

# The Grand Challenges Scholars Program @ The Colorado School of Mines



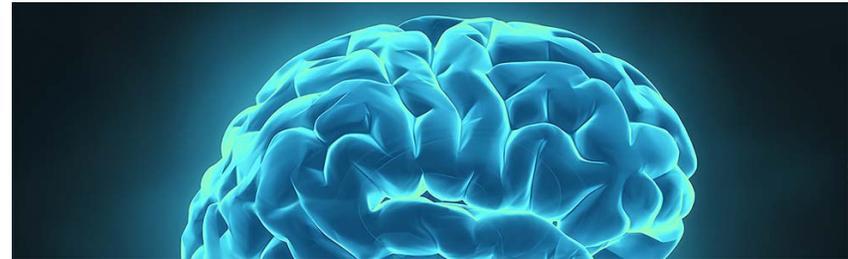
**GRAND CHALLENGES SCHOLARS PROGRAM**  
C O L O R A D O   S C H O O L   O F   M I N E S

# What engineering do we “do”?

NAE’s 14 Grand Challenges for Engineering in the 21<sup>st</sup> Century



Advance personalized learning



Reverse engineer the brain



Make solar power economical



Advance health informatics



Enhance virtual reality



Secure cyberspace

# The Grand Challenges Scholars Program @Mines



**2009:** The Grand Challenges Scholars Program is proposed as a national program to “prepare engineers to be world changers”

**March 2015:** Commitment from Mines to POTUS to form a Grand Challenges Scholars Program

**August 2016:** GCSP@Mines approved by the National Academy of Engineering

# GCSP @ Mines

Five required pillars to become a Grand Challenges Scholar

Interdisciplinary Curriculum

Service Learning

Entrepreneurship

Global Dimension

Research or Project Experience

Entire experience is united by a final GCSP portfolio.

# Example GCSP experience: Molly Miner



Her freshmen year, Molly enrolls in the *Nature and Human Values/Engineering Practices Introductory Course Sequence (EPICS) I* course sequence focused on the GCE, which meets the **Interdisciplinary Curriculum** requirement.

As a sophomore, she joins Mines Without Borders and takes a lead on their water-related project designing a water distribution system in a community in Nicaragua. This experience would fulfill the **Service Learning** requirement.

As a junior, the student travels with MWB to Nicaragua to implement their work, fulfilling the **Global Awareness** requirement. She also joins a group of students working on a pitch for the Student Innovation Competition at a Grand Challenges Summit, completing the **Entrepreneurship** pillar.

Finally, her senior year, the student's senior design project focuses on water purification via a sand filter, completing the **Project Based Learning** requirement.

In her **final portfolio**, Molly unifies these experiences by discussing the challenges of water purification and distribution across worldwide communities.

# Interdisciplinary Curriculum



***The purpose of this pillar is to provide you with the skills to address the interdisciplinary nature of the Grand Challenges. Upon completing this requirement, you will also be able to describe the challenges and opportunities that interdisciplinary problems present, and how to best approach such problems.***

6 units of the following:

- Grand Challenges NHV/EPICS
- EGGN 301: Human-Centered Problem Definition
- LAIS 430: Corporate Social Responsibility
- LAIS 490: Engineering and Social Justice
- LAIS 490: Energy and Society
- LAIS 377: Engineering and Sustainable Community Development
- Completing McBride or the HE minor will automatically meet this criteria, due to their interdisciplinary nature

# Service Learning



***Each of the Grand Challenges aims to address a major societal or global problem. Service learning combined with or integrated into your engineering education will prepare you to address problems that impact people and their communities in your future career.***

One of the following:

- LAIS 374: Service Learning
- Working in Residence Life, as a Peer Mentor, or other on-campus service roles
- Substantial involvement with Circle K, Active Minds @ Mines, or a related student group
- STEM Tutoring or other forms of sustained STEM outreach
- Substantial involvement with Mines Without Borders
- Year-long commitment to the Grand Challenges Council as a Grand Challenges Mentor

# Entrepreneurship



***Entrepreneurship embodies many of the skills required of a GCS: creativity, ingenuity, teamwork and communication. This skillset is required to address the Grand Challenges.***

One of the following:

- EBGN 360: Introduction to Entrepreneurship
- EBGN 5xx: Technology Entrepreneurship
- EPICS 151: First-year engineering course (must be the entrepreneurship-focused option)
- Start-up/Pitch Competition (must include a prototype or mock-up)
- Substantial contributions to the Entrepreneurship Club, Maker Club, or a related student group
- Student Innovation Competition at a Grand Challenges Summit

# Global Awareness



***The Grand Challenges are problems that impact populations across the world. Working with international countries requires a special understanding and awareness that is rarely fostered in conventional engineering curricula.***

One of the following:

- Study abroad or international internship experience
- Substantial involvement with Mines Without Borders or other student group with international involvement
- LAIS 377: Engineering and Sustainable Community Development
- LAIS 475: Engineering Cultures in the Developing World

# Research or Project-Based Learning Experience



***Project-based learning and undergraduate research experiences provide opportunities for students to unify the skills and knowledge they have acquired from their diverse courses and extracurricular experiences, and to apply them to a problem that matters. Addressing the Grand Challenges will require such an ability.***

6 credits or equivalent of the following:

- Independent research under the supervision of a faculty mentor related to a single GCE (1 year = 6 credits)
- EGGN 401: Projects for People (may be repeated once for credit)
- EPICS II – Grand Challenges related
- EGGN 491/492: Senior Design on a GCE-related project; other Senior Design courses could qualify as well, if they are GCE-focused
- CEEN 477: Sustainable Engineering Design
- Relevant internship experience (1 summer = 6 credits)

# GCSP @ Mines

Interdisciplinary Curriculum	Service Learning	Entrepreneurship	Global Dimension	Research or Project Experience
<ul style="list-style-type: none"> <li>• Grand Challenges NHV/EPICS</li> <li>• EGGN 301: Human-Centered Problem Definition</li> <li>• LAIS 430: Corporate Social Responsibility</li> <li>• LAIS 490: Engineering and Social Justice</li> <li>• LAIS 490: Energy and Society</li> <li>• LAIS 377: Engineering and Sustainable Community Development</li> <li>• McBride or HE minor</li> </ul> <p>• <i>6 units total if coursework-based</i></p>	<ul style="list-style-type: none"> <li>• Working in Residence Life, as a Peer Mentor, or other on-campus service roles</li> <li>• Substantial involvement with Circle K, Active Minds @ Mines, or a related student group</li> <li>• STEM Tutoring or other forms of sustained STEM outreach</li> <li>• Substantial involvement with Mines Without Borders</li> <li>• Year-long commitment to the Grand Challenges Council as a Grand Challenges Mentor</li> <li>• LAIS 374: Service Learning</li> </ul>	<ul style="list-style-type: none"> <li>• EBGN 360: Introduction to Entrepreneurship</li> <li>• EBGN 5xx: Technology Entrepreneurship</li> <li>• EPICS 151: First-year engineering course (must be the entrepreneurship-focused option)</li> <li>• Start-up/Pitch Competition (must include a prototype or mock-up)</li> <li>• Substantial contributions to the Entrepreneurship Club, Maker Club, or a related student group</li> <li>• Student Innovation Competition at a Grand Challenges Summit</li> </ul>	<ul style="list-style-type: none"> <li>• Study abroad or international internship experience</li> <li>• Substantial involvement with Mines Without Borders</li> <li>• LAIS 377: Engineering and Sustainable Community Development</li> <li>• LAIS 475: Engineering Cultures in the Developing World</li> </ul>	<ul style="list-style-type: none"> <li>• Independent research under the supervision of a faculty mentor related to a single GCE (1 year = 6 credits)</li> <li>• EGGN 401: Projects for People (may be repeated once)</li> <li>• EPICS II – GCE related</li> <li>• EGGN 491/492: Senior Design on a Grand Challenges-related project; other Senior Design courses could qualify as well, if they are GCE-focused</li> <li>• CEEN 477: Sustainable Engineering Design</li> <li>• Relevant internship experience (1 summer = 6 credits)</li> </ul> <p>• <i>The equivalent of 6 units is required</i></p>

Entire experience is unified by a final GCSP portfolio.

# Application and portfolio



- Application
  - Due within one year of your graduation
    - I.e. if you plan to graduate in May 2018, it's due by April 2017
  - Target date: First semester your sophomore year
  - Next applications will be accepted by October 2, 2017
  - Then April 2018, October 2018... (reviewed 2x/year)

Requires a letter of recommendation from a faculty member

Answers to three questions

Proposal with how you will accomplish the five curricular components

- Portfolio
  - Unifying piece of the program
    - How do your diverse experiences as a part of the GCSP together prepare you to tackle the Grand Challenges?
    - What is a unifying theme of your work as a GCS?
    - A critical view of the GCE – who benefits? Who doesn't? Who is not a part of the conversation?
- Expect a lot of overlap with McBride and HE

# Student Leadership Opportunities



## Grand Challenges Grand Council

*A group of students charged with mentoring their fellow scholars (especially those just beginning the program) and creating a community among the GCSs.*

- Student-led, student-initiated
- Opportunity to mold the GCSP into what you want it to look like
- Eventually will register with Student Life as an official student group
- Can be used to meet the Service Learning requirement of the GCSP (assuming sufficient commitment and involvement)

# Student Leadership Opportunities



## Grand Challenges Mentors

*Made up of current GCSs who have been in the program for at least one year, these mentors will primarily be responsible for assisting students in writing a program proposal as they apply to the program, and guiding them through their initial year as scholars.*

- GCMs will be a part of the GCGC