



College of Engineering

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Date: 23 April 2015

To: Randy Smith  
Vice Provost, Office of Academic Affairs (OAA)

From: Ed McCaul  
Secretary, College Committee on Academic Affairs (CCAA)

Subject: Proposal to create a Grand Challenge Scholars Program

CCAA has reviewed and approved with contingencies the attached proposal to create a Grand Challenge Scholars Program on the 8th of December 2014.

Since all of the contingencies have been met, I am forwarding the proposal to you so that it can be approved by the Council on Academic Affairs. If you have any questions concerning this proposal please let me know.



To: College Committee on Academic Affairs  
From: David Tomasko, Associate Dean  
Date: 9 September, 2014  
Re: Proposal for NAE Grand Challenge Scholars Program in Engineering

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tomasko.1@osu.edu

The attached proposal is a student-led effort in response to a National Academy of Engineering effort to expose more undergraduate engineering students to the NAE Grand Challenges. The program developed by NAE is called the “Grand Challenge Scholars Program”. See [www.grandchallengescholars.org](http://www.grandchallengescholars.org) for details (the home page and steering committee list are attached as appendices to this proposal). This is different than the residential co-curricular Scholars Programs at The Ohio State University but we believe that through appropriate communications and referring to this proposal by the acronym GCSP that we can minimize confusion among the two.

A program structure has been proposed by a national steering committee which allows individual institutions to develop educational programs for their students that address five impactful experiences that when completed will better prepare graduating engineers to tackle societal challenges. The proposed approach at Ohio State to fulfill the goals of the Grand Challenges Scholars Program will be to package programs that are already offered together in a synergistic way for students to receive the “NAE Grand Challenge Scholar” designation on their transcript. These components include interdisciplinary coursework, undergraduate research, business/entrepreneurship activities, global studies and service learning. There is significant overlap with the Honors contract in the engineering such that honors students pursuing the contract would have a relatively small set of extra requirements to achieve both Honors in Engineering and NAE Grand Challenge Scholar designations.

The effort to create this program has been completely initiated and led by undergraduate honors students Deep Shah, Seth Ringel, and Adam Neu. These young men approached me in spring of 2013 and asked if the College of Engineering was planning to participate in the program. The reply was “we will if you write the proposal!” With minimal assistance on administrative processes from Dr. McCaul and myself, the students developed a program structure and brought it to the administration for feedback. With small adjustments presented the program to the Honors Committee in the College of Engineering and gained their approval on 22 April 2014. Simultaneously, the students presented OSU’s proposal to the national steering committee for their evaluation. The students have handled all the communication with that committee answering their questions and addressing their comments in revising the proposal. The proposal as presented has been approved by the national steering committee (email attached). Although approved at the national level, it is still open to feedback and revision by OSU committees. The students and I will communicate changes back to the steering committee as needed. I hereby submit the attached proposal for your review and approval and a recommendation to forward it to the Council on Academic Affairs for review.



**THE OHIO STATE UNIVERSITY**

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COLLEGE OF ENGINEERING

**Proposal for  
NAE Grand Challenge Scholars\* Program in Engineering**

**The Ohio State University**

**College of Engineering**

2070 Neil Avenue  
Columbus, OH 43210

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David B. Williams, Dean  
David Tomasko, Associate Dean, Undergraduate Education and Student Services

## I. VISION

The National Academy of Engineering (NAE) released, in 2008, a list of fourteen “Grand Challenges” for engineering in the 21st century in order to achieve a sustainable, economically robust, and politically stable future for generations to come. These challenges range from the most basic of human needs to the extraordinary [<http://www.engineeringchallenges.org/>]. The fourteen Grand Challenges are listed thematically below:

### Energy & Environment

- Make solar energy economical
- Provide energy from fusion
- Develop methods for carbon sequestration
- Manage the nitrogen cycle
- Provide access to clean water

### Health

- Advance health informatics
- Engineer better medicines

### Security

- Prevent nuclear terror
- Secure cyberspace
- Restore urban infrastructure

### Learning & Computation

- Reverse engineer the brain
- Enhance virtual reality
- Advance personalized learning
- Engineer the tools of scientific discovery

The goal of the NAE Grand Challenge Scholars Program is to prepare young engineers to confront these challenges with a multidisciplinary, socially aware, and entrepreneurial background. The Grand Challenge Scholars Program (GCSP) will increase the awareness of the next generation of engineers in the issues facing the world today through a broadened curriculum and diverse extracurricular components. Students successfully completing the program will be recognized by the National Academy of Engineering as Grand Challenge Scholars and we are requesting that they receive the transcript designation “NAE Grand Challenge Scholar”.

## **II. Administrative Structure**

Responsibilities of the GCSP Steering Committee will be incorporated into the existing Engineering Honors Committee. The Committee is comprised of faculty members from each engineering department along with the Associate Dean for Undergraduate Education and Student Services, who will also act as the GCSP Director. The committee meets monthly and members of the Committee will be reappointed each year. For the GCSP program, the responsibilities of the committee include the selection of students, the tracking of their progress with the GC Mentors, approving GC portfolios, and compiling and conveying the accomplishments of GC Scholars to the Director.

