

# *A Grand Challenge Scholars Program at Olin College*

## *Program Summary*

### *Program Goals*

1. Olin's GCSP will support and build upon the existing strengths, culture, and core competencies of the Olin experience by allowing students to engage in their academic experiences through a set of the NAE's Grand Challenges.
2. Olin's GCSP will support the institutional efforts of improving engineering education by serving as a test bed for non-traditional academic student engagement and by sharing the learning experiences with other similar programs in schools across the nation.
3. Olin's GCSP will create a community of learners by engaging alumni, industrial, governmental, and academic institutions to join Olin's efforts in addressing the NAE's Grand Challenges.
4. Olin's GCSP will educate leaders capable of affecting change through means varying from entrepreneurial action to service contributions, in an effort to bridge global perspectives on issues of importance.
5. Olin's GCSP will educate citizens of the world with global perspective and an ability to integrate their individual contributions with those of others to address the large, complex problems that the Grand Challenges entail.

### *Administrative Structure*

The GCSP at Olin College will be overseen by a Program Board acting on behalf of various Challenge Groups that form the heart of the GCSP community.

**The Challenge Groups** are self-formed communities of practice consisting of Olin community members with a shared interest. Chaired by a current student, Challenge Groups are organic nucleation points where individuals working on related projects converge to share ideas, resources, and mentorship. These groups are the heart of Olin's GCSP, serving as microcosms of the type of community of learners and doers we hope to engender.

**The Program Board**, comprised of students, staff, faculty, and alumni, is responsible for administering the Olin GCSP including admitting, monitoring, and approving participant work towards the distinction of Grand Challenge Scholar. The Board also maintains the program's documentation and serves as a point of contact for other GCSP schools. The Board is responsible for the implementation of Olin's GCSP and oversees the creation and dissolution of Challenge Groups.

### *Becoming a Grand Challenge Scholar*

**Eligibility:** There are neither admissions nor acceptance criteria for an Olin student to participate in the program. It is not a privilege obtained only by a select group; rather, it is a symbol of an Olin community member's decision to emphasize the skills determined by the National Academy of Engineering and the fourteen Grand Challenges' solutions to be driver of his/her academic and personal development.

True to the spirit of lifelong learning and the importance of creating an active community of learners, we anticipate that the definition of who becomes a Grand Challenge Scholar will expand to include Olin faculty, staff, alumni, trustees, and other members of the Olin community.

**Timeline:** Aside from fulfilling the requirements before graduation for those wishing to become Scholars, there is no mandatory timeline for participation in the program. However, it is strongly recommended that a plan of study towards their goal of becoming a Grand Challenge Scholar be created by fourth semester of matriculation at Olin. We also recommend students become matched to a Challenge Group by this time. The purpose of the plan of study is for the Program Board to initiate discussion with the applying scholar about the requirements of the program, an appropriate and feasible timeline, and preliminary ideas for how to complete the open-ended requirements. This gives interested students time to gauge their interest in the program while also providing them with enough time for plan of study iterations, especially in the context of the three different program areas: curriculum, community and portfolio.

**Program Requirements:** To accomplish a Grand Challenge Scholar standing, an Olin student must demonstrate achievement in each of the following:

1. Concentrated effort and dedication in each of the following ***five curricular components***:
  - a. Grand Challenge Project
  - b. Interdisciplinary Experience
  - c. Entrepreneurial Experience
  - d. Global Awareness
  - e. Service Learning
2. Creation of individual Grand Challenge ***Scholar Portfolio***
3. Active, contributing member of ***Grand Challenge Program Community*** at Olin

The details of these requirements and the community-driven evaluation process are spelled out on the following pages.

## ***Detailed Program Requirements***

### ***A. Curricular Components:***

Community building and outreach will occur through large events (i.e. Grand Challenge Summit) and Expo, where students will be able to present the work they performed towards a requirement of the Grand Challenge Scholars Program. Outside guests and non-Grand Challenge students will all be invited to offer feedback on student work and learn more about the Program.

#### ***1 Grand Challenge Project***

***Goal:*** The requirement of a specific Grand Challenge Area Project ensures that depth of understanding and exposure to at least one Grand Challenge Area is attained by each scholar. There are 14 individual challenges and 4 different challenge areas in which students can complete projects, as shown in Appendix 1.

***Requirements:*** Since working to solve the NAE Grand Challenges is the fundamental motivation for the Grand Challenge Scholars Program, each Program Participant must contribute to a substantial team or independent project relating to a Grand Challenge Area or specific Grand Challenge. A substantial project experience must:

- Represent at least one semester of sustained effort and dedication during which the Program Participant makes significant contributions to the project outcomes
- Clearly relate to one of the Grand Challenges or to a Grand Challenge Area.

***Examples:*** In the past students have worked on research through Olin College's sustainable design lab for topics such as: a stand-alone Photovoltaic system to power a greenhouse, coffee production life cycle analysis research, as well as microbial fuel cell research. Other students have worked on projects including an automated tuberculosis tester for the developing world, enabling a hydrogen economy with photosynthetic bacteria, in-home energy audits, and environmental social psychology.

#### ***2 Interdisciplinary Experience***

***Goal:*** Bridging engineering to other disciplines is essential for solving the NAE Grand Challenges. Olin experiences are designed to build connections amongst fundamental science, mathematics, and engineering; amongst different fields of engineering; amongst the arts, humanities and social sciences and technical disciplines; and amongst design, entrepreneurship, and technology. The interdisciplinary portion of this Program requires going beyond coursework to explicit reflection on the value of interdisciplinary thinking in the work of a Grand Challenge Scholar. A detailed definition of an "interdisciplinary experience" is left intentionally undefined in this document to allow the Program Participants to interpret this term and describe relevant experiences based on their personal and professional goals and aspirations.

***Requirements:*** To fulfill the interdisciplinary experience requirement, the Program Participant must:

- Identify additional interdisciplinary coursework or paracurricular experiences appropriate to the Participant's Program of study. The specific experiences may include students' Grand Challenge Project, summer work, research, a course, or any other project or experience.
- Reflect upon these interdisciplinary experiences; emphasize the process that the Participants went through to complete their goals. What questions did they ask? Where did they learn to ask those questions? What things did they do to answer them?
- Reflect on how the GCSP as a part of the Participants' overall Olin experience allowed and encouraged them to weave in an interdisciplinary aspect in their personal holistic growth as an engineer and a citizen of the world.
- Create a written personal reflection, to be included in the portfolio that encapsulates the questions above. Also be sure to define "interdisciplinarity" and discuss how it ties into the Grand Challenges.

**Examples:** The Olin Introductory Experience (OIE) is designed to take advantage of the synergies that exist among mathematics, science, and engineering topics, including coordinated opportunities for students to apply fundamental mathematics and science to real engineering problems that further elucidate important linkages among disciplinary topics. For example, Design Nature is one of these OIE courses, where nature is treated as an important source of inspiration and understanding through which students develop bioinspired ideas into functional prototypes. Students complete individual and team projects in a studio environment where they seek to develop a shared practice and understanding of engineering design. Students also gain experience in visualization, experimentation, estimation, fabrication, and presentation as they relate to designing. Finally, students are asked to make considerations for the end user of the prototypes, as fourth grade students are present for the final review and demonstration of the team projects.

In addition to the OIE, Olin builds multidisciplinary connections through tightly coupled, faculty team-taught courses such as the Paul Revere: Tough as Nails course block that links history of technology with materials science. The Paul Revere: Tough as Nails course features a series of readings, lectures, and discussions on the relationship between materials, science, society, and the environment in three historical periods. The course emphasizes the development of three skills that are vital to these studies: contextual thinking, communication (both written and oral), and historical research methods pertaining to source evaluation and narrative construction.

Many other courses feature teaching or visits from faculty members who share different perspectives and thereby help students understand the broader context and implications of their work. Finally, through the curricular and social connections available to Program Participants through Babson College, Wellesley College, and Brandeis University as well as through various community service activities it is expected that many other opportunities for interdisciplinary engagement involving specifically non-engineering students will become a part of Program Participants' experience.

### **3 Entrepreneurial Experience**

**Goal:** The combination of entrepreneurship and innovation is central to promoting growth and technological development in our society. Whereas innovation relates to the creation of new products and technologies entrepreneurship enables the introduction of these solutions into the world for the benefit of many people. The purpose of the entrepreneurial component of the Grand Challenge Scholars Program is to engage students in the process of translating invention and innovation into practical

solutions that make a difference in people's lives. A Grand Challenge Scholar needs to demonstrate his/her entrepreneurial capabilities.

**Requirements:** In addition to completing the Foundations-in Business and Entrepreneurship course, each Program Participant must display a basic level of achievement by doing one or more of the following:

- Create a venture (for-profit or non-profit) which may be a service organization or club. The student must demonstrate commitment to this venture for at least 4-6 months.
- Work at a startup or early stage venture that addresses a Grand Challenge Area.
- Participate in startup competitions and/or entrepreneurship events outside of Olin College.
- Successfully complete an Entrepreneurship Capstone individual project that displays substantial thought and involvement in one of the Grand Challenge Areas.
- Pursue any other project that displays a substantial level of commitment and initiative on the part of the student to investigate and understand entrepreneurship.

