

DEARBORN

COLLEGE OF ENGINEERING & COMPUTER SCIENCE

Grand Challenges Scholars Program (GCSP) Proposal

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GCSP Vision, Mission and goals

Missions of the University and the College

The University of Michigan-Dearborn (UM-Dearborn) is an inclusive, student-focused institution that is committed to excellence in teaching, learning, research, and scholarship as well as to access, affordability, and metropolitan impact. The university offers a transformative education reflective of the University of Michigan's acclaim and rooted in an ongoing commitment to transform metropolitan Detroit. Since its inception, the university has set itself apart in higher education through intentional, meaningful engagement with local industry, government, and nonprofits. In recognition, UM-Dearborn earned the Community Engagement Classification awarded by the Carnegie Foundation for the Advancement of Teaching.

UM-Dearborn is rich in opportunities for independent and collaborative research, integrated learning, and civic engagement. The university is responsive to the changing needs of its diverse student body, the world in which they live and work, ever-advancing technologies, and a knowledge-based global economy. In service to creating positive change, the vision of UM-Dearborn is to earn national recognition as a dynamic metropolitan university where teaching and research interact, in an inclusive environment, to develop future leaders and new knowledge.

UM-Dearborn's inclusive learning environment is enriched by the diversity of its undergraduate student body. Over 40% of the undergraduate students are Pell grant eligible, about 40% are first generation in their families to attend college, and about 27% are students of color. With the university's ability to recruit students from such a diverse student body, the experience gained through the proposed GCSP will be transformative for the participants.

To fulfill UM-Dearborn's mission and vision, the College of Engineering and Computer Science (CECS) has defined its mission as "to be a leader in providing quality undergraduate and graduate programs in an environment integrated with engineering practice, research, and continuing professional education, in close partnership with the industrial community."

Mission and Vision and Goals of the UM-Dearborn GCSP

The proposed GCSP aligns well with the visions of the university and the college by complementing existing high-impact practices (experiential learning, internships and cooperative education, undergraduate research) and serving as a catalyst to extend opportunities to all students. Furthermore, the program will strengthen interdisciplinary education by integrating knowledge from the social and behavioral sciences, the humanities, and the arts into developing technical solutions to the examined grand challenge problems.

Accordingly, the vision of the UM-Dearborn GCSP is:

To offer an impactful educational experience that uniquely prepares citizen-engineers to integrate technical and non-technical knowledge to address contemporary global challenges. This will be achieved in an inclusive and experiential environment that places strong emphasis on ethics, innovation, and creativity.

To achieve its mission and vision, the specific goals of the UM-Dearborn GCSP are:

- To prepare engineering leaders who possess a broader understanding of the contemporary global grand challenges and equip them with the tools to create innovative solutions to address these challenges.
- To offer enriching pathways that enable each student to pursue a personalized curricular and co-curricular educational experience focused on one of the NAE grand challenges and provide the support structure to help them succeed in their education and beyond.
- To utilize the GCSP to bring awareness of the global grand challenges and to serve as a change agent within CECS for propagating key elements of the program throughout the curriculum and culture.

GSCP Themes

The UM-Dearborn GCSP will address all four themes. However, based on the undergraduate programs offered by UM-Dearborn and the experience of its faculty, a subset of grand challenge goals under each theme will be targeted. Specifically, students will be able to focus their work on the following grand challenges:

- **Sustainability**
 - ✓ Make solar energy economical (1)
 - ✓ Provide access to clean water (5)
- **Health**
 - ✓ Engineer better medicines (6)
 - ✓ Advance health informatics (7)
- **Security**
 - ✓ Secure cyberspace (9)
 - ✓ Restore and improve urban infrastructure (10)
- **Joy of Living**
 - ✓ Enhance virtual reality (11)
 - ✓ Advance personalized learning (13)
 - ✓ Engineer the tools of scientific discovery (14)

In addition to the 14 Grand Challenges identified by NAE, students motivated to focus on emerging challenges will have the opportunity to propose a course of study concentrated on such a topic. Students wishing to pursue this approach would need to submit a proposal to the program committee identifying:

1. The identification of on-campus subject-matter expert(s) who have agreed to serve as a program advisor and assist in the development of the proposal.
2. A definition of the proposed emerging challenge.
3. A plan for how the required 5 competencies would be satisfied, including the requirement that each competency contain an off-campus experience. The program advisor may assist the student in connecting with “non-GCSP” faculty either on-campus or at other institutions.

The program committee would work with any “non-GCSP” faculty needed to address the proposed challenge to extend the compensation model to compensate their participation.

Essential Elements of GCSP

Grand challenges scholar recruitment and selection

Annual Number of Grand Challenges Scholars Admitted to the Program: 20–30

At steady state, the targeted number of students represents about 5% on the undergraduate student enrollment in the college, which currently stand at about 2,250 students.

Scholars will Primarily be Admitted as Rising Sophomores

The first UM-Dearborn GC Scholars will Graduate in April 2022



A. Promoting the Program

- Advertising to high school and transfer students: the program would appeal to students who are already engaged and interested in making a difference on topics related to the grand challenges:
 - ✓ Include in the presentations at the campus recruiting events and Open House
 - ✓ Send out material with letters of admission
 - ✓ Display a banner for the program and have a faculty member present during the admitted student receptions
 - ✓ Present to school students during high school visits
 - ✓ Present the program during new student orientation sessions

- Advertising program to continuing students:
 - ✓ ENGR 100 (Intro to Engineering) presentation about the program
 - ✓ Informational sessions with academic advisors
 - ✓ Through the program website
 - ✓ Through college events
 - ✓ *Long-term:* By featuring the accomplishments of scholars on the program website and at events such as the CECS Experiential Learning Day

B. Joining the Program

- CECS rising sophomores who are in good academic standing can apply for the program during the spring of their freshman year. We expect to admit approximately 20 students each year from this group. The application process will include:
 - ✓ A personal statement describing the student's interests in the program overall and the specific grand challenge of interest.
 - ✓ A letter of support from a faculty advisor, who will serve as the student's mentor in the program.
 - ✓ A plan for completing the elements of the program utilizing the available pathways. The plan should outline a path for achieving the five competencies required to complete the program.
- CECS rising juniors and seniors who are in good academic standing can apply for the program during the spring of their sophomore or junior years. We expect to admit approximately 5 rising juniors and 5 rising seniors each year. A student's courses and experiences completed prior to applying the GCSP will be reviewed and accepted if they fulfill the program requirements. The application process will include:
 - ✓ A personal statement describing the student's interests in the program overall and the specific grand challenge of interest.
 - ✓ A letter of support from a faculty advisor, who will serve as the student's mentor in the program.
 - ✓ A mapping of the student's academic experience to date to the requirements of the talent competencies and the relationship to the specific grand challenge of interest.
 - ✓ A plan for meeting the remaining requirements without impacting time to degree.

C. Review Process for Applications and Admission to the Program

- The program committee, consisting of a faculty member from each department and an external member (e.g., entrepreneurship faculty member or humanities faculty member), will review applications in February/March of each academic year.
- Students will be notified of the acceptance decision by late March to allow them enough time to work with their academic advisors in mapping out their course schedules for the upcoming year, especially since registration for the fall semester begins in the middle of April of the previous academic year.

D. Maintaining good standing in the program

A student's good standing in the program is determined annually based on the following:

- Maintaining good academic standing (at least 2.0 overall GPA and 2.0 GPA in the major)
- Maintaining good standing in the GCSP
 - Engaging in at least 60% of the organized activities for the GCSP
 - Delivering the required reflections
 - Presenting their project work at the annual Experiential Learning Day organized by the college

A student who does not maintain good academic standing or good standing in the program will be placed on probation for one academic semester. Failure to return to good standing after one semester on probation will result in dismissal from the program.

Grand Challenges Scholars Program Experiences:

To fulfill the program requirements and accomplish Grand Challenge Scholar recognition, a student must fulfill the following:

1. Demonstrate achievement of each of the five competencies through curricular and co-curricular learning activities.
2. Develop a portfolio that connects and reflects on the aforementioned experiences as they related to the student's selected grand challenge.
3. Engage with the UM-Dearborn Grand Challenges Community of Scholars. To maintain good standing, a student is expected to participate in 60% of the community-organized events.
4. Complete a capstone team project related to the grand challenge.
5. Present their achievements annually at the CECS Experiential Learning Day.

Approach for satisfying the five competencies

- Leverage, enrich, and align three key existing student experiential opportunities with the GCs:
 - ✓ Project-based coursework
 - ✓ Internships and cooperative education
 - ✓ Research experiences for undergraduate students
- Partner with campus-wide activities that support and enhance the GCSP through coursework and co-curricular and off-campus experiences:
 - ✓ Near-peer student mentors with K–12 schools
 - ✓ Alternative spring break
 - ✓ Entrepreneurship class
 - ✓ Student-team business pitch competitions
 - ✓ Study abroad
- Coordinate the GCSP with the campus-wide “DiscoveryQuest” initiative—a UM-Dearborn initiative that parallels the GCSP by providing similar thematic experiences for non-engineering students.
- Partner with the Talent Gateway, a UM-Dearborn co-curricular *student-driven professional development program that uses the iterative practice of reflection to develop a habit of creative thinking*, to advance the student's ability to develop reflections on their learning activities and experiences in the GCSP.

Following is detailed description of how each of the five experiences is fulfilled in the program. A general timeline for GC Scholars is given in Appendix A.

Talent Competency:

Goal: To provide program participants with a breadth of experiences related to a Grand Challenge that stimulate inquiry, foster creativity, and teach critical thinking.

Requirements: To achieve this competency, the students will be required to complete all of the following:

- a. Introduction to Engineering course (ENGR 100)
- b. Design Innovation: Processes, Methods and Practice—studio based (ENGR 360): GC specific
- c. Capstone project for their major related to the grand challenge
- d. Faculty-guided co-op experience (ENGR 399)

- e. Develop a portfolio of the project and present the outcome of the research work at the CECS Experiential Learning Day
- f. Completing one of the following experiences:
 - i. Two semesters of faculty-mentored research (ENGR 492) and/or faculty-mentored design (ENGR 493)—GC specific
 - ii. Participate in the UM-Dearborn Summer Undergraduate Research Experience (SURE) Program
 - iii. Participate in an on- or off-campus NSF-funded Research Experience for Undergraduates (REU)

Viable Business/Entrepreneurship Competency:

Goal: To provide program participants with an appreciation and understanding of the process and challenges associated with translating ideas into feasible solutions from business, commercialization, and societal perspectives.

Requirements: Complete the following

- a. Entrepreneurial Thinking and Behavior (ENT 400) as a technical elective.
- b. Participate in one of the following
 - i. A company sponsored business plan competition
 - ii. An internship or co-op experience related to a Grand Challenge
 - iii. The NSF I-Corps Introduction to Customer Discovery workshop through the Midwest I-Corps Node in Ann Arbor

Recommended: Attend entrepreneurship-related workshops and maintain active membership in a relevant student organization.

Multicultural Competency:

Goal: To provide program participants with experiences that broaden their cultural perspectives through meaningful interactions and collaborative working environments involving people from diverse backgrounds.

Requirements: Program participants fulfill the requirements for this competency by:

- a. Completing 6 credit hours of courses in the humanities and/or social and behavioral sciences related to the grand challenge. A sample list of courses offered at UM-Dearborn related to this competency is included in Appendix B.
- b. Completing at least one off-campus multicultural, collaborative work experience (domestic or international). Examples include:
 - Community-based volunteering (e.g., Detroit Future City—a nonprofit think tank focused on advancing the quality of life for all Detroiters through a land use, sustainability, and economic development lens)
 - Study abroad: Semester-long or faculty-guided course offered by UM-Dearborn
 - International co-op or internship

Multidisciplinary Competency:

Goal: The goal of this experience is to connect knowledge from the behavioral, health, natural, and social sciences; mathematics; the arts; and business with the global grand challenge being

investigated. Students will work with their faculty mentors and academic advisors to identify the proper curricular and co-curricular path toward fulfilling this competency.

Requirements: This competency is fulfilled by completing:

- a. Two general education courses relevant to their selected Grand Challenge.
- b. A multidisciplinary course team project; either a
 - i. Capstone team design project (two semesters long) addressing a Grand Challenge-related problem. The team must include non-engineering students. The project should integrate knowledge gained through the general education coursework into the development of design solutions for a global challenge by taking into consideration public health, safety, and welfare as well as global, cultural, social, environmental, and economic factors.
 - ii. Course offered through the UM-Dearborn IDEA Lab (Innovation, Design, Entrepreneurship and Artistry, <https://umdearborn.edu/academics/idea-lab>), which requires students from three different UM-Dearborn colleges to work on a project to tackle a complex problem in collaboration with a client from the Metro Detroit community.
- c. Co-op or internship related to the Grand Challenge.
- d. Reflection on the multidisciplinary experience in the portfolio and addressing relevant multidisciplinary components in the presentation at Experiential Learning Day.

Social Consciousness Competency:

Goal: The goal of this experience is to provide students with relevant and meaningful service to targeted organizations and the community that leads to a deeper understanding of the service-learning course content. This not only benefits the community, but also benefits the students by fostering critical thinking about citizenship, democracy, and civic life, all of which strengthens disciplinary understanding in the public context.

Requirements: This competency is fulfilled by:

- a. Completing a service-learning course. The course may be completed as part of the general education requirements, as a course in the student's major, or as an elective course as allowed by the program of study.
- b. Writing a reflection on how the experience contributed to enhancing the student's appreciation for the community they served in the project.
- c. Participating in at least one of the following community service programs
 - i. Alternative spring break
 - ii. Near-peer student mentors with K–12 schools
 - iii. Habitat for Humanity
 - iv. GRID Alternatives
 - v. Other service through local community organizations that are relevant to the grand challenge

Tables 1, 2, map the curricular and co-curricular requirements to the competencies and Table 3 shows the credit hours required to meet the program requirements.

Table 1: Mapping of Existing Courses to Required Competencies

| Course | Talent Competency | Viable Business/ Entrepreneurship Competency | Multicultural Competency | Multidisciplinary Competency | Social Consciousness Competency |
|---------------------------------|-------------------|--|--------------------------|------------------------------|---------------------------------|
| Gen. Education | | | ✓ | ✓ | ✓ |
| ENGR 100 | ✓ | | | | |
| ENGR 360 | ✓ | | | | |
| ENGR 399 | ✓ | ✓ | | | |
| ENGR 492 | ✓ | | | | |
| ENGR 493 | ✓ | | | | |
| ENT 400 | | ✓ | | | |
| Senior Design | ✓ | | | ✓ | ✓ |
| Service learning course | | | | | ✓ |
| Multidisciplinary design course | | | | ✓ | |

Table 2: Mapping of Existing Non-Course Experiences to Required Competencies

| Co-curricular | Talent Competency | Viable Business/ Entrepreneurship Competency | Multicultural Competency | Multidisciplinary Competency | Social Consciousness Competency |
|---------------------------|-------------------|--|--------------------------|------------------------------|---------------------------------|
| SURE program or NSF REU | ✓ | | | ✓ | |
| Business pitch or I-CORPS | | ✓ | | | |
| Co-op/ internship | ✓ | ✓ | | ✓ | |
| Community service | | | ✓ | | ✓ |
| Study abroad | | | ✓ | | |

Table 3: Summary of Courses Required to Complete the Program

| Course or topic area | Credit Hours |
|---|--------------|
| General education courses: Humanities, Arts, and Social & Behavioral Sci. <i>GE</i> | 12 |
| Introduction to Engineering (ENGR 100). <i>R</i> | 2 |
| Introduction to Entrepreneurship (ENT 400). <i>E</i> . | 3 |
| Sophomore Project: ENGR 492 and/or 493. <i>TE</i> . | 2 |
| Junior Project: Design Innovation: Proc., Meth. & Practice (ENGR 360). <i>E or TE</i> | 4 |
| Faculty-supervised Professional Experience (ENGR 399). <i>TE</i> | 1 |
| Senior Project: Capstone project for degree (2 semesters). <i>R</i> | 4 |
| Service-based Learning class (double counted as one of above-listed courses) | |
| Total Credit Hours | 28 |

- E:* Upper level Elective or General Elective in the program
- GE:* General Education courses. Fulfill program requirements.
- R:* Required by program
- TE:* Used to fulfill Technical Elective in the program

Thematic Continuity and Connectivity:

- Students will be exposed to the GC during the freshman year and will select a focus for their experiences upon joining the program.
- Alignment in GC activities: All GC-specific project-based coursework and activities will be related to the student's focus area, building upon one another and leading to a comprehensive understanding of the GC and the selection of the topic for their senior capstone project.
 - ✓ Sophomore project course—GCSP specific
 - ✓ Introduction to Entrepreneurship (ENT 400)-related project—Business model for GC, economics of the challenge
 - ✓ Junior course project—GCSP specific
 - ✓ Senior capstone project course—Specific, comprehensive solution to an aspect of the GC, including a potential commercialization plan

Programmatic and Individual student Assessment:

The GCSP will be comprehensively assessed in terms of individual students, faculty mentors, and the overall effectiveness and efficiency of the program. Understanding the challenge and burden of reporting on a large cohort of students, the administrative effort required by both faculty and academic advisors will be minimized through the use of electronic forms that streamline the process by limiting the required open-ended responses. This will facilitate the tracking of student progress and the aggregation of the data of all students in the program. Visualization of the program data will be available through Tableau dashboards based upon the data collected, including student satisfaction surveys.