GC Mentors will be appointed through each department that comprises the Honors and GCSP Steering Committee. Students may choose to use these appointed officials as their mentors, or they have the choice of finding their own from the university faculty.

The GCSP Director at the Ohio State University will be responsible for communication between the national and institutional levels of the GCSP. This includes relaying information regarding GCSP graduates to the National Steering Committee and maintaining contact with the GCSP electronic community. The Director must also prepare the annual report of the programmatic GCSP accomplishments.

Students may appeal to the GCSP Steering Committee for the acceptance of certain coursework and extracurricular activities to fulfill their GC requirements.

## **III. Selection of Students**

### **i. Student Marketing**

The GCS Program will be promoted at Ohio State in various ways. Incoming freshman are required to take an engineering seminar class to help familiarize them with the university, thus incoming freshmen will be made aware of the GCSP. To further increase awareness and interest in the program, current GC Scholars will advocate for the program in freshman engineering classes as the program progresses.

### **ii. Academic Requirements**

Grand Challenge Scholars must meet the following academic requirements in order to be considered for acceptance into the GCSP.

- a. Be an engineering major at the sophomore or junior level
- b. Have a cumulative GPA of at least a 3.4. Higher consideration will be given to students who also have a major GPA above a 3.4.
- c. Students must maintain the 3.4 cumulative GPA for the duration of the program. Students already accepted to the program will have one semester to regain their cumulative GPA should it fall below a 3.4.

We note that the academic requirements are the same as those to maintain honors status in the College. However, this program does not meet (and is not intended to meet) the university honors program requirement of at least 6 honors level courses. This requirement may be reconsidered in the future.

### **iii. Program Acceptance**

Prospective GC Scholars will have to complete a GCSP Plan of Study and have it approved by both the GCSP Steering Committee at OSU and the student's GC Mentor. The Plan of Study will include a description of how the student intends to complete the five components of program, which are listed below. Additionally, students must express connectivity amongst the five program pillars in their Plan of Study that thematically addresses GC themes. The program expects to allow thirty students to join per rank per year. Students will apply by either the end of their sophomore or junior year. If unsuccessful in their first application, students will be given constructive feedback by the GCSP Steering committee and their GC mentor in regards to their original Plan of Study. They will have the opportunity to reapply if they still meet the eligibility requirements.

## **IV. Detailed Program Requirements**

The Grand Challenge Scholars program has five components that students must pursue in order to tackle a Grand Challenge. Students must participate in each of the five pillars, however, their involvement in each component can vary. It is required for students to have in-depth, immersive engagement in at least two of the five components, and medium level engagement in at least two of the five components. The last component may be pursued at a minimum depth. Levels of immersion will be described individually for each component. Overlap amongst the components is valid and recommended to get the most out of the program.

**1) Project or research activity engaging a GC theme or challenge:** Students must select a project or research activity that addresses one of the fourteen Grand Challenges. OSU has multiple undergraduate research opportunities in which students can participate. Independent study projects that are more engineering design related may also be approved for this component but a student may not double count the same project for credit in a required course (such as capstone design) and this program. Departments through the College of Engineering offer credit to students involved in faculty research or independent study. Financial support is also available

to students through the College of Engineering, the Undergraduate Research Office, and through some independent faculty research groups. Those who choose to pursue research distinction at OSU have the opportunity to apply for grants from the College of Engineering to fund their work. The College is willing to appropriate some of that money to be geared solely towards students seeking distinction in GCSP. The exact amount will be varied based on how many students pursue the program and if the university is able to privately fund the program through its external resources.

The research component is required to be an in-depth engagement. The student may fulfill this requirement by completing at least six credit semester hours of research relevant to a student's proposed Grand Challenge (equivalent to 270 hours of research work) with a satisfactory (if taken as a pass/fail course) rating or a grade of C or above. Students can also partake in a full time research based internship/co-op for eight weeks, or a full time eight week REU that addresses one of the fourteen Grand Challenges. Students at Ohio State can graduate with research distinction or honors research distinction which will also fulfill this component.

**2) Interdisciplinary curriculum:** A multifaceted educational curriculum will allow students to confront the Grand Challenges with a wider breadth of knowledge, helping them to foster novel advancements. An in-depth immersion in interdisciplinary curricula can be accomplished by taking three approved courses. A medium-level immersion can be accomplished by taking two. GC Scholars are required to fulfill at least the medium-depth immersion for this requirement. The chosen courses can fall under any of the GC themes. To allow for maximum scheduling flexibility, there is no requirement for students to concentrate their interdisciplinary coursework on one specific GC theme. Each of the following example courses relates to a theme of the fourteen GCs. Other courses may be counted toward this requirement with the approval of the GCSP Steering Committee.

