Saint Louis University

Grand Challenge Scholar Program Proposal

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The Grand Challenge Scholar Program Vision

Saint Louis University is a learning community in the Jesuit tradition where knowledge touches lives, faith inspires justice, and service forms tomorrow's leaders. This requires that we honor human dignity as we promote the common good by becoming men and women for others in everything we do. Parks College was America's first federally certified school of aviation, founded in 1927. Today, Parks has a worldwide reputation for our aviation and aerospace engineering programs, and has emerged as a leader in disciplines such as electrical engineering, biomedical engineering, mechanical engineering, computer engineering, and civil engineering. Additionally, Parks has recently partnered in the establishment of a University-wide, interdisciplinary Sustainability Center launched in the fall of 2010, and Parks College is a KEEN Network school and provides multitude of opportunities for students to engage in entrepreneurship related activities (see http://www.keennetwork.com/about-keen/).

Fitting our University and College missions well, the Grand Challenge Scholars Program is designed to prepare our students to solve some of the major challenges facing society, such as making solar energy economical, providing access to clean water, and reverse engineering the human brain. These are complex societal issues that require engineers and scientists to be broadly educated, innovative thinkers dedicated to help humanity. The mission of the university itself combined with recent student projects related to clean water, solar energy, and wind energy, excellent opportunities for engineering entrepreneurship, study abroad opportunities, and service learning opportunities, uniquely positions our institution to have a highly successful Grand Challenge Scholars Program.

Selection of Grand Challenge Scholars:

Students must meet the following criteria to enter the Saint Louis University Grand Challenge Scholar Program (GCSP):

1. Be an engineering or science major at the sophomore level that has completed at least 30 semester-hours in their program of study and has a cumulative GPA of 3.50 or higher.

2. Have a GCSP Plan of Study approved by the GCSP Director, Faculty Mentor, and GCSP Steering Committee. The Plan of Study form is available on GCSP website at http://parks.slu.edu/gcsp/ (see Appendix A).

To begin the process of becoming a Grand Challenge Scholar, each student must work with the GSCP Director and a faculty mentor from his/her chosen field to develop a Plan of Study and have that Plan of Study approved by GSCP Steering Committee. The Plan of Study must include the five components listed below. Additionally, students must demonstrate connectivity across the five components addressing a Grand Challenge theme in their GCSP Plan of Study.
1. **Define a Grand Challenge research experience.** Grand Challenge Scholars must participate in a research experience that relates to a Grand Challenge theme (see http://www.engineeringchallenges.org/). This requirement can be met through a 6 semester-hour senior design capstone project courses, 6 semester-hours of independent research courses, a full-time summer research experience, or a full-time summer research internship. Summer research experiences and/or internships can be paid or done on a volunteer basis. Students must obtain a letter of recommendation from a faculty mentor who will assist the student with the research.

2. **Develop an interdisciplinary program of study.** Grand Challenge Scholars must develop a Plan of Study that includes strong interdisciplinary content that aligns with their Grand Challenge theme. Students can choose to take 6 semester-hours of interdisciplinary courses or indentify significant interdisciplinary content in their research project. Courses should be selected from varied disciplines focused on the GCSP theme. Suggested interdisciplinary courses grouped by GCSP themes are listed in the GCSP Plan of Study form.

3. **Incorporate entrepreneurship in their project, public service, and/or curriculum.** Grand Challenge Scholars must include an entrepreneurship component in their Plan of Study. This could involve taking their project idea to market, participation in the Idea to Product (I2P) annual competition held on the Saint Louis University campus, or taking an entrepreneurship course for at least 3 semester-hours of credit. Suggested entrepreneurship courses are listed in the GCSP Plan of Study form.

4. **Find a global dimension in the project and/or program of study.** Grand Challenge Scholars must include a global dimension in their Plan of Study. This could involve a study abroad experience, taking 6 semester-hours of courses that expand a student’s global perspective, or identifying a significant global perspective in their research project. Suggested courses that add to a student’s global perspective are listed in the GCSP Plan of Study form.

5. **Demonstrate service learning experience.** Grand Challenge Scholars must participate in service activities and document what they have learned through these activities. The service learning experience must relate to the student’s selected Grand Challenge theme. Suggested relevant service activities are listed in the GCSP Plan of Study form.

Grand Challenge Scholars must maintain a 3.50 or better GPA and submit a progress report to their faculty mentor and the GCSP Director each semester. A final portfolio documenting achievement of the five components of the Grand Challenge Scholar experience must be submitted to the GCSP Director, the student’s faculty mentor, and the GCSP Steering Committee to demonstrate completion of the GCSP requirements. A GCSP portfolio guide is available from the GCSP website http://parks.slu.edu/gcsp/ (See Appendix B). Students completing the GCSP requirements will receive a Grand Challenge Scholars Certificate from the National Academy of Engineering and have the designation added to their transcript.

**Assessment and Tracking of Grand Challenge Scholars**

At the national-level, the GCSP Director will participate in the electronic community, workshops, and summits. In addition, the GCSP Director will convey the names and
accomplishments of students who successfully complete the GCSP to the National Steering Committee as part of the required annual report.

The Saint Louis University GCSP Steering Committee will be composed of faculty from appropriate disciplines to assure students achieve the five program components. The expected composition of the Steering Committee is one representative from each of the four engineering departments and three faculty from outside of engineering to bring an interdisciplinary component to the committee. At least one member on the Steering Committee will be involved with our KEEN Network entrepreneurship program. The Steering Committee will assist the GCSP Director with longitudinal tracking of Grand Challenge Scholars in cooperation with the National Steering Committee and NAE using surveys.

At the institutional level, the GCSP Director and faculty mentor will work with each student to develop a Plan of Study to submit to the GCSP Steering Committee for approval. The GCSP Director and the assigned faculty mentor will review the student’s progress each semester. To complete the program, the student must submit a portfolio to the GCSP Director, Steering Committee, and the assigned faculty mentor for review and approval. GCSP portfolios will document the student’s curriculum and research activities, providing evidence that the student has completed the five Grand Challenge components, and demonstrate the achievement of the connectivity among the five components along a Grand Challenge theme. Completed Grand Challenge Portfolios will be collected electronically and submitted to the National Committee in the annual reports. Sample portfolios will be posted on the GCSP website at http://parks.slu.edu/gcsp/.

**Promotion of Early Student Engagement in Grand Challenge Activities**

Starting in the Fall of 2010, we are introducing the Grand Challenges in our required Freshman Engineering course to promote early student engagement in Grand Challenge related activities. Additionally, recruiting materials for future and current students will be developed for dissemination during Engineer's Week activities, bulletin board postings, recruiting materials, and web-publications posted on the GCSP website http://parks.slu.edu/gcsp/.
Appendix A – Grand Challenge Scholar Program (GCSP) Plan of Study Form

Student Name: ___________________________ Major: ___________________________

Faculty Mentor: ___________________________ Completed Credit Hours ______

Select a Grand Challenge theme for your Plan of Study from the following list:

<table>
<thead>
<tr>
<th>Energy and Environment</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Make solar energy economical</td>
<td>□ Prevent nuclear terror</td>
</tr>
<tr>
<td>□ Provide energy from fusion</td>
<td>□ Secure cyberspace</td>
</tr>
<tr>
<td>□ Develop methods for carbon sequestration</td>
<td>□ Restore urban infrastructure</td>
</tr>
<tr>
<td>□ Manage the nitrogen cycle</td>
<td>□ Learning and Computation</td>
</tr>
<tr>
<td>□ Provide access to clean water</td>
<td>□ Reverse engineer the brain</td>
</tr>
<tr>
<td></td>
<td>□ Enhance virtual reality</td>
</tr>
<tr>
<td>Health</td>
<td>□ Advance personalized learning</td>
</tr>
<tr>
<td>□ Advance health informatics</td>
<td>□ Engineer the tools of scientific discovery</td>
</tr>
<tr>
<td>□ Engineer better medicines</td>
<td></td>
</tr>
</tbody>
</table>

Describe your proposed research project and illustrate how it aligns with your selected Grand Challenge theme.

Describe how you plan to implement your Grand Challenge research project (senior design, independent research, summer research, internship).
Describe any interdisciplinary aspects of your proposed research project and/or identify at least 6 semester-hours of interdisciplinary courses that align with your Grand Challenge theme (see suggested list).

Describe any entrepreneurship components of your proposed research project and/or identify a 3 semester-hour of entrepreneurship course (see suggested list).

Describe how you plan to achieve a global dimension in your Plan of Study that aligns with your selected Grand Challenge theme. This can be achieved by selecting a Grand Challenge research project with a significant global perspective, participating in a study abroad program, or by selecting at least 6 semester-hours of global perspective courses (see suggested list).

Describe a proposed service learning experience that aligns with your Grand Challenge theme (see suggested list). Describe the specific service learning activity, expected learning outcomes, and explain how this activity aligns with your Grand Challenge theme.

Attach the following documents to your GCSP Plan of Study:
- ✓ Motivational statement (Why do you want to be a Grand Challenge Scholar?)
- ✓ Current transcript(s)
- ✓ Faculty mentor letter of recommendation
Suggested Grand Challenge Scholar Program Courses

The following are suggested courses that align with Grand Challenge themes and major component requirements. Students may select courses not included on the list with the approval of the GCSP Director.

