

## **UND Grand Challenge Scholars Program**

### **EXECUTIVE SUMMARY**

The University of North Dakota College of Engineering and Mines (CEM) is proud to be among the more than 120 US engineering colleges who have committed to establishing their own Grand Challenge Scholars Program. The GCSP at UND will offer undergraduate students the opportunity to broaden their academic and practical experience beyond the traditional engineering education. Students will build a customized portfolio of skill and aptitude developing activities, courses, projects and teamwork encompassing interdisciplinary, entrepreneurial, global, service, and research experiences related to a chosen Grand Challenge topic.

UND is well-positioned to launch and operate a successful GCSP. CEM is already the home to the Jodsaas Center for Engineering Leadership and Entrepreneurship, which is focused on providing students opportunities in business, entrepreneurship, and leadership. As many of its goals overlap with those of the GCSP, the Jodsaas Center is a natural fit for managing this program. Students will have numerous opportunities to build their portfolios by leveraging the many existing resources both at the University and within the dynamic North Dakota business and entrepreneur ecosystem. Below are a few examples of how students will be able to meet the requirements of the GCSP by taking advantage of opportunities that already exist:

- Conduct a research project through the Research Experience for Undergraduates (REU) program, the Advanced Undergraduates Research Awards (AURA) program, or through a paid position with a research center or an individual faculty researcher.
- Learn how to: a) start a business, and/or b) build and market innovative new products in an existing company through coursework and other extracurricular activities offered by the School of Entrepreneurship (SOE). Or work on real-world projects related to the Grand Challenges with startups or US market entry firms from abroad housed at UND's Center for Innovation (CFI) and/or with innovation oriented larger companies in UND's entrepreneurial business ecosphere.
- Gain a global perspective by participating in one of the numerous study abroad and international exchange programs coordinated by UND's Office of International Programs, or work on an entrepreneurial project with an international company through UND's Jodsaas Center for Engineering Leadership and Entrepreneurship.
- Participate in service learning and engineering outreach projects through the College of Engineering and Mines' Office of Student Outreach and Experience, or by joining the student chapter of Engineers Without Borders.
- Gain a broader perspective by taking advantage of the numerous opportunities on campus to learn from or work with people outside of engineering (business, public policy, law, medicine, etc.).

To ensure the success of the UND GCSP, CEM has already secured initial funding for this program from the Larson Foundation, which is based locally and supports engineering and entrepreneurship activities in the region. This funding will be used to provide stipends to students and support their projects as they work to complete the GCSP requirements.

The proposal below provides the details of the program, how it will be managed, and how students will be selected and supported as they work to meet the requirements of the program.

## **PROGRAM OVERVIEW**

UND's GCSP will be a 3-year program beginning in the student's 2nd year. We will initially target 10 – 20 students per cohort, for a total of 30 – 60 students in the program at any given time. Students will apply at the end of their first year and be selected in time to begin their GCSP activities immediately at the beginning of their 2nd year. Non-standard entry options will also be provided for more senior students or transfer students to join the program at other times. The selected GCSP students, continuing in good standing, will receive a semester-by-semester stipend as well as access to grant funds for other GCSP activities (such as research projects, internships, and international activities).

CEM will also use the GCSP as a platform for bringing together students, faculty, research centers, and industrial partners, both domestic and foreign, to work on projects focused on one or more of the Grand Challenges. As one example, under the Grand Challenge "Provide Access to Clean Water", CEM has several current faculty with expertise in this area, as well as a strong relationship with a local engineering company with a long history of projects related to water treatment and remediation. In addition, several companies from Europe are currently working in this arena in the US through the CFI. Under the auspices of the GCSP, we can engage each of these partners to work together, perhaps through sponsored research projects, capstone design projects, internship opportunities, or scholarships in both the CEM and SOE. By utilizing its network of alumni and its existing connections with various companies, the CEM and SOE have the ability to form similar partnerships around most of the 14 Grand Challenges.