#### Energy & Environment

**EARTH SCI 2155** - Energy and Environment

**EARTH SCI 2203** -Environmental Geoscience

**EARTH SCI 2204** - Exploring Water Issues

**EARTH SCI 2210** - Energy, Mineral Resources, and Society

**EARTH SCI 2220H** - Contemporary Topics in Earth Sciences

**EARTH SCI 3411** - Water Security for the 21st Century

**EARTH SCI 4425** - Energy Resources and Sustainability

**ECE 3040** - Sustainable Energy & Power Systems

**ENR 2155** - Energy and Environment

**ENR 2300** - Society and Natural Resources

**ENR 2500** - Introduction to Environment, Economy, Development, and Sustainability

**PHILOS 2342** - Environmental Ethics

Health

**BMI 5710** - Introduction to Biomedical Informatics  
**BMI 5720** - Introduction to Imaging Informatics  
**BMI 5730** - Introduction to Bioinformatics  
**BMI 5740** - Introduction to Research Informatics  
**BMI 5750** - Methods in Biomedical Informatics  
**BMI 5760** - Public Health Informatics  
**FDSCTE 4536** - Food Safety and Public Health  
**FABENG 3481** - Introduction to Food Engineering  
**FABENG 3510** - Introduction to Biological Engineering  
**HTHRH 3400** - Health Promotion and Disease Prevention  
**NEUROSC 4100** - Basic and Clinical Foundations of Neurological Disease  
**PATHOL 5733** - Human Genetics  
**PHARMCL 5852** - Biology of Aging  
**PHR 4100** - Biomedical Chemistry  
**PHR 4200** - Introduction to Medicinal Chemistry  
**PHR 4300** - Introduction to Pharmaceuticals  
**PHR 4320** - Drug Discovery and Development  
**PHR 4330** - Basic Pharmacokinetics  
**PHR 4400** - Integrated Pharmacology  
**PHILOS 3341H** - Ethical Conflicts in Healthcare Research, Policy, and Practice  
**PSYCH 4531** - Health Psychology  
**PUBHEHS 3310** - Current Issues in Global Environmental Health

Security

**CRPLAN 2200** - Sustainable Infrastructure Planning  
**CRPLAN 2210** - Sustainable Urbanism  
**CRPLAN 3400** - Planning for Sustainable Economic Development  
**CSE 4471** - Information Security  
**INSTDS 4700(H)** - Terror and Terrorism  
**INSTDS 4701** - The Development and Control of Weapons of Mass Destruction  
**INSTDS 4803** - Intervening for Peace: Peacekeeping and Collective Security  
**INSTDS 4850** - Understanding the Global Information Society  
**POLITSCI 4310** - Security Policy  
**POLITSCI 4315** - International Security and the Causes of War  
**POLITSCI 4318** - The Politics of International Terrorism

Learning & Computation

**ACCAD 5102** - Programming Concepts and Applications for Artists and Designers  
**ART 4401** - Computer Animation  
**BOIMEDE 4110** - Bioimaging



**CSE 5526** - Introduction to Neural Networks

**ESEPSY 2309** - Psychology Perspectives on Education

**PSYCH 2311** - Psychology of Motivation

**NEUROSC 3050** - Structure and Function of the Nervous System

**3) Entrepreneurship:** GC Scholars must be able to meld entrepreneurship and innovation to promote technological development in our society. For the case of unspecified immersion experiences, the mentor must review the student's proposed experience and submit it to the GCSP Steering Committee for final approval. An in-depth immersion in entrepreneurship can be accomplished by any of the following:

- Placing in a business plan competition
- Involvement in the Customer Aligned Startup Training (C.A.S.T.) program - in which students take an existing technology at OSU and drive it through the entire commercialization process with limited guidance from the Technology Commercialization and Knowledge Transfer Office
- Earning a minor in business, economics, or entrepreneurship and innovation
- An immersion experience or research activity spanning at least eight weeks
- Taking at least three semester-long business classes. Examples included below

A medium-depth immersion in entrepreneurship can be accomplished by any of the following:

- Participating in a business plan competition
- Participating in the BOSS Program through the TCO - a competition in which students pitch to a panel of judges, revise their ideas according to judge feedback, and return to pitch again over a period of six weeks
- Significant involvement in one of the many business/entrepreneurship organizations on campus, including, but not limited to: Students Consulting for Nonprofit Organizations (SCNO) and Business Builders Club (BBC) - documentation and approval from the OSU GCSP mentor and director needed
- An immersion experience or research activity lasting less than eight weeks
- Taking two semester-long business classes. Examples included below

A minimum-depth immersion can be accomplished by one of the following options:

- Taking one semester-long business class from the approved list below

The following courses are approved to count toward the entrepreneurship requirement:

**BUSFIN 3290** - Foundations of Entrepreneurial Finance

**BUSMHR 2500** - Entrepreneurship

**BUSMHR 3510.01** - New Venture Creation

**BUSMHR 3510.02** - Creating the Social Venture

**BUSMHR 3541** - Global Innovation and Entrepreneurial Leadership

**BUSMHR 3542** - The Accelerator: Planning the Entrepreneurial Venture

**BUSMHR 3660** - Innovation Practice

**BUSMHR 5530** - Topