**Daniel Felix Ritchie School
of Engineering & Computer Science**

UNIVERSITY OF DENVER

Grand Challenge Scholars Program (GCSP)

Student Information Manual

Updated: August 2021

What is the Grand Challenge Scholars Program?

The Grand Challenge Scholars Program (GCSP) was developed to inspire students from engineering schools and K-12 programs to tackle the National Academy of Engineers (NAE) Grand Challenges. These 14 challenges represent game-changing goals for improving life on the planet and are listed here:

1. Make solar energy economical
2. Develop carbon sequestration methods
3. Provide access to clean water
4. Restore and improve urban infrastructure
5. Advance health informatics
6. Engineer better medicines
7. Reverse-engineer the brain
8. Prevent nuclear terror
9. Secure cyberspace
10. Enhance virtual reality
11. Advance personalized learning
12. Engineer the tools of scientific discovery

These challenges have also been divided into thematic groups that include: Sustainability, Health, Security, and Joy of Living.

In order for students to approach these challenges in a wholistic and thoughtful way, the GCSP asks that they achieve competencies in the following five areas:

1. Talent Competency: mentored research/creative experience on a Grand Challenge-like topic

2. Multidisciplinary Competency: understanding multidisciplinary of engineering systems solutions developed through personal engagement

3. Viable Business/Entrepreneurship Competency: understanding, preferably developed through experience, of the necessity of a viable business model for solution implementation

4. Multicultural Competency: understanding different cultures, preferably through multicultural experiences, to ensure cultural acceptance of proposed engineering solutions

5. Social Consciousness Competency: understanding that engineering solutions should primarily serve people and society reflecting social consciousness

Specific information about how each competency can be completed is described in section (X).

Definitions:

To help clarify terms used in this document, here are some helpful definitions:

***Grand Challenges Scholars Program Applicant (GCSP Applicant)* –** a student in the Ritchie School who is completing an application for submission to the Ritchie School Grand Challenges Scholars Program.

***Grand Challenges Scholar Candidate (GCS Candidate)* –** a Ritchie School major who has been accepted to the GCSP and is working with a GCSP Mentor.

***Grand Challenges Scholar (GC Scholar)* -** a Ritchie School major who has completed the Grand Challenges Scholars program.

***Grand Challenges Scholars Program Mentor (GCSP Mentor)* –** a faculty member or industry partner who is advising and guiding a GCSP Candidate on a topic tailored to one of the National Academy of Engineering (NAE) Grand Challenges topics. Mentors will be responsible for periodic monitoring of the GCS Candidate's progress in the overall program. If the mentor is an industry partner, a secondary faculty mentor will also be selected to help with the academic advising.

***Grand Challenges Scholars Program Leadership Team (GCSP Leadership)* –** Selected Ritchie School faculty and staff, the Senior Associate Dean, and selected GCS Candidates who are responsible for the recruitment of GCSP Applicants, application review and acceptance of GCS Candidates, reviewing research plans, monitoring overall student progress toward completion of the program, and public relations for the Ritchie School Grand Challenges Scholars Program. The Ritchie School Dean is a non-voting advisory member.

Application Process:

Students will apply to the GCSP program once they are enrolled at the University of Denver. Information about GCSP and the application process will be presented in first-year engineering and computer science courses, specifically Engineering Connections (ENGR 1511) and First Year Computer Science courses. If a student is not able to enroll any of these courses, they should reach out to the GCSP Director for information on arranging an alternative for obtaining application information.

The program application will include:
- A list of grand challenges the student is interested in
- An initial plan for each criteria area

Core Competency Criteria, Implementation, and Assessment:

The goal of the GCSP is that each GCS Candidate will complete criteria in five competency areas. Below each area is described, along with pre-approved implementation activities and assessment for each achievement level.

Achievement Levels:

The achievement levels are defined as high, moderate, and foundational, and each level is worth 3, 2, or 1 completion points respectively. In order to complete the program a student is required to have a minimum of 10 total completion points along with completing a criteria for all five competency areas. Below are examples of what this may look like for different combinations:

> Two high-level + one moderate-level + two foundational-level completions =
> 2x3 + 1x2 + 2x1 = 10 points
>
> Three high-level+ two foundational-level completions =
> 3x3 + 2x1 = 11 points
>
> One high-level + three moderate-level + one foundational-level completions =
> 1x3 + 3x2 + 1x1 = 10 points

Talent Competency: Hands-on Project OR Research Experience

Each GCS Candidate is expected to complete a mentored hands-on project, creative project, or research experience/project. This project can be accomplished in many different ways including senior design or capstone projects, augmented in-class projects, on-campus research with faculty, research experiences at a different campus (REU), during an industry internship, or an independent study project.

Assessment of Accomplishments for Talent Competency:

a. High level of accomplishment:
   i. Engineering Design / Capstone presentation at a national conference, or
   ii. Publication and presentation of research at a professional conference.
b. Moderate level of accomplishment:
   i. Engineering Design / Capstone presentation at a university-wide forum, or
   ii. Acceptance of an abstract and paper or poster for presentation in a regional or local conference.
c. Fundamental level of accomplishment:
   i. Presentation of research with internal report and presentation of the results at a department seminar.

Multidisciplinary Competency:

The goal of the multidisciplinary competency is to help students understand engineering or computer science systems solutions developed through personal engagement. This can include interdisciplinary courses that complement disciplinary fundamentals with courses in other fields related to their chosen Grand Challenge topic and prepares students to work at the intersection of public policy, business, law, ethics, human behavior, risk, and the arts, as well as medicine and the sciences. It is not required that the multidisciplinary competency include credit-granting coursework, and other examples of completing this include participating in other learning opportunities outside of the student's course of study including workshops, free online courses, etc.

Assessment of Accomplishments for Multidisciplinary Competency:

a. High level of accomplishment:
    i. A combined GPA of 3.0 or greater within 20 QH of an approved set of thematic interdisciplinary courses used to fulfill this requirement. Must include a written reflection.
    ii. Completion of a minor outside of RSECS, not including mathematics*. Must include a written reflection.
b. Moderate level of accomplishment:
    i. A combined GPA of 3.0 or greater within 12 QH of an approved set of thematic interdisciplinary courses used to fulfill this requirement. Must include a written reflection.
    ii. Completion of a workshop or an experiential learning experience on a thematic topic related to the GCSP topics, but outside of the GCS Candidate's field of study. Must include a written reflection.
    iii. Completion of a set (at least three) of thematic free online courses outside of the GCS Candidate's field of study The courses must be pre-approved, and this must include a written reflection.
c. Fundamental level of accomplishment:
    i. A combined GPA of 3.0 or greater within 8 QH of an approved set of thematic interdisciplinary courses used to fulfill this requirement. Must include a written reflection.
    ii. Completion of a free online course outside of the GCS Candidate's field of study and related to their GCSP topic. The course must be pre-approved, and this must include a written reflection.

*Because Computer Science majors require two minors for their degree requirements, in order to use this criterion, they must relate their minor directly to their GCSP challenge area

Viable Business/Entrepreneurship Competency:

The entrepreneurship requirement prepares students to translate invention to innovation; to develop market ventures that scale to global solutions in the public interest. This should include an understanding, preferably developed through experience, of the necessity of a viable business model for solution implementation.

Assessment of Accomplishments for Entrepreneurship Competency*:

a. High level of accomplishment:
    i. Complete the Entrepreneurship minor, or
    ii. Serve in a leadership position in an entrepreneurship related club (Dynamize, DU Entrepreneurs, etc.)
    iii. Participate in founding a startup company
b. Moderate level of accomplishment:
    i. Complete 12 QH courses within the Entrepreneurship minor with a combined GPA of 3.0 or higher, or
    ii. Complete 12 QH of courses themed around entrepreneurship or business viability
    iii. Complete 3 "sprint" courses offered by the Daniel's College of Business
    iv. Participate in a startup, or
    v. Participate in an entrepreneurship themed workshop
c. Fundamental level of accomplishment:
    i. Complete 8 QH courses within the Entrepreneurship minor with a combined GPA of 3.0 or higher.
    ii. Complete 2 "sprint" courses offered by the Daniel's College of Business
    iii. Attend "Denver Startup Week" or similar event

*All options require a written reflection piece

Multicultural/Global Dimension Competency:

This requirement develops the students' global perspective necessary to address challenges that are inherently global as well as to lead innovation in a global economy. This is also includes understanding different cultures, preferably through multicultural experiences, to ensure cultural acceptance of proposed engineering solutions.

Assessment of Accomplishments for Multicultural Competency:

a. High level of accomplishment:
    i. Study or work abroad for a quarter and present a reflection of their experience related to the GC to the Ritchie School, or
    ii. Participate in a service-learning experience abroad or with a global impact, and present a reflection of their experience related to the GC to the Ritchie School

    b. Moderate level of accomplishment:
        i. Complete internship or co-op experience with an organization with a multi-national reach and write a reflection on the global impact of the experience, or
       ii. Participate in a project with one of the winning companies of the UN's Global Solutions Summit competition.

    c. Fundamental level of accomplishment:
        i. Participate in an on-campus organization with a global reach (e.g., Engineers Without Borders) and write a reflection on the global impact of the experience, or
       ii. Participate in the Engineering for People - Design Challenge and present at the regional level (at least)

Social Consciousness/Service-Learning Component:

The goal of this portion is to develop and deepen students' social consciousness and their motivation to bring their technical expertise to bear on societal problems through mentored experiential learning. It should also help students understand that engineering solutions should primarily serve people and society reflecting social consciousness

Assessment of Accomplishments for Social Consciousness Component:

    a. High level of accomplishment:
        i. Contribute a minimum of 60 hours of service to a service organization on a project related to their proposed Grand Challenges area(s), as well as writing a reflection on the service aspects of the experience or
       ii. Define, develop, and lead a service project of acceptable magnitude in collaboration with their mentor addressing aspects of their Grand Challenges topic area(s) as well as writing a reflection on the service aspects of the experience.