## **MANAGEMENT & GOVERNANCE OF UND'S GCSP**

UND's GCSP will be operated through the Jodsaas Center for Engineering Leadership and Entrepreneurship. The Jodsaas Center was founded in 2008 and provides students opportunities to gain experience in leadership and entrepreneurship in order to develop business and management skills beyond the traditional engineering curriculum. The Jodsaas Center offers entrepreneurship courses, conducts seminars and workshops, and serves as a hub between Engineering, the School of Entrepreneurship, and the Center for Innovation.

Because the mission of the Jodsaas Center is closely aligned with many of the goals of the GCSP, the Jodsaas Center Director will also serve as the Director of the GCSP, and will work under the guidance of two committees: a) the Strategy Committee and b) the Operating Committee.

**STRATEGY COMMITTEE:** The Dean and his Strategy Committee will be responsible for the governance of the GCSP and will operate like a board of directors. The Strategy Committee will meet at least once per year, or as needed, to review the performance of the program and make adjustments as necessary. The Strategy Committee will consist of the following members:

- Dean of the College of Engineering & Mines (Dr. Hesham El-Rewini)
- Larson Foundation Representative (TBD)
- Director of the Jodsaas Center (Dr. William Paulin)
- CEM Student Success Champion (Dustin McNally)
- CEM Innovation and Entrepreneurship Champion (Dr. Brian Tande)
- Student Representative (Senior TBD)

**OPERATING COMMITTEE:** The Jodsaas Center Director and the Operating Committee will oversee the day-to-day management of the GCSP. The Operating Committee will meet at least once

per semester to manage the on-going program activities. The Operating Committee will consist of the following membership:

- Director of the Jodsaas Center (Dr. William Paulin)
- One faculty member from each of the 6 engineering departments (Civil, Chemical, Mechanical, Electrical, Petroleum, Geological).
- One or two representatives from other disciplines on campus (e.g., Entrepreneurship, Medicine, etc.)
- Two student representatives from each class / cohort (6 total).

The table below details the roles and duties of each member of the two committees.

COMMITTEE MEMBER	STRATEGY COMMITTEE	OPERATING COMMITTEE		
	Program Review & Planning	Student Advising	Recruiting and Selection	Final Review
Dean of Engineering	X			
Major Supporters (Larson Foundation)	X			
Jodsaas Center Director	X	X	X	X
Student Success Champion	X			
Innovation and Entrepreneurship Champion	X			
Dept. Faculty Reps (6)		X	X	X
External Reps (2 or more)		X	X	X
Student Reps	X		X	

The six Operating Committee members from the Engineering departments will also serve as academic advisors to the scholars. CEM requires mandatory faculty advising for all students, meaning that all students will meet with a faculty advisor each semester prior to registering for the following semester. Upon acceptance into the program, each student will be reassigned to the Operating Committee member in the department of the student’s program.

## MARKETING & RECRUITING FOR UND’S GCSP

It is our intent to develop UND’s GCSP into a highly selective, high performance program and to find ways to maximize student involvement in the management of the program. In our experience with other student-led organizations, this dramatically increases the student’s energy, involvement, and performance. We believe that these *three fundamental market positions* of the GCSP program – a) exclusivity, b) student-empowerment, and, c) the ability to work on real-world problems with real businesses- will serve to attract the best and most dedicated students.

Awareness of the GCSP will be promoted through: a) fliers, emails and the campus wide TV monitor communication system, b) various web pages hosted by the CEM, CFI and SOE as well as the University’s VP of Research and Business Development, c) GCSP student recruitment activities, and d) various events at the University and the local, vibrant business community as well. Furthermore, GCSP representatives within each department will champion the program to their students and faculty.

## SELECTION & CONTINUATION OF GCSP SCHOLARS

APPLICATION: To apply for the GCSP at the UND, students will complete a simple, 2 page (maximum) on-line application and a face-to-face interview with a GCSP Operating Committee

member by the middle of the second semester (April 1) of their first year. Questions in their application will include:

- What do you hope to gain from the program?
- Which Grand Challenge(s) interests you the most? Why?
- Are there any activities or courses have you already completed that satisfy one or more of the five GCSP components?
- Describe your initial ideas of those activities or courses you would like to apply toward fulfilling the GCSP requirements.

Late entry students (e.g., sophomore or junior standing, transfer students, etc.) or special entry students (e.g., international or exchange students and etc.) will be permitted, provided the students are able to meet and complete an approved GCSP Program Plan. All students must complete the same application process and develop an approved Program Plan.

Application process due dates for the two types of students – standard entry or late entry – are listed in the proposed Annual Calendar below. The expected response dates by the GCSP Operating Committee and other milestone dates are included in the Annual Calendar as well.

**ACCEPTANCE:** Student application responses will be limited to two pages. Interviews will take about ½ hour. The Jodsaas Center Director and Operating Committee will review the applications and will notify students of their acceptance within two months of applying.

Draft - **UND'S GCSP ANNUAL CALENDAR** - Draft

<b><u>STANDARD ENTRY (Sophomore Year)</u></b>	
Recruiting Period	January / March - Freshman year
Application Deadline (on-line & interview)	April 1 - Freshman year
Acceptance Deadline	June 1- end Freshman year
Faculty Advisor & Program Plan Approval Deadline	September 1 - Sophomore year
Continued Acceptance Semesterly Deadlines	December 1 & May 1 each year
Approval of Grand Scholar Award	April 1, second semester Senior year
<b><u>NON-STANDARD ENTRY (Other than Sophomore Year)</u></b>	
Recruiting Period	Upon acceptance & entry to UND
Application Deadline (on-line & interview)	ASAP
Acceptance Deadline	ASAP - ID Cohort
Faculty Advisor & Program Plan Approval Deadline	ASAP - Including catch-up work if necessary
Continued Acceptance Semesterly Deadlines	December 1 & May 1 each year
Approval of Grand Scholar Award	April 1, second semester Senior year

## CONTINUATION AS GCSP SCHOLARS

**PROGRAM SIZE:** We anticipate accepting about 10-15 incoming students in the first year of the program (1 – 3 per department), supplemented by 5-10 junior and senior “program launch students” for a total of 15-25 early stage, pioneer / program development participants. In subsequent years, we anticipate about 10-20 students per cohort class (sophomore, junior and senior for a total of 30-60 students in the program at any one time.

**CONTINUED PERFORMANCE:** To continue in the GCSP (including receiving the GCSP “fellowship” – see below), and earn the Grand Challenge Scholar designation with their University

graduation, students must:

- Pick the Grand Challenge area of focus for each individual student or for a student assembled team to address over the 3 program years.
- Create a GCSP Program Plan that includes the five GCSP curricular components and get it approved by the GCSP Operating Committee by the end of their first sophomore semester (December 1).
- Regularly attend the 1 credit GCSP course, given occasionally during each term. Content of this course, given by the Operating Committee will be progress and sharing reports, questions & answers and occasional speakers as well.
- Remain a student in good standing by: a) attending the GCSP 1 credit course all 3 years and b) completing their approved GCSP Program Plan in a timely manner per their approved schedule, or with approved changes.

## **HOW THE FIVE GCSP CURRICULAR COMPONENTS WILL BE MET AT UND**

**CUSTOM PORTFOLIO OF COURSES & ACTIVITIES:** Students will create a portfolio of courses and activities encompassing the *five components* as described below. The exact content, time duration or commitment for each component is not specified by UND's GCSP. Rather, students are responsible for developing their own unique portfolio of courses that satisfy the spirit and basic requirements of the GCSP, as well as justifying their Program Plan to their GCSP faculty advisor.

**THE 5 CURRICULAR COMPONENTS:** Each student, or student team will create their own unique approach to fulfilling the five curriculum components specified by the Grand Challenge program and outlined here:

- Research Experience: To satisfy the research component of the GCSP, students must complete a research experience under the direction of a faculty member on one particular element of the selected Grand Challenge. This can consist of either one summer (10 weeks) of full time (40 hrs/wk) or two semesters of part time (20 hrs/wk). At the end of this experience, the student must present his or her work through either a poster or oral presentation at the UND Scholarly Forum, CEM Design Expo, REU poster session, or other similar venue. Research opportunities include:
  - UND Research Experience for Undergraduates (REU) Program
  - Advance Undergraduate Research Awards (AURA) program
  - Other equivalent research or significant hands-on project experience conducted for credit or pay under the direction of a faculty member
- Interdisciplinary Curriculum: Through courses or other significant experiences, students must learn to work across disciplines, including business, medicine, law, public policy. Note that while this component may often be satisfied with the same courses or activities of the following three components (Entrepreneurship, International or Service Learning), to satisfy the interdisciplinary component of the GCSP, students must take:
  - Two courses outside of CEM that are related to the selected Grand Challenge, or
  - One course outside of CEM plus a significant interdisciplinary experience through an internship, independent study project, research project, service learning activity. This must be approved by the Jodsaas Center director and should consist of at least 100 hrs. of experience.
- Entrepreneurship Dimension: Students must be prepared to assess the commercial viability

of GCSP-related innovations. To satisfy the Entrepreneurship component of the GCSP, students must:

- Take ENGR410 Technology Ventures (or equivalent course) and complete a project related to their Grand Challenge as part of the course,
- AND one of the following:
  - Perform market assessment and business development research for potential business ventures as approved by the Jodsaas Center Director. Possible sources of business ideas are:
    - The students engineering research projects
    - The University's IP office
    - Local and regional businesses
    - The Center for Innovation
  - Participate in the School of Entrepreneurship's Business Plan competition or
  - Participate in the Innovate ND program offered by the North Dakota Dept. of Commerce, with a project related to the student's selected Grand Challenge
  - Participate in the Innovate North Dakota program offered by the North Dakota Dept. of Commerce, with a project related to the student's selected Grand Challenge
  - Participate in one of the business development programs offered by the Center for Innovation (CFI), with a project related to the student's selected Grand Challenge
  - Take an additional 3 cr. entrepreneurship course offered in the School of Entrepreneurship
  - Other equivalent experience as approved by the Jodsaas Center Director
- Global Experience: Students are able to satisfy the Global Experience component in a variety of ways:
  - Spend at least 1 semester studying or working abroad in a program coordinated by the UND Office of International Programs
  - Spend at least one semester working with businesses coming into the region from abroad through the Center for Innovation and North Dakota's economic development organization.
  - Work on a project with a significant international component, as approved by the Jodsaas Center Director. As a general guideline, this experience should consist of a minimum of 150 hrs of work and involve at least one trip outside of the US. Examples include:
    - Working extensively and formally with a foreign company through a project organized by the Jodsaas Center.
    - A service learning project through Engineers without Borders or other organization
    - A research project with a significant global focus
    - An internship or co-op experience with a significant global focus
- Service Learning: To satisfy the Service Learning component of the GCSP, student must participate in at least 40 hours of service related to a Grand Challenge. Examples of service activities include the following:
  - Participation in projects through Engineers Without Borders, Habitat for Humanity, etc.
  - Participation in outreach activities coordinated by the CEM Office of Student Experience, such as the FIRST Lego League, Power On, Young Scientists and

- Engineers Academy, etc.
- Tutoring and mentoring other students
- Other activities as approved by the Jodsaas Center Director

## **UND'S GCSP SCHOLARSHIP & FELLOWSHIP PROGRAM**

The Edson & Margaret Larson Foundation has provided \$100,000 in funding to support the Grand Challenge Scholars' Program. These funds, as well as other institutional funds, will be used to award stipends, fellowships and grants for program participants.

As currently envisioned, the fund will offer all program participants a \$500 per semester stipend for being in the program, for a total of \$3000 over the course of three years. In addition to the stipend, students are able to apply for funding to support their activities, including the following:

- Research grants
- Business Development grants
- Work /study abroad fellowships
- Grants to support service learning projects

Each student will be subject to a lifetime cap of \$6000 of support (not including the stipend), but will have flexibility to apply those funds in the way that best supports their individual plan. Funding requests will be made to the GCSP Operating Committee under a process to be determined. Once the pipeline of students has been filled by year three, the total funding needed for the program will range from \$100,000 to \$150,000 per year, which will be sustained by pursuing additional grants as well as through targeted fundraising activities by the college.

## **HOW GCSP SCHOLARS WILL BE TRACKED, ASSESSED & MANAGED AT UND**

ONE CREDIT GCSP "COURSE:" GCSP scholars will attend periodic meetings (2 or 3 times per term) for both: a) relevant speakers or topics and b) progress reporting. This, and the active faculty Operating Committee will be the primary method of managing the GCSP and improving its operations over time.

FACULTY ADVISOR: Once selected into the GCSP, each student will be assigned (or reassigned) a faculty advisor from among the Operating Committee members, with whom they will visit at least once per semester to review progress, up-date plans and continue fellowship approvals and etc.

OPERATING COMMITTEE: The GCSP Operating Committee will meet or work through email to: a) select new GCSP students each Spring (to join the program as a sophomore cohort each Fall) and as needed for non-standard entry students, b) review and approve the Program Plan of each student at least by the middle of their 2<sup>nd</sup> year fall term, c) review each student's progress per plan (or modifying plan) at least twice per year and d) review the Final Portfolios of each senior cohort student at least two months before graduation in order to award the GCSP certificate upon graduation.

Program Plans and Final Portfolios will be judged based on completeness, relation between the chosen coursework/activities to the chosen Grand Challenge, external impact, uniqueness/creativity, and commitment to the program and chosen Grand Challenge.

## ASSESSMENT:

- 1) Initial Program Plan Assessment: Only Program Plans satisfying all of the requirements listed below will be accepted:
  - a) Theme: A Grand Challenge has been chosen, and a theme exists centered around the chosen Grand Challenge.
  - b) Advisor: The student has obtained an appropriate faculty advisor.
  - c) Completeness: The Program Plan must be complete and clearly indicate how each of the 5 GCSP components will be met.
  - d) Commitment: The student plans to actively participate in the GCSP each semester unless an adequate explanation is provided.
  - e) Creativity: The plan has unique or creative elements.
  
- 2) Final GCSP Portfolio & Performance Assessment: A rubric will be used to help standardize the final grading and awarding of the GCSP Certificate. As a starting point, we will use this rubric prepared by the University of Utah, found in appendix A

**APPENDIX A**  
**DRAFT PORTFOLIO ASSESSMENT RUBRIC\***

	1	2	3	4	5
Completeness of the Final Portfolio (including that at least 2 GC components are satisfied by Depth)	Most of the criteria is not met	One of the GC curricular components is not completed, or minor aspects are missing from most of the GC curricular components	One or two minor aspects are missing from more than one of the GC curricular components	One or two minor aspects are missing from one of the GC curricular components	All criteria are met
Commitment: Actively participated in the GCSP each semester, or an explanation for long absences of a semester or longer are provided (if the student is simultaneously enrolled in coursework at the University during those absences)	Long, unexplained period(s) significantly longer than one semester exist during which no contributions are made to the Portfolio	An unexplained period of about one semester exists during which no contributions are made to the Portfolio	An unexplained period of duration less than one semester exists during which no contributions are made to the Portfolio	Some level of participation is documented every semester	Active throughout every semester once admitted to the GCSP
Uniqueness / Creativity	The are no unique or creative elements to the portfolio	The portfolio is not very unique or creative	The portfolio is somewhat unique or creative	The portfolio has some unique and / or creative elements	Highly unique and creative portfolio
The topic of the chosen Grand Challenge is a common theme seen throughout much of the activities / courses chosen to fulfill the GC curricular components	A theme is not present	A theme exists and is present in 2 of the 5 components	A theme exists and is present in 3 of the 5 components	A theme exists and is present in 4 of the 5 components	A theme exists and is present in each of the 5 components

Max Possible Points: 20 (Scores above 15 and higher will be considered passing.)

\*This initial draft of the rubric is based on one published by the University of Utah.