**Examples:** Examples of past Olin entrepreneurial initiatives that would satisfy this requirement include the following: Working for a startup called RawSolar that developed a solar concentrator for thermal applications; Investigating the dissemination/marketability of system prototype for handling plastic waste in Ghana and other countries; Developing on an Entrepreneurship Capstone project about 'micro franchising' that involved interviewing founders and upper-level management of existing international micro franchises and writing a report on this study. An example of a non-business form of entrepreneurship can be seen in the case of one student who founded and has sustained BASIC (Brothers and Sisters in Christ) in the Boston area. BASIC is an organization that connects people with similar religious interests living in the same geographic location, and exemplifies a non-profit entrepreneurial activity.

#### **4 Global Awareness**

**Goal:** Solving the Grand Challenges will require co-operation and collaboration on a global scale. Ultimately, any solution to the Grand Challenges will require a global solution implementation, which will need to work effectively in an interdependent world. The problem solvers that will address the Grand Challenges will be able to identify cultural and economic issues to work on global teams to generate products and programs that are feasible for people living in different regions of the world.

**Requirements:** To demonstrate this global awareness component of the program, each Program Participant should have participated in or completed one of the following:

- Study abroad experience.
- Work or intern abroad.
- Work on a distributed design project.
- Participate in an internationally minded program located domestically.
- Actively participate on addressing an issue of global significance.

**Examples:** Olin students often study abroad, which, with an additional reflection (see interdisciplinary experience), would serve as an education in global awareness. Similarly, work abroad, during a leave of

absence or over a summer would also qualify the scholar with this additional reflection. Additionally, classes like Distributed Engineering Design which has students working in globally distributed teams to solve design problems, or attending domestic programs like the IDDS summit would be great ways of gaining global experience as a student that fulfill this requirement.

## **5 Service Learning**

**Goal:** Empathizing with the people and organizations that are most strongly affected by the Grand Challenges now and in the future is a critical first step towards solving them. In addition, a sense of caring and compassion for all people of all classes and abilities is important attribute of someone who will be designing solutions that affect many different types of people. The service learning requirement of the Olin Grand Challenge Scholar Program focuses on giving to and learning from other people and organization in need.

**Requirements:** In order to complete the Grand Challenge Scholars Program's service learning component, each Program Participant should demonstrate significant effort in some if not all of these areas:

- A substantial long-term commitment to a service organization.
- A leadership role in a service oriented activity.
- Dedication of service time with an organization related to a Grand Challenge area with the goal of helping others by applying his/her knowledge and understanding to a problem.

**Examples:** Some examples of participation in a full time service project/organization that Olin students have completed in the past include teaching with City Year for a semester and a summer spent volunteering abroad with a non-profit. Examples of leading a long term initiative on campus include holding a leadership position on the SERV board (Olin community service organization), or coordination of projects done through another program such as Engineering Discovery.

## **B. The Grand Challenge Scholars Portfolio**

To induce lateral thinking, Program Participants are encouraged to connect their work into a cohesive Grand Challenge Portfolio. This portfolio must contain a representation of the work that the Program Participant has done for each Curricular Component and may contain any other work related to the Grand Challenges that the Program Participant feels should be included. Additionally, the Program Participants need to demonstrate the interconnectedness of the work that they have done and an understanding of how that work fits together into their broader education. The interconnectedness and understanding will be established in the final reflection component of the Grand Challenge Portfolio.

Additionally, the Grand Challenge Portfolio must contain a final component that demonstrates the student's role as an Active Program Participant. This may be a video, letter of recommendation or a reflection on how the Participants have helped the community function and grow.

This portfolio currently has no specified form, though we do hope for public visibility and electronic accessibility for all present and past Grand Challenge Scholars. The Program Board will update this process over time as needed.

## **C. Active Program Participants**

The social components of Olin's Grand Challenge Scholars Program – Challenge Groups, the community of mentorship, and outreach to other participating Grand Challenge Scholars schools– are critical to the

life of the program. Students who wish to become scholars must be active participants in Olin's community of students and mentors working to understand and address the Grand Challenges. As outlined above, there is not a formal admission process to begin participating, nor are there ongoing membership requirements that must be met to remain a participant in the program. However, in order to graduate as a Grand Challenge Scholar, the program expects students to be active participants and leaders in the Grand Challenge Scholars community. Rather than a checklist of community tasks, program participants will use one component of their portfolio to show how they had a continuous role in leading and learning as part of the community of students and mentors.

#### Examples of active student participation and leadership:

- Take a leadership role in a Challenge Group at Olin
- Form a project team of students and mentors
- Help the program grow by inspiring younger Olin students to join a Challenge Group
- Grow the mentorship network by inviting an alumni or outside expert to help with a project
- Facilitate communication between students of multiple Grand Challenge Scholar schools
- Help organize the community presentation events (Olin College EXPO, Grand Challenge Summits)