    b. Moderate level of accomplishment:
        i. Contribute a minimum of 30 hours of service to a service organization on a project related to their proposed Grand Challenges area(s), or
       ii. Join and participate in Engineers Without Borders or The Invictus Initiative and participate in one of the chapter's projects as well as writing a reflection on the service aspects of the experience.
      iii. Contribute a minimum of 30 hours to a project within the DU Grand Challenges program and write a reflection on the service aspects of the experience

    c. Fundamental level of accomplishment:
        i. Participate in a service organization through a project or volunteer experience with at least 30 hours contribution as well as writing a reflection on the service aspects

of the experience and their relation to social consciousness in engineering or computer science.

    ii.   Participate in a service-learning course and write a reflection on the service aspects of the experience and their relation to social consciousness in engineering or computer science

Unlisted Criteria:

If a student would like to petition for an accomplishment not currently listed above, or an adjustment to one of the accomplishments listed above, they must fill out a provided form (found in Appendix X) to be approved by both their mentor and the GCSP committee. Once a student submits a form to the GSCP committee, the committee will have 30 days to consider the petition. It is suggested that a student does not start an alternative accomplishment until approval is given.

GCS Candidate Expectations:

1. After acceptance into the GCSP Program, GCS Candidates are required to submit a set of goals for the first quarter. Quarterly reports are due to their GCSP Mentor that defines progress and accomplishments on each of their proposed program components. In addition, the intermediate goals for the following quarter need to be identified.

2. Good academic standing in the program is achieved by attaining at least a 2.7 quarter GPA once accepted to the program. The student's academic progress will be monitored by their GCSP Mentor. If a GCS Candidate falls short of the quarter GPA requirement, a remediation plan is required to define the shortcoming and how it will be addressed. Students will not be permitted to continue in the program if they have two consecutive quarters below the expected 2.7 GPA. Note, this is for the specific quarter GPA, not the cumulative GPA.

3. GCS Candidates will contribute to the program by providing peer feedback and regularly attending GCS meetings and events.

4. When preparing for graduation, the GCS Candidates will submit final deliverables in the form of a portfolio. The complete portfolio will be submitted to the GCSP Mentor. The GCSP Mentor will review documents and verify that the GCSP Candidate has met all expectations. The portfolio will then be sent on to GCSP Leadership for final verification.

5. If a student is not meeting the above expectations, they will be asked to meet one-on-one with the GCSP Director to discuss their plans and program goals. The outcome of this meeting may lead to the student being removed from the program if they are not willing to complete the above expectations.

GCS Candidate Resources:

GCS Candidate's will have access to resources for support of completing their criteria.

Scholarship Funds:

GCS Candidates will receive a scholarship from RSECS while participating in the program. In order to continue to receive this scholarship students will need to maintain a 2.7 cumulative GPA, complete all necessary financial aid paperwork, and continue to meet all of the GCS expectations outlined in section X.

Research and Project Funds:

Selected Ritchie GCS Candidates will be eligible to receive financial support for travel to present their GC research or design project, and/or financial support in materials or equipment costs related to their research or design project. These funds are not to be directed toward travel costs for study abroad or travel related to other components. Departments and mentors can supplement these funds from their sources, which can be used to supplement travel or other material expenses. Faculty mentoring Ritchie GCS Candidates will also receive, as incentive, discretionary funds that they will be able to spend to upgrade their laboratories in a way to support more effectively the research or the design carried out by the GCS Candidates working in their laboratories. The amounts will depend on the requirements of the proposed research and the level of involvement of the faculty member in the GCSP activities.

All funds must be applied for by the student and will not be distributed without approval. The application form can be found in appendix X.

APPENDIX X – Forms

Grand Challenge Scholars Program
Petition for Unlisted Accomplishment Criteria

In order to use a criterium that is not explicitly listed in the GCSP Manual you must complete and submit this form to your mentor first and then the GCSP committee. Both the mentor and committee may make comments and suggestions prior to approval. Once approved signatures are required from your mentor and at least one committee member representing the group.

Name: _____   Date: _____

What criteria category are you applying for? _____

What level are you applying for? _____

Explanation of new accomplishment:

Explanation of the level desired for the above:

Signature of Mentor: _____

Comments from Mentor:

Signature of Committee Member: _____

Comments from Committee:

Grand Challenge Scholars Program
Purchasing Form

Please return this completed form to Sabrina DeGroot in order to make your purchase. Do not purchase anything until this form has been completed and submitted for approval.

Name: _____ Date: _____

Describe what you are purchasing and how it is related to your project:

What is the cost of the purchase (*include any supporting documentation, for example a price sheet or item description)*:

How will the purchase be made? (check one and describe as necessary)

_____ Through Sabrina

_____ Through my mentor and then reimbursed through GCSP funds

_____ I will make the purchase and then submit for reimbursement through GCSP funds

_____ Other (explain below)

Signature of Mentor: _____ Date: _____

Comments from Mentor: