

NAE Grand Challenges Scholars Program

Operational Document

North Dakota State University



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Vision and Goals. The Grand Challenges Scholars Program (GCSP) at North Dakota State University (NDSU) is a natural fit with the mission of the College of Engineering at NDSU, which states: "The College of Engineering will be nationally recognized for producing creative and innovative graduates and research to meet the changing needs of a global society." Finding solutions to the NAE's Grand Challenges will require creative and innovative approaches from the students who have to be aware of and can react to the needs of the global society.

The goal of NDSU's GCSP is to prepare students with research, curriculum, and experience that will mold their abilities and prepare them as leaders for solving grand challenges in engineering.

Steering Committee. The NDSU GCSP Steering Committee (Leadership Team) is made up of faculty members from the College of Engineering who volunteer to be on the committee. We endeavor to have at least one representative from each of the six departments in the College (Agricultural and Biosystems Engineering, Civil and Environmental Engineering, Construction Engineering and Management, Electrical and Computer Engineering, Industrial and Manufacturing Engineering, and Mechanical Engineering).

Recruiting. The GCSP publicizes the program on the College of Engineering website with contact information of the Director and the Steering Committee members. In fall each year, the Director and the Steering Committee members visit freshman classes to promote the program. In the spring semester, ENGR 191 (Engineering Grand Challenges Seminar, 1 credit) is offered to further familiarize the interested student in the GCSP. Prospective mentors visit with students during the class and make pitches about their research and opportunities for undergraduate research to address the grand challenges.

Application and Selection. Students may apply to be enrolled in the GCSP at NDSU in spring semester during their freshman year or in fall semester of their sophomore year. The application package should contain a personal statement and a research statement in addition to other information. The research statement should be prepared in consultation with faculty mentor(s). The student should also identify the pathway for his/her graduation while fulfilling the NDSU GCSP requirements. The application package will be reviewed by a select committee, and the students will be notified of the decision. Once accepted, they start the program from their sophomore year; however, earlier entry is also allowed and encouraged.

Faculty Mentors. Faculty mentored are recruited through email requests and announcements in faculty meetings. The faculty mentor must have an active research program and should be willing to facilitate the learning process for the GCSP students. The mentor will guide the student in formulating and carrying out the research to address one or more of the engineering grand challenges. The mentor will supervise the final research thesis prepared by the student and get it evaluated by the GCSP select committee before the student graduates.

Funding/Support. Travel expenses for the GCSP Director, faculty mentors, and students to attend the annual GCSP event and other related meetings will be provided by the College of Engineering on a case-by-case basis. Course release or stipend for the GCSP Director and/or active faculty will be considered as needed by the Dean of the College of Engineering. The Dean will provide additional assistance based on need and merit for inviting experts, guest lecturers, entrepreneurs, and others to interact with the GCSP students for their benefit. Partial support may be provided to students participating in service learning and global experiences. The College will also provide grant-in aid for research supplies to the students and/or the mentors on recommendation of the Director of GCSP and/or the Steering Committee.

Unique Aspects. The College will provide grant-in aid for research supplies to the students and/or the mentors on recommendation of the Director of GCSP and/or the Steering Committee. Partnerships will be established with Engineers Without Borders, Society for Woman Engineers, and international/national/local nonprofits as well as academic and research institutions within and outside the country to facilitate student learning and meeting the GCSP requirements.

5 GCSP Components. The NDSU program has five pillars in line with NAE. The NDSU program will ensure that each GCSP participant has to the opportunity to excel in the following categories:

- (1) **Research Experience** for *creative technical competency*: The GCSP students will be involved in mentored research or creative experience in specific research areas of interest to the students as they try to address one or more of the Engineering Grand Challenges;
- (2) **Interdisciplinary Curriculum** for *multidisciplinary competency*: The GCSP will gear the students towards understanding of multidisciplinary engineering system solutions, developed through engagement;
- (3) **Entrepreneurship** for *business competency*: The GCSP students will develop a clear understanding and preferably have experience necessary to develop a viable business model for solution implementation and business competency;
- (4) **Global Experience** for *cultural competency*: The GCSP will emphasize on understanding of cultures, preferably through a multicultural/global experience, to ensure cultural acceptance of proposed solutions to the engineering grand challenges; and
- (5) **Service Learning** for *social consciousness competency*: The GCSP students will have a clear understanding that solutions should primarily serve people and society, reflecting social consciousness. Service learning will be part of the program to promote social consciousness;

Mentorship, Support, Tracking and Assessment. A GCSP students will join the mentor's research group and work on her/his research by the student's junior year or as soon as both the student and the mentor think appropriate. The GCSP students will need to identify their overall Grand Challenge subject area and milestone accomplishments that will demonstrate completion of two learning outcomes with a high level of accomplishment and two learning outcomes with at least moderate level of accomplishment. The mentor will serve as his/her GCSP advisor until her/his graduation and ideally continue to communicate with him/her after graduation. The Director of GCSP will monitor and advice all students on their progress in the program. S/he will meet with each student at least once every semester to get updates and take any necessary actions to ensure student success. Exit interviews will be conducted for the graduating students and post-graduation surveys will be administered every 3 years to track the scholars and their careers.

Recognition. NDSU GCSP students will be recognized for completing the GCSP during their graduation. Their diploma will specifically mention their GCSP completion. The Director of the GCSP will report all graduates from the program each May to the GCSP HQ Steering Committee. The students' names will be included in the NAE press release and each of them will receive a letter from the NAE President.

Other. The NDSU GCSP has an additional emphasis on leadership development. It is not required to take leadership role, but encouraged for our students. (Description: **Leadership** for *Leadership competency*: Special leadership training program will be organized at NDSU for the GCSP students. The GCSP will encourage the students to take leadership positions in project implementation and student organizations such that they can acquire the skills needed to lead a project to achieve a proposed solution.)