Programmatic Assessment:

- Periodic review of the program goals (first review after two years, then every five years thereafter)
- Annual review of achievement of desired learning outcomes

Individual Student Assessment:

- Assessment of student portfolio annually and upon program completion
- Individual course and project assessment
- Assessment of co-curricular work (e.g., co-op employer evaluation, competition team advisor evaluation, etc.)

A. STUDENTS:

- Students will be assessed by their faculty advisor/mentor, who submits an annual report to the program committee.
- Students must maintain good academic standing (overall GPA ≥ 2.0 and major GPA ≥ 2.0) and make satisfactory progress toward fulfilling the program requirements identified in their curricular plan.
- Students must complete all of the requirements of the program one month prior to graduation, with the exception of the capstone project, which can be completed by the end of their last semester in their undergraduate academic program.
- Students will develop annual reflections on their experience and complete an anonymous survey on their experience in the program.

B. FACULTY ADVISORS/MENTORS:

- Faculty advisors complete an assessment on each of their students.
- Faculty advisors provide their own assessment of the program.

C. PROGRAM DIRECTOR:

- Compiles the student and faculty surveys and reports the findings to the program committee.
- Solicits input from the academic advisors on curricular challenges.
- Works with the program committee to make necessary changes to the program to improve the program effectiveness, improve the student experience, and improve the faculty member experience.
- Presents the findings to the dean and to the Administrative Council of the college.
- Obtains governing faculty approval of any program changes that need to be implemented.
- Recommends scholars who have completed the program to the NAE.

Institutional GCSP Governance and Sustainability:

DIRECTOR: *The associate dean for undergraduate education will serve as the founding director. As the program grows, a faculty director will be appointed.*

PROGRAM COMMITTEE: *Composed of faculty representing the Grand Challenges targeted by UM-Dearborn, a GCSP student (initially from the CECS Experiential Honors Program), and the CECS assistant dean for corporate relations and research development.*

• **Program Committee**

- ✓ Directing the GCSP will be incorporated into the job description of the associate dean for undergraduate education. When the program grows, this would evolve into a separate director position with a faculty appointment.
- ✓ Representation from each of the themes (and challenges), along with an experiential honors student (eventually GCSP student).
- ✓ Members will serve staggered 2-year terms on the program committee, with the option of a second term.
- ✓ Succession will be from the current member to the alternate, with new alternates within a theme identified at the time of transition.
- ✓ Decisions will be made by consensus or simple majority (when necessary).
- ✓ Minutes for meetings will be kept and published on the GCSP website.
- ✓ Program committee will meet monthly during the AY and as needed during the summer months.
- ✓ Performing assessment of students, mentors, and program.

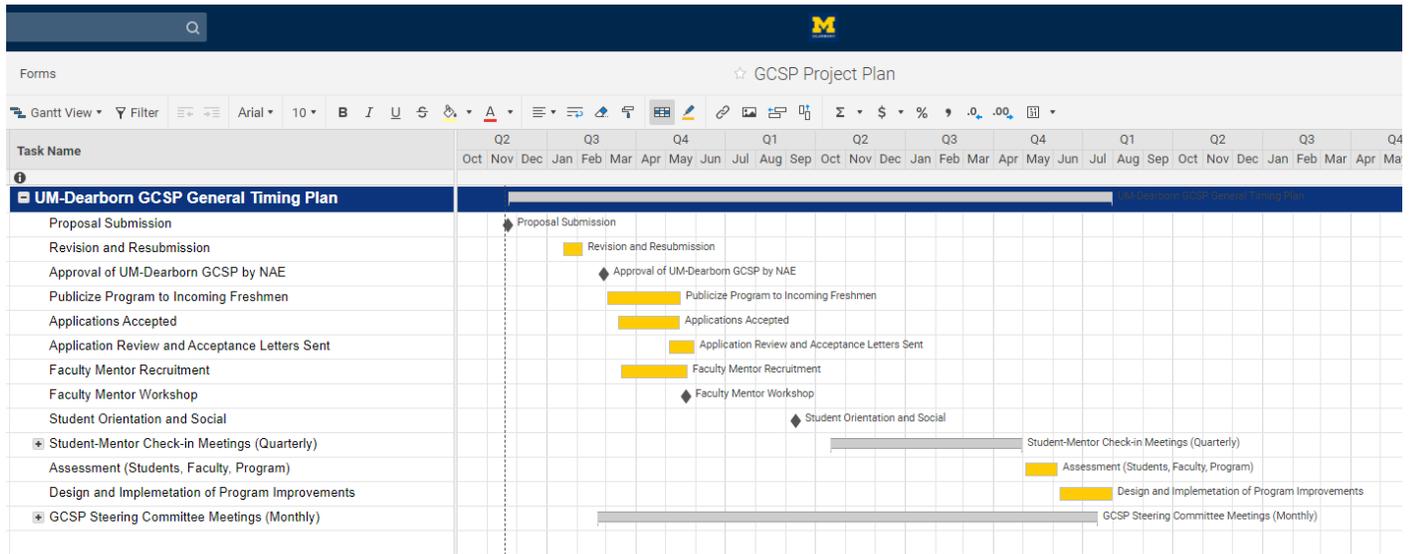
• **Faculty Mentors for GCSP**

Any faculty member in the College of Engineering and Computer Science with subject-matter expertise in the student's selected grand challenge can serve as a mentor for the student. The following criteria will be used in selecting the faculty mentors:

First Year Project Plan:

The general timing for first year activities of the UM-Dearborn GCSP is shown in Table 4 below:

Table 4: UM-Dearborn GCSP Program Plan



Mentorship for GCSP Faculty and Students:

Mentorship of GCSP Faculty

- Mentorship of GCSP faculty will be coordinated between the college and the UM-Dearborn Hub for Teaching and Learning Resources.
- Annually organized workshops will be offered to new faculty members interested in mentoring grand challenge scholars. The training will be focused on topics such as effective mentoring, service learning, and other relevant topics to be identified after the program is launched.
- The Hub for Teaching and Learning Resources will also organize a community of practice for the mentors to share their experiences.
- The college (HP-CEEP) will cover the cost of travel for up to two faculty members per year to participate in the NAE GCSP annual meeting.

Mentorship of Students

- Each student will have a faculty mentor to guide them in developing their pathway for fulfilling the program requirements.
- One of the academic advisors in CECS will be assigned responsibility for advising the students in the GCSP.
- New students admitted to the program will be required to attend an orientation. The orientation will be offered by the faculty and staff for the first year after launching the program but will include students and scholars in subsequent years of the program.

- Through the UM-Dearborn Talent Gateway, scholars will be mentored on how to develop, track, and document meaningful reflections on their experiences. They will also be offered guidance on developing their e-portfolios and their on-line digital presence.
- Through the community of scholars, students will have opportunities to network with each other as well as with faculty, staff, college, and campus leaders; alumni; entrepreneurs; community leaders; and other professionals.
- The college (HP-CEEP) will provide annual support for three to four scholars to participate in the NAE GCSP Annual meeting.

Student Recognition:

GC students who complete all elements of the program receive the following recognitions:

- Be recommended to the NAE upon graduation
- Be recommended to the associate dean for undergraduate education so that their achievements are acknowledged in the commencement program and special designation is included on their transcripts.
- Wear specially designed stoles at graduation

Unique Aspects:

The following are some unique aspects of UM-Dearborn's proposed implementation of the GCSP:

- **Required External Component:** In order to be satisfied, all competencies require an external component that enhances the students' experience.
- **Diverse Community of Scholars:** UM-Dearborn will be enriched by the diversity in the UM-Dearborn student body in terms of socioeconomics, first generation in college, race, and ethnicity. This will allow for recruiting and graduating a diverse community of scholars.
- **Connection to UM-Dearborn's DiscoveryQuest program:** The capstone project required in this campus-wide program will be administered by CECS. This will allow students in the GCSP to take a holistic engineering approach by integrating technical and non-technical (economic, societal, health, etc.) aspects into the development of their Grand Challenge design solutions.
- **Integration with the UM-Dearborn Talent Gateway:** The program will benefit from existing campus resources such as the Talent Gateway, which offers a wealth of resources for developing and tracking extracurricular participation through the completion of challenges that focus on specific experiences and meaningful reflections.

APPENDIX A

GENERAL TIMELINE FOR GRAND CHALLENGES SCHOLARS

FRESHMAN YEAR: RECRUITMENT AND ADMISSION

- The program will be introduced to students in the introduction to engineering (ENGR 100) course. Students will be assigned course projects related to the NAE grand challenges.
- Students identify a faculty advisor. The student and the advisor meet to plan the student's path through the program to include with the application package.
- Students apply to the program. Admission notification is sent by mid-March and the academic plan is finalized.
- Admitted students meet with their academic advisors to plan their course selection based on the approved plan.

SOPHOMORE YEAR: STARTING THE PROGRAM

- Students enroll in general education classes that introduce social consciousness relevant to the student's grand challenge.
- Students complete their first project. The project will be designed to integrate knowledge gained in the foundational courses completed in the first two years with the selected grand challenge.
- Students present their projects at the Experiential Learning Day held in April.
- Students work with their faculty advisors and their academic advisors to plan their courses for their junior year.
- Students spend the summer working on a grand challenge related co-op experience or participate in the Summer Undergraduate Research Experience (SURE) program

JUNIOR YEAR: GLOBAL AND BUSINESS EDUCATION

- Students gain a global/cultural perspective by completing one or more of the following:
 - Complete a semester-long study abroad program
 - Complete a faculty-guided international course
 - Pursue an international summer co-op
 - Work with UM-Dearborn's Office of Metropolitan Impact to participate in local community-based service-learning or research projects
 - Work on a national community service-learning project
 - Serve as "near-peer" mentors for STEM students in local K-12 schools
- Students are introduced to business/entrepreneurship topics. This can be achieved by completing one of the following:
 - ENT 400: Entrepreneurial Thinking and Behavior course
 - Participate in the student team pitch competition organized by the college of business
 - Participate in corporate idea pitch competition organized by local corporations
- Students work on their junior-year grand challenge-related project.
- Students present their project at Experiential Learning Day.
- Students spend the summer working on a grand challenge-related co-op experience or participate in the Summer Undergraduate Research Experience (SURE) program.

SENIOR YEAR: PROGRAM COMPLETION AND CAPSTONE EXPERIENCE

- Students apply for graduation and for completion of the GCSP.
- Students begin their two-semester grand-challenge capstone experience, in which they integrate technical and non-technical knowledge gained in the program to address the problem.
- Students present their capstone projects and participate in the Senior Design Competition.

APPENDIX B
RELEVANT COURSES OFFERED AT UM-DEARBORN

| Humanities and the arts | | Prerequisite(s) |
|---|---|------------------|
| ARTH 241 | Encountering the Renaissance: Art, Global Explor. & Social Reform | |
| HUM 201 | Religions of the World | |
| | | |
| Social and Behavioral Analysis | | |
| ANTH 202 | World Cultures | ANTH 101 |
| ANTH 320 | Culture and International Business | ANTH 101 |
| POL 325 | Environmental Politics | POL 101 |
| OB 354 | Organizational Behavior | |
| POL 487 | Comparative Environmental Policy | |
| PSYC 363 | Cognitive Psychology | PSYC 101 |
| SOC 200 | Understanding Society | |
| SOC 201 | Contemporary Social Problems | |
| SOC 382 | Social Psychology | SOC 200 |
| SOC 403 | Minority Groups | SOC 200 |
| SPEE 310 | Interpersonal Communication | SPEE 101 |
| | | |
| Intersections | | |
| ECON 442 | Economic Development | ECON 201/2 |
| ENGR 360 | Design Innovation: Processes, Methods and Practice | |
| ENGR 400 | Applied Business Techniques for Engineers & Computer Scientists | |
| ENT 400 | Entrepreneurial Thinking and Behavior | |
| IMSE 421 | Engineering Economy and Decision Analysis | |
| GLOC 301 | Introduction to Global Cultures | |
| OB 404 | International Organizational Behavior | OB 354 |
| POL 325 | Environmental Politics | POL 101 |
| | | |
| Other relevant UM-Dearborn Courses | | |
| BA 320 | Project management and leadership skills | |
| ECON 351 | Environmental Economics | ECON 202 |
| ECON 447 | International Finance | |
| ECON 448 | International Trade | |
| GEOL 320 | Global Climate Change | GEOG 203 |
| LIBS 275 | GIEU: Global Intercultural Exp | |
| MKT 382 | Understanding Customers | MKT 352 |
| MKT 457 | Global Consumer Cultures and Marketing | Several Pre-reqs |