fox University Juniors Abroad</a> or <a href="#">Int'l May Serve Program</a>	
	<b>Or</b>	
	<a href="#">Approved International Study Program</a>	
	<b>Or</b>	
	Internship with significant global focus	
	<b>Or</b>	
	INTL 200 (Cultural Geography/Global Relations) <b>and</b> one of the following courses: <ul style="list-style-type: none"> <li>• ECON 370 (Global Political Economy)</li> <li>• ECON 461 (International Trade)</li> <li>• GBSN 300 (Global Business)</li> <li>• SOCI 300 (Cultural Anthropology)</li> <li>• PSCI 380 (American Foreign Policy)</li> <li>• INTL 440 (World Religions)</li> <li>• HIST 340 (History of the Middle East)</li> <li>• PSCI 460 (Peace Theory)</li> <li>• PSCI 253 (Introduction to Comparative Politics)</li> </ul>	
<i>For the selected <b>Global Dimension</b> option a justification must be submitted explaining how the proposed study program/internship/research experience/two courses will help cultivate an enhanced global awareness in the chosen field.</i>		
<b>Service Learning</b>	ENGR 381 and ENGR 382 Servant Engineering I and II	

### **Deliverables (Completion / Graduation requirements)**

At the completion of all activities outlined in their Curricular Plan and required by the GC Program (and no later than the twelfth week of their final semester), each GC Scholar Apprentice must:

- 1) submit their ePortfolio to the GC Steering Committee through their GC Faculty Mentor (ePortfolio guide below);
- 2) submit a letter of recommendation from their GC Faculty Mentor to the GC Steering Committee confirming that they have satisfactorily completed the program requirements;
- 3) complete a capstone presentation to present and share information about their scholarship and project experiences. The presentations will be given at the annual Spring Engineering Expo which occurs in the final week of the spring semester and is attended by current students, faculty and administrators as well as prospective high school students, alumni, industrial advisory board members, and senior design project sponsors.

Upon successful completion of these activities, the GC Scholar Apprentice will be named a George Fox College of Engineering Grand Challenge Scholar (GFCEGCS).

**GFU Grand Challenges webpage:**

<http://www.georgefox.edu/academics/undergrad/departments/engr/grand-challenges.html>

## Grand Challenge Scholar Program (GCSP) Plan of Study Form

Student Name: \_\_\_\_\_ Major: \_\_\_\_\_

Faculty Mentor: \_\_\_\_\_ Completed Credit Hours \_\_\_\_\_

Select the Grand Challenge theme(s) of interest for your Plan of Study from the following list:

### Energy and Environment Grand Challenge Theme:

- Make solar energy economical
- Provide energy from fusion
- Develop methods for carbon sequestration
- Manage the nitrogen cycle
- Provide access to clean water

### Health Grand Challenge Theme:

- Advance health informatics
- Engineer better medicines

### Security Grand Challenge Theme:

- Prevent nuclear terror
- Secure cyberspace
- Restore urban infrastructure

### Joy of Living Grand Challenge Theme:

- Reverse engineer the brain
- Enhance virtual reality
- Advance personalized learning
- Engineer the tools of scientific discovery

List one or more potential research projects and explain briefly how they align with your selected Grand Challenge theme(s).

Identify which mechanism you are likely to use to implement your Grand Challenge research project (senior design, independent research, summer research, internship).

Identify which interdisciplinary course (see list) you will take in addition to the integrated math and science curriculum, and describe how that course aligns with your Grand Challenge theme.

Describe the entrepreneurship components of your proposed research project and/or confirm that you will be taking ENPR 300 and 400 to fulfill this GC program component.

Identify how you plan to include a global dimension in your Plan of Study that aligns with your selected Grand Challenge theme. The global dimension component can be fulfilled by selecting a Grand Challenge research project with a significant global perspective, participating in a study abroad program, or by selecting at least 6 semester-hours of global perspective courses (see suggested list).

Describe a proposed service learning experience in your Plan of Study that aligns with your Grand Challenge theme. Identify the specific service learning activity and expected learning outcomes, and explain how this activity aligns with your Grand Challenge theme.

*Attach the following documents to your GCSP Plan of Study:*

- ✓ *Personal essay addressing the question, "Why do you want to be a Grand Challenge Scholar?"*
- ✓ *Current transcript(s)*
- ✓ *Faculty Mentor letter of recommendation*

## Grand Challenge Scholar Program (GCSP) ePortfolio Guide

Each Grand Challenge Scholar Program (GCSP) student must work with their faculty mentor and the GCSP Director to complete an ePortfolio providing evidence of satisfactory achievement of the five GCSP components. Students must submit the final ePortfolio as a continuous single .pdf file to the GCSP Director and Steering Committee for approval. All ePortfolios must contain the following sections in the noted order:

1. **Cover Page:** Include the University name, your name and major, selected GCSP theme and research project title, the name of your faculty mentor, and the date of submission.
2. **Research Report:** Include a research report that describes your project objective, methodology, and outcomes. At a minimum, your report must include the following sections: Introduction and Background, Methodology, Results, Discussion, Conclusions, Future Recommendations, and References.
3. **Interdisciplinary Component:** Document how you achieved the interdisciplinary component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your interdisciplinary learning experience relates to your GCSP theme. Include evidence of any strong thematic interdisciplinary outcomes from your research project.
4. **Entrepreneurship Component:** Document how you achieved the entrepreneurship component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your entrepreneurship learning relates to your GCSP theme. Include evidence of any entrepreneurship component in your research project, such as taking your project idea to market and/or developing a business model canvas, launching a Kickstarter or Indiegogo campaign, etc.
5. **Global Dimension Component:** Document how you achieved the global dimension component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your global dimension learning relates to your GCSP theme. Include evidence of any strong thematic global dimension in your research project and/or a study abroad experience.
6. **Service Learning Component:** Document how you achieved the service learning component of your Plan of Study. Provide evidence of what you learned through your service activity and show how this experience relates to your GCSP theme.
7. **Overall GCSP Outcome Evaluation:** Reflect on your overall GCSP experience. Discuss how your research project, study abroad, service learning experiences, and coursework helped you achieve the GCSP goals in each five components. Cite specific examples and evidence included in your portfolio demonstrating your achievement of the GCSP goals. Discuss the connectivity across the five components addressing your Grand Challenge theme. Note any components not well achieved by your experience in the GCSP. State your overall opinion of your GCSP experience and how the GCSP could be improved.