University of Bridgeport

Engineering and Technology Building

221 University Avenue
Bridgeport, CT 06604

Grand Challenge Scholar Program

Tarek M. Sobh, Ph.D., P.E., CMfgE,
Senior Vice President for Graduate Studies and Research
Dean of the School of Engineering

Prof. Khaled M. Elleithy, Ph.D.
Associate Vice President for Graduate Studies and Research
Associate Dean of the School of Engineering

GCSP Director Contact Information:

University of Bridgeport

Engineering and Technology Building
221 University Avenue
Bridgeport, CT 06604
+1 (203) 576 – 4703
elleithy@bridgeport.edu

Grand Challenges Scholars Program Vision and Curricular Plan for University of Bridgeport

Vision and Goals

The University of Bridgeport (UB), as quoted from its Mission, "offers career-oriented undergraduate, graduate and professional degrees and programs for people seeking personal and professional growth. The University promotes academic excellence, personal responsibility and commitment to service. Distinctive curricula in an international, culturally diverse supportive learning environment prepare graduates for life and leadership in an increasingly interconnected world."

Additionally, the Mission Statement of UB's School of Engineering strongly documents and emphasizes its own commitment to "provide comprehensive education and research opportunities to a diverse community in engineering, sciences, and the application and management of technology. The School prepares students for leadership and technology positions in industry, government, and academia and significantly contributes to the profession and community locally, nationally, and globally. The School offers a distinctive education in fundamental and emerging disciplines through its faculty and institutional partners. The education features an application-oriented approach to interdisciplinary issues and opportunities that balances theory with real world state-of-the-art practices. A stimulating environment, modern research laboratories, and distinguished programs at the bachelor's, master's, and doctoral levels ensure that our graduates possess creative, innovative, and analytical skills with a strong commitment to research and technical excellence, ethical conduct, and cultural, societal, and global well-being."

The University's and School of Engineering's Missions support and advocate the principles of the National Academy of Engineering (NAE) Grand Challenge Scholars Program.

The University maintains its primary commitments and holds fast to its values. Academic programs are offered through thirteen schools, colleges and institutes. Concern for student development and support predominate. A career-oriented focus in academic programs is complemented at the undergraduate level with a state-of-the-art core curriculum that helps students secure competencies for lifelong learning and knowledge about our world. The graduate, professional and health sciences programs offer career-oriented masters and doctoral degrees.

At the University of Bridgeport, community and global engagement is inherent in both what we do and who we are. UB prides itself on being one of America's most internationally diverse universities. As well, UB's commitment to outreach and service is deeply rooted in our mission, our history, our curriculum, and our daily lives. Together, our diverse, close-knit community of lifelong learners and educators impact the region and the world.

Explicitly, the Grand Challenge Scholar Program goals can be achieved through diverse course offerings in our professional schools including the ABET accredited School of Engineering, College of Public and International Affairs, ACBSP accredited Ernest C. Tretz School of Business, School of Arts and Sciences, and as needed schools and colleges within Health Sciences (including the Physician Assistant Institute, School of Nursing, Fones School of Dental Hygiene, College of Chiropractic, College of Naturopathic Medicine).

Students must select at least one option in each category but more involvement in each of the components is encouraged:

1) **Research Experience / Hands-on Project**
   All GCSP undergraduate students at the junior and senior level will participate in an approved team or individual one to two year-long design project within a Grand Challenge area. Other research opportunities or other investigative work such as UB faculty or industry-sponsored research projects may qualify as additional research experience and are strongly encouraged.

2) **Interdisciplinary Curriculum**
   The University of Bridgeport (UB) Core Curriculum courses and selected electives establish a comprehensive foundation in aforementioned areas and significantly contribute towards research solutions to problems identified in Grand Challenge areas. These courses are taken right from the freshman year.

   a. **Area of Ethical Issues (minimum 35 hours)**
      ENGR 100 – Intro to the Field of Engineering (Pre-engineering program)
      ENGR 111 – Intro to Engineering (Engineering majors)
      IntSt C101 – Ethical Issues in Computing (Computer Science majors)
      These courses are taken in the freshman year. ENGR 111 and IntSt C101 count towards the 'First Year Seminar' of the UB Core Curriculum. A student is required to take one of the two depending on their major/program.

   b. **Area of Global Development and Public Policy (minimum 35 hours)**
      PSCI 206 – Political Economy of N-S Relations
      PSCI 207 – World Politics
      MCOM 265 – Intercultural Communication
      Note: There is a choice of Social Science electives for GCSP scholars. These specific three courses have been identified to prepare the scholars in the areas of global development and public policy. These courses are typically taken during the sophomore/junior year and count towards the Social Science elective of the UB Core Curriculum. Students can take one/two of these courses.

   c. **Area of Entrepreneurship (minimum 35 hours)**
      BUAD 210X / MGMT 520 – Fundamentals of Entrepreneurship

MGMT 582 – Business Planning
The students can take these courses in the sophomore/junior year. One of the courses can be taken in lieu of the free elective.

d. **Area of Grand Challenge Research (optional)**
With concurrence of their department chair and GCSP committee students can take courses in the junior and senior year as a free elective. (This is optional and not required.)

3) **Entrepreneurship (engagement in both (a) formal coursework and (b) Theory into Practice are required)**
   - **a.** Build foundation with formal coursework:
     BUAD 210X / MGMT 520 – Fundamentals of Entrepreneurship
     MGMT 582 – Business Planning
     The students can take these courses in the sophomore/junior year. One of the courses can be taken in lieu of the free elective.
   - **b.** Potential 'Theory into Practice' Experience: select one – minimum 35 hour commitment (required) or more (encouraged):
     - Directed 'real-world' case study created by the student through interviews with selected entrepreneurs from local area businesses, e.g. new idea to market, scientific laboratory to viable product breakout from large company to market, etc.
     - Shadow business person/people to get perspective on 'business' aspects of running a business and 'compare and contrast' different stages of entrepreneurial ventures.
     - Participate in a Grand Challenge-related project in association with Business, Engineering, and Science or a similar activity at UB or through other student chapters of professional or other engineering societies.
     - Utilize the Student Entrepreneur Center or the CTech IncUBator for product or business startup.

4) **Global Dimension (engagement in all (a) format coursework, (b) symposium/seminars and (c) Theory into Practice are required)**
   - **a.** Build foundation with formal coursework:
     PSCI 206 – Political Economy of N-S Relations
     PSCI 207 – World Politics
     MCOM 265 – Intercultural Communication
     These courses are typically taken during the sophomore/junior year and count towards the Social Science elective of the UB Core Curriculum. One 3-credit course will be required; taking an additional course is encouraged.
   - **b.** Symposium/Seminar: Attend one (required) or more (encouraged):
     The program participants will have opportunities to attend School of Engineering Symposiums and/or International Business Breakfast series

and/or Student Entrepreneur Center presentations (sponsored by the School of Business).

c. Potential 'Theory into Practice' Experiences: select one – minimum 35 hour commitment (required) or more (encouraged)

In addition, program participants will be provided opportunities to participate in an approved international study abroad program/internship or internship/research/program experience with significant global focus. For example, UB students have partnered with the company FuelCell Energy to track, monitor, and evaluate an alternative and sustainable energy source on campus and beyond. UB students have participated in study and service learning experiences in 48 countries including those in the Middle East, North Africa, Asia, Latin America, Europe, Sub-Sahara Africa, and Greater Arabia region. Another example includes the University of Bridgeport Model United Nations team which won four awards, including the highest prize given to a participating group, at the National Model United Nations Europe Conference held in Olomouc, Czech Republic in November, 2015. Inaugural Grand Challenge cohort member, Youssef Agiez was one of the UB student delegates.
http://www.bridgeport.edu/news-archive/ub-model-united-nations-team-sweeps-conference-awards-in-the-czech-republic/

5) Service Learning

a. Identify student membership opportunities in service/professional clubs in the university in the freshman year and subsequent leadership opportunities.

b. Potential Domestic/Global Service Learning Activities: select one (required) or more (encouraged):

- Encouraged to attain leadership role in service/professional clubs by the junior year. Examples: Peer advisors, officers in student club / professional society / honor society with attendance at student leadership conference or other approved activity.
- Significant and sustained volunteer activity such as volunteering in public schools; outreach activities, etc. with approval.
- Participating in service trip, e.g. Alternative Spring Break (this may include overseas opportunities). For example, UB students have dedicated a week of service during Alternative Spring Break in Rincon, Puerto Rico, or learned about hunger and the homeless during a "Global Gateway" service weekend at Heifer Farm in Rutland, Massachusetts. UB students have participated in service learning experiences in 48 countries including those in the Middle East, North Africa, Asia, Latin America, Europe, Sub-Sahara Africa, and Greater Arabia regions. This includes participation in Engineers Without Borders, Engineering World Health and/or Engineers for a Sustainable World.

All the above activities will be documented in the student portfolio at all steps in the program. The table “Summary of the Five Grand Challenges Curricular Components” on the next page presents the above information in tabular form.

Summary of the Five Grand Challenge Curricular Components				
	CURRICULAR COMPONENTS	**PROGRAM REQUIREMENTS**		**ENCOURAGED ACTIVITIES**
1.	**Research Experience / Hands-on Project**	Design project (individual or team) related to GC area of interest *(by Senior Year)*		Participation in faculty-sponsored or industry-sponsored research activity
2.	**Interdisciplinary Curriculum**	***Potential Courses (new courses may be added in future) / Activities***	***Required Activities***	***Encouraged Activities***
	Ethical Issues	ENGR 100 – Intro to the Field of Engr ENGR 111 – Intro to Engineering IntSt C101 – Ethical Issues in Computing *(in Freshman year)*	One of these courses is a requirement.	
	Global Development & Public Policy	PSCI 206 – Political Economy of N-S Relations PSCI 207 – World Politics MCOM 265 – Intercultural Communication *(in Sophomore/Junior year)*	One 3 credit course is a requirement.	More are encouraged.
	Entrepreneurship	BUAD 210X / MGMT 520 – Fundamentals of Entrepreneurship MGMT 582 – Business Planning *(in Sophomore/Junior year)*	One 3 credit course is a requirement.	More are encouraged.
	Grand Challenge Research	With concurrence of their department chair and GCSP committee students may take courses in support of their Grand Challenge Research area. *(in Junior/Senior year)*		This is encouraged but not required (optional).

3.	**Entrepreneurship**	***Courses*** *(in Sophomore/Junior year)*	***Details Under Interdisciplinary Curriculum***	***Details Under Interdisciplinary Curriculum***
		Potential 'Theory into Practice' experiences • Develop case study on entrepreneur / entrepreneurial business. • Participate in GC- related project in association with Business, Engineering, and Science or a similar activity at UB or through other student professional or engineering society chapters. • Pursue product or business startup through the Student Entrepreneur Center or CTech IncUBator *(by Senior Year)*	One of the activities is required. These are expected to be semester-long activities.	More than one and additional activities that expect more than a semester to complete are encouraged. One such activity can be to shadow/reflections on different business leaders or ventures.
4.	**Global Dimension**	***Courses*** *(in Sophomore/Junior year)*	***Details Under Interdisciplinary Curriculum***	***Details Under Interdisciplinary Curriculum***
		Symposium/Seminars • Attend School of Engineering Symposiums • Attend International Business Breakfast series • Attend Student Entrepreneur Center presentations *(by Junior Year)*	Attending one is required.	Attending more than one is encouraged.
		'Potential Theory into Practice Activities' Study abroad / internship /research *(by Senior Year)*	One of these is required.	More are encouraged.
5.	**Service Learning**	***Potential Activities:*** • Student Club membership and leadership. • Significant and sustained volunteer activity. • Alternative Spring Break or Service trip (Domestic / Global) • Participation in Engineers Without Borders, Engineering World Health and/or Engineers for a Sustainable World. *(by Senior Year)*	Student Club membership required by Freshman year. One of the other activities required.	More than the required including attaining leadership role in these is encouraged.

** All the above activities will be documented in the student portfolio at every step.

Selection of Grand Challenges Scholars and Anticipated Involvement

All engineering students will be invited to participate in the Grand Challenges Scholars program during their freshman year with full acceptance into the program during their junior year. Each academic year will require the completion of tasks with increasing involvement in the program, culminating with a design project and/or significant research experience in a Grand Challenges area. A minimum cumulative GPA of 3.0 is required.

For full acceptance into the program, prospective students (rising juniors) will be appointed by the Program Director upon the recommendation of the Advisory Board and the student's academic advisor. The Advisory Board will review and assess required materials, the portfolio, and present/future plans. The committee will also suggest activities, projects, internships to promote internal and external activities for the Grand Challenge Scholar Program.

A summary of the four-year participation and appointment process is as follows.

Freshman year- All School of Engineering students are invited to explore possibilities of Grand Challenge Scholars Program. Students complete a brief application to inform their academic advisor and the program director of their interest. All School of Engineering freshman and transfer students are introduced to the NAE Grand Challenges and the University of Bridgeport Grand Challenges Scholars Program through introductory courses in engineering or computer science.

Sophomore year- Students apply for 'conditional' appointment to the Program with a second application and present their portfolio with evidence of their initial commitment freshman year.

Junior year- Students apply for 'full' acceptance to the Program with a proposal and academic plan for completing research and course requirements. The students will present their portfolio with evidence of commitment and work completed.

Senior year- Students meet with their faculty research advisor and Program director/committee to assess progress, past and future, to assure all requirements are met and documented. The students will present their portfolio with evidence of commitment and work completed.

After freshman year, '*conditional*' and '*full*' appointment into the Grand Challenges Scholars Program and continuation will be based on achieving and maintaining a minimum 3.0 cumulative GPA, satisfactory academic progress, selective service status, if required, and full-time status. The student will maintain a minimum 3.0 major and cumulative GPA. Additionally, the committee will review the student's materials to determine that all requirements are met, and will subsequently grant approval for continuation and /or completion of the GCS program.

The goal at UB is to have at least two GCSP students per one of our three majors (Computer Science, Computer Engineering and Electrical Engineering) per year for a total of 24 students in the program at one time. After the BS in Mechanical Engineering begins in Fall 2017, this number will increase to a maximum number of students to 32, i.e., two per major per year. There are currently exactly 200 students in the UB undergraduate programs in the School of Engineering, with 41 in pre-engineering.

Advisory Steering Committee

An Advisory Steering Committee has been established. Members represent organizations within the university, which provide the services or have the responsibility for the five Grand Challenge curricular areas. Members include the Director of the Center for Career Development (internships); within the Dean of Students Office: the Director of Campus Activities and Civic Engagement and the Civic Engagement Coordinator (clubs and outreach); the Education Abroad Resource Center and the Overseas Study Coordinator; the Director of the Student Entrepreneur Center; the Director of Undergraduate Research; faculty representatives from the various university schools, colleges and institutes that will provide supporting curriculum courses (current faculty in public policy, entrepreneurship, and global development); faculty chairs from the undergraduate engineering programs (Chairman of Electrical Engineering department, Chairman of Computer Science and Computer Engineering department, and with the establishment of the BS in mechanical engineering in the Fall 2017, the chair of the Mechanical Engineering department). The Program Director and two co-directors and faculty research mentors also serve on the Advisory Board.

Meeting the Five Grand Challenges Curricular Components

The five GC curricular components will be satisfied through careful selection of Core Course requirements and electives, in-house, academic or industrial research projects, the design project, and intramural and extramural activities. Students will document all work in a portfolio, which may be started freshman year and completed upon graduation with submission to NAE Grand Challenges Program.

Freshman year- All freshman students are invited to explore possibilities of the Grand Challenge Scholars program. At this time, students will be required to attend several events relevant to the five curricular components in Grand Challenges Program and start a portfolio with brief essays reflecting on these activities. (Such activities may include one or more of the following: attend School of Engineering symposiums, write a focused essay on engineering career (ENGR100 / ENGR 111 / IntSt C101), join a student service or professional club, and identify student leadership opportunities at UB.

Sophomore year- Sophomore students who have established a portfolio in their freshmen year or otherwise have demonstrated and documented an equivalent involvement have a ‘conditional’ appointment to the Program. During the sophomore year, some of the Core Curriculum Requirements will be selected and students are encouraged to become involved in a service activity, previously identified. At the end of the year, students should try to identify an area of interest and will be encouraged to apply for an internship in a GC area at the end of their sophomore year.

Junior year- Junior students who have participated in the program during their first two academic year, established a portfolio or otherwise have demonstrated and documented an equivalent involvement may earn a 'full' appointment to the Program. Students have demonstrated a serious and documented interest and submitted a portfolio, proposal, and academic plan for completing research and course requirements.

During the junior year, continued selection of the Core Course Requirements as well as continued involvement in a service activity striving for a leadership role, previously identified. They will maintain a portfolio with documentation of these courses and electives (engineering or non-engineering); apply for and secure a summer internship, research opportunity or travel abroad activity. During the junior year the student will begin working with a research faculty advisor and identify their design project in the GC area of interest.

Senior year- Senior students continue to have a 'full' appointment and have maintained the required GPA and portfolio. Students will continue to meet with their faculty research advisor and the Program Director and co-directors to assess progress, past and future, to confirm that requirements are met and documented for graduation.

During their senior year, the student will focus on their design project in the Grand Challenge area of interest as the culminating activity that brings together all the five curricular components. For example, their portfolio will be used to reflect on interdisciplinary components of project, and relating materials learned from the Core Curriculum Courses and other electives to their project. They will participate in an outreach activity to meet the service requirement of the Program and present to selected audience (complements UB outreach to local high schools). Submission of their portfolio provides the evidence to be fully accepted as a Grand Challenge Scholar and receive this designation from the National Academy of Engineering (NAE).

Mentorship, Support, Tracking and Assessment

Mentorship and Support: The Grand Challenges Scholars program will utilize a Program Director, who is responsible for the overall program, as well as, the student's academic progress toward completion of the five curriculum components. Two co-directors, who will be responsible for the day-to-day operation of the program, will assist the Program Director. The co-directors will confirm the student's academic progress toward completion of the five curriculum components.

Each GC scholar will have a committee composed of the Program Director (who is currently the Associate Dean of Engineering), the two co-directors, and for GCSP juniors and seniors one member of the Advisory Board and a research faculty advisor. The students' committee will review and assess the progress and competency of the student, by reviewing the portfolio and perform an academic program degree audit. The Advisory Board and faculty research advisor members will depend on the individual student's interests.

GCSP members will meet bi-weekly as a group with the co-directors to share experiences, review progress, participate in group activities (speaker presentations, group outreach), discuss common concerns, discuss research, etc.

In addition to the program director, co-directors, faculty research advisors and advisory committee support, UB graduate students (in particular Ph.D. students) will be trained to work with the Grand Challenge Program Scholars in their research areas and on research methods.

Assessment and Tracking: The Grand Challenge Scholar Program will be included as a community within UB's Canvas Learning Management System. Students will be able to create and maintain portfolios of their participation and fulfillment of program requirements.

Information regarding the NAE Grand Challenge Scholars Program and UB's Grand Challenge Scholar initiative will be shared at freshman orientation and in three undergraduate classes: a) ENGR 100 - Introduction to the Field of Engineering (for students in the pre-engineering program), b) ENGR 111 - Introduction to Engineering (a first year seminar course for engineering majors) and c) IntSt C101 – Ethical Issues in Computing (a first year seminar course for computing majors). Information will also be shared at UB student engineering society meetings (National Society of Black Engineers (NSBE), Society of Women Engineers (SWE), IEEE, and the Aerospace Club (in the process of becoming an AIAA chapter)). Current Program participants will share their experiences in a peer-to-peer manner.

We will also work with the undergraduate engineering advisors to inform students of Grand Challenge Scholar Program, to encourage students to apply and demonstrate how the Program integrates with their existing curriculum and involvement in campus-wide activities.

A UB Grand Challenge website, posters, application materials and a brochure will highlight the GCSP mission, opportunities in GC areas, examples of possible student curriculum and the intramural and extramural activities to fulfill the GCSP requirements.

Funding/Support

Presently, the financial support for UB's Grand Challenge Scholar Program will be budgeted through the Dean of Engineering's Office. Scholars will receive a stipend of $2000 total during the junior and senior year with successful accomplishment of specific objectives each semester while participating in research.

Travel expenses for the GCSP Director and potentially 1-2 faculty and 2-3 students to attend a national GCSP event each year will be provided. Additionally, the following funds will be provided: stipend for the co-directors; food costs for GCSP meetings and events; and printing expenses to market the UB Grand Challenge Scholar Program.

It should be noted that funds to enable GC Scholars to participate in entrepreneurial activities, such as attending conferences or entering competitions or to fund scholars to participate in service learning experiences may be available through UB's Student Government Association (SGA) which also provides financial support for students to attend leadership and/or technical workshops and conferences.

Students with outstanding academic records, thus with the potential to be GC scholars, are often awarded scholarships by the university. The School of Engineering faculty sponsors paid undergraduate research opportunities during the academic year as well as in the summer. The Center for Career Development and Connecticut Space Grant provides opportunities with local industries, which may also provide students with a monetary incentive or compensation to promote study in the Grand Challenge areas.

With the establishment of UB's Grand Challenge Scholar Program, the School of Engineering (and in particular co-director Dr. Jani Macari Pallis) will seek additional funding avenues. With the School of Engineering, UB's Office of Research and Sponsored Programs, the Center for Career Development, and Student Financial Services, Dr. Pallis will seek funding through additional scholarships, research grants and university - industry collaborations for Grand Challenge Scholars to pursue in the Grand Challenges areas. The university plans to pursue National Science Foundation International Research Experiences for Students (IRES) and National Science Foundation Research Experiences for Undergraduates (REU) grants.

Faculty Mentors

Mentors will be recruited from the School of Engineering full-time faculty. Program information will be sent to all regular full-time School of Engineering faculty. Faculty have already noted areas of research relevance to the 14 NAE Grand Challenges. Faculty will be trained in a workshop and will serve on the Advisory Board. They will commit to working with an undergraduate student during the student's junior and senior year. Faculty recognize that the Grand Challenge Scholar Program has "top-down" support from the Dean of Engineering and that these students have been selected based on academic excellence. Thus, a high rate of success is expected.

Recognition

In addition to the national press release and letter from the NAE president, UB graduates of the program will have a Grand Challenge Program notation on their official university transcript. Scholars will receive a letter from the Dean of Engineering and the Director of the Grand Challenge Scholar Program. They will be bestowed a special honor stole to wear with their graduation robe.