Interdisciplinary

Energy and Environment:
- BIOL 120 - Ecological Issues and Society
- BIOL 420 - Aquatic Ecology
- CHEM 100 - Chemistry and the Environment
- EAS 142 - Foundations of Atmospheric Science
- EAS 160 - Sustainable Energy
- EAS 310 - Environmental Issues
- PHIL 342 - Environmental and Ecological Ethics
- PPS 400 - Politics and Ecology

Health:
- BIOL 140 - Biology of Health and Disease
- BIOL 215 - Genetics and Human Diversity
- CMH 201 - Introduction to Global Health
- CSCI 150 - Introduction to Object Oriented Programming
- EAS 417 - Introduction to GIS
- HCE 100 - Health Care Ethics

Security:
- CHEM 193 - Nanotechnology & Modern Society
- EAS 132 - Natural Disasters
- EAS 193 - Introduction to Earthquakes
- PHIL 344 - Morality and Modern Warfare
- SOC 250 - Current Social Problems
- SOC 322 - Urban Sociology
- SOC 351 - Terrorist Challenge in America

Learning and Computation:
- BIOL 115 - Genetics and Human Diversity
- CSCI 130 - Computer Game Design
- CSCI 150 - Introduction to Object Oriented Programming
- EDF 201 - Foundations of Early Childhood Education
- EDF 423 - Psychology or Teach/Learn
- PSY 310 - Brain, Mind & Society
- PSY 316 - Learning & Memory
Entrepreneurship

- MGT 320 - Managing Ideas in Entrepreneurship Firms
- MGT 321 - Managing Resources in Entrepreneurship Firm
- MENG/ECE 493-Engineering Entrepreneurship

Global Perspective

- CMH 201 - Introduction to Global Health
- CMH 235 - Contemporary Issues in Global Health
- EAS 325 - Global Change
- IB 200 - Intro to International Business
- ISTD 110 - Intro to International Studies
- SOC 118 - World Geography
- SOC 218 - Cities and Space
- SOC 220 - Cultural Anthropology
- SOC 222 - Peace and Conflict Studies
- SOC 361 - Sociology of International Relations

Suggested Grand Challenge Scholar Program Service Learning Activities

The following are suggested service learning activities that align with Grand Challenge themes. Students may select other activities with the approval of the GCSP Director. More information about service learning opportunities at SLU can be found at the Center for Service and Community Engagement at http://www.slu.edu/x24776.xml

- Amnesty International
- Engineers Without Borders (SLU student group application in progress)
- Energy Care
- FOCUS St. Louis
- Global Medical Brigades
- Habitat for Humanity
- Institute for Peace and Justice
- Missouri Coalition for the Environment
- OneWorld
- SLU Student Environmental Task Force
- Students United For Africa
Appendix B – Grand Challenge Scholar Program (GCSP) Portfolio Guide

Each Grand Challenge Scholar Program (GCSP) student must work with their faculty mentor and the GCSP Director to complete a portfolio providing evidence of satisfactory achievement of the five GCSP components. Students must submit the final portfolio electronically as a continuous single .pdf file to the GCSP Director and Steering Committee for approval. All portfolios must contain the following sections in the noted order:

1. **Cover Page:** Include the University name, your name and major, selected GCSP theme and research project title, the name of your faculty mentor, and the date of submission.

2. **Research Report:** Include a research report that describes your project objective, methodology, and outcomes. At a minimum, your report must include the following sections: Introduction and Background, Methodology, Results, Discussion, Conclusions, Future Recommendations, and References.

3. **Interdisciplinary Component:** Document how you achieved the interdisciplinary component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your interdisciplinary learning experience relates to your GCSP theme. Include evidence of any strong thematic interdisciplinary outcomes from your research project.

4. **Entrepreneurship Component:** Document how you achieved the entrepreneurship component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your entrepreneurship learning relates to your GCSP theme. Include evidence of any entrepreneurship component in your research project, such as taking your project idea to market and/or participation in the Idea to Product (I2P) annual competition.

5. **Global Dimension Component:** Document how you achieved the global dimension component of your Plan of Study. For courses, include a syllabus and example course materials that illustrate how your global dimension learning relates to your GCSP theme. Include evidence of any strong thematic global dimension in your research project and/or a study abroad experience.

6. **Service Learning Component:** Document how you achieved the service learning component of your Plan of Study. Provide evidence of what you learned through your service activity and show how this experience relates to your GCSP theme.

7. **Overall GCSP Outcome Evaluation:** Reflect on your overall GCSP experience. Discuss how your research project, study abroad, service learning experiences, and coursework helped you achieve the GCSP goals in each five components. Cite specific examples and evidence included in your portfolio demonstrating your achievement of the GCSP goals. Discuss the connectivity across the five components addressing your Grand Challenge theme. Note any components not well achieved by your experience in the GCSP. State your overall opinion of your GCSP experience and how the GCSP could be improved.