

Grand Challenges Scholars Program Lafayette College

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Purpose: The National Academy of Engineering (NAE) has set forth a list of fourteen "Grand Challenges" that must be addressed in order to achieve a sustainable, economically robust, and politically stable future for our children and grandchildren. These challenges range from the most basic of human needs to the extraordinary. Developing solutions for the Grand Challenges will require a new generation of college graduates who will collectively:

- Create new capabilities
- Provide pragmatic solutions for basic human needs
- Develop new entrepreneurial opportunities
- Are the architects of a sustainable society
- Broaden access to technological innovation
- Refine communication and representation of technological solutions
- Connect technology with society
- Consider multi-cultural, political, and economic factors in human and technology development and dissemination
- Transfer knowledge, expertise, and creativity across disciplinary and other boundaries
- Pursue an equitable and just distribution of resources
- Foster multi-disciplinary and intellectual diversity

The Lafayette College Grand Challenge Scholars Program (GCSP) is premised on the belief that solving these complex challenges necessitates innovative solutions with joint contributions from engineering and the liberal arts. As such, the purpose of the GCSP at Lafayette College is to encourage undergraduates to acquire the disciplinary expertise, breadth of knowledge, and the social, ethical, technical, and environmental awareness to successfully address these challenges.

Steering Committee:

The committee typically consists of a group made up of the Director of Engineering, Academic Dean, 2 Engineering Faculty, 2 Faculty outside of Engineering.

Application/Selection:

An invitation to participate in the GCSP program will be sent to all sophomore and junior students at the College. Students will be invited to an open informational meeting where the GCSP Steering Committee members and participating students will describe the goals of the program and answer questions. First Year students will be invited to learn about the program but will not be eligible to join until the sophomore year. There is no minimum GPA other than good standing to be a GC Scholar. Both domestic and international students will be eligible for the program. As part of the application process, students will need to choose a Grand Challenge that they are interested in studying and write an essay explaining why they are interested in the topic.

Students who are selected to participate and successfully contribute solutions to the Grand Challenges will be expected to do the following through written expression, poster sessions and presentations and/or other similar activities:

- articulate the political and economical factors involved in the challenge
- work at the intersection of engineering with public policy, business, law, ethics, human behavior, risk as well as medicine and the sciences
- employ a global perspective to communicate and empathize across borders
- articulate the role of the engineering design process in technology development and distribution
- apply the engineering design process to address one or more Grand Challenge
- translate invention to innovation, scaling solutions for the public good
- collaborate within a multidisciplinary team to address complex, open-ended problems using the perspectives of different disciplines
- synthesize the knowledge of the group members in the development a project
- communicate effectively with team members, project stakeholders, and the public
- recognize and consider broad issues in the development of a project such as the societal context, ethical implications, environmental impacts, technological limitations, and feasibility of implementation.

Once accepted into the GCSP, students will be required to actively participate in the activities of the GCSP, not just activities related to their specific challenge. GCSP will sponsor speakers, poster sessions, recruiting sessions and other similar activities.

Students must complete all of the program elements described below to graduate as a Grand Challenge Scholar. The students must demonstrate that all five components of the program used to satisfy the program requirements relate to the Grand Challenge that the students chooses for their project.

The five GCSP components include:

Project or Research Experience: Each GC scholar must participate in a substantial multidisciplinary team project related to a specific Grand Challenge problem as detailed below. The project/research experience will be similar in structure to Lafayette Engineering's senior design projects/capstone projects and will be fully vetted through the Curricular and Education Policy committee. Students will be required to provide rationale on the connections of their course cluster to their GC project in their proposal as well as during and after completion of GCSP.

- The project must have at least two students and they must be from two different majors. Projects with more than two students can have more than one student per major as long as at least two different majors are represented.
- GC projects will be counted as a course and will receive a grade. Students may only participate on one GC project for credit and may earn a maximum of 2 course units for work on GC projects.

- The student team must have a faculty mentor with expertise/strong interest in the area being investigated. This faculty member will grade the students on their individual and team efforts. The grade will be based on all aspects of the project including, teamwork, organization, technical merit, ability to meet deadlines, written and oral reports, and project success. Grades will be recorded on the student's transcript as an independent study within the Engineering Division.
 - The GCSP Chair will be the Director of the Engineering Division who will have oversight over all projects, budgets, and the overall program. This applies to both engineering students and non-engineering students.
 - Students must present their GC project at an on-campus poster session as well as an oral presentation session. These activities will also be used as a recruiting instrument.
 - The proposal and the summary report must:
 - Include a detailed description of the Grand Challenge identified as the "GC Focus" of the project
 - demonstrate that the students appreciate the complex interdependencies of science, technology, and society
 - identify key questions
 - include a list of deliverables
 - identify stakeholders impacted by the challenge
 - include a budget and justification
 - include an anticipated plan, including a timeline, that will be used in addressing the challenge
 - include a letter of support from the faculty member mentoring the project
 - Funding for project expenses is up to \$2k per project. Budgets must be approved by the faculty mentor and must also be approved by the GC Chair. All purchases must be approved by the GC Chair prior to ordering.
 - When budgets allow, GC at Lafayette will provide a limited amount of funding for on-campus student housing during the summer/interim. These funds will be competitively awarded and must be fully justified.
 - Students may apply for funding for travel costs to present their projects at conferences. This is expected to be competitively awarded.
1. Interdisciplinary Curriculum: Each GC scholar must participate in a curriculum that prepares them to work at the intersection between an engineering and non-engineering discipline, such as public policy, international relations, business, law, ethics, human behavior, risk, medicine and the natural sciences.

The student must demonstrate the link between the Interdisciplinary Curriculum component and the Grand Challenge being investigated. The student should explain how this experience has increased or broadened their understanding of the issue.

- Complete an interdisciplinary cluster of 3 courses outside of one's major department. The cluster must meet the following requirements:
 - i. Only one course can be in the student's "home" division (Humanities, Social Science, Engineering, Natural Science). If a student is in an interdisciplinary

major, than only one course can be in either of the two home divisions, e.g., 2 of the courses must be outside the home divisions

- ii. If the student is a non-engineering major, one of the courses must be an engineering course.
 - iii. None of the courses used in the cluster may be at the 100 level (with the exception of a GC based First Year Seminar)
 - iv. The student must provide rationale in the GCS proposal describing the connections among the cluster of courses and how they relate to the GC being investigated
2. Entrepreneurship: Each GC scholar must participate in a curricular or meta-curricular component on the process of translating invention and innovation into market ventures. This may be either risk-taking ventures for business or introducing technology for not-for-profits in the public interest.

The student must demonstrate the link between the Entrepreneurship component and the Grand Challenge being investigated. The student should explain how this experience has increased or broadened their understanding of the issue.

Do one of the following:

- Participate in 15 hours of co-curricular programming related to entrepreneurship that is approved by the GCSP Steering Committee. These include seminars, workshops, and symposia sponsored by the IDEAL Center (described below).
- Complete an Entrepreneurship course such as Lafayette's Economics course ECON 339: Foundations of Entrepreneurship and Economic Development
- Serve in a managerial capacity at a non-profit or entrepreneurial enterprise for at least 3 months
- Participate in a business start-up competition such as Student Startup Madness (SSM), USASBE Launch!, or The Hult Prize.

Lafayette's IDEAL Center coordinates and supports opportunities for students in all four academic divisions (Humanities, Engineering, Natural Sciences, and Social Science) to acquire and apply the skills, perspectives, and attributes to become leaders in the business, nonprofit, and government sectors. The Center allows students to connect liberal arts perspectives to current issues, to acquire practical skills for the business world, to develop global and multicultural perspectives, and to deepen leadership skills for working in teams.

3. Global Dimension: Each GC Scholar must participate in a curricular or meta-curricular component that instills elements necessary to develop innovations in a global economy, or address ethical issues of global concern. Domestic activities that stress global or cross-cultural implications may satisfy this component.

The student must demonstrate the link between the Global Dimension component and the Grand Challenge being investigated. The student should explain how this experience has increased or broadened their understanding of the issue.

Do one of the following:

- Complete a semester or interim study abroad program
- Complete (2) additional Global and Multicultural designated (GM) courses beyond the Common Course of Study
 - i. The student must provide rationale to the GC Committee describing the connections among the cluster of courses and how they relate to the GC being investigated

4. Service Learning: Each GC Scholar must participate in a curricular or meta-curricular component that deepens their social awareness and aims to heighten their motivation to bring their expertise to bear on societal problems. GC Scholars can look to the Landis Center to help organize projects and outreach, <http://landiscenter.lafayette.edu/>

The student must demonstrate the link between the Service Learning component and the Grand Challenge being investigated. The student should explain how this experience has increased or broadened their understanding of the issue.

Do one of the following:

- Actively participate for one academic year in a global service organization such as Engineers Without Borders, or Alternate Spring Break. Report and present on the activities of the group, your contribution, and the outcomes of the efforts
- Actively participate for one academic year for the College's community outreach programs. Report on the activities of the group, your contribution, and the outcomes of the efforts
- Participate on a semester long Community Based Learning Research and Service Project. Present the results during a poster session

*** Courses and activities used to satisfy one set of GC requirements may not be used to satisfy another set of GC requirements; however, they may be used to fulfill applicable sections of the College's Common Course of Study. ***

Upon completing the five requirements of the GCSP, students must submit an application to complete the Grand Challenge Scholar Program. Part of this application will be a requirement that students write an essay where the student relates the five components to their selected Grand Challenge and shows how they have impacted the challenge under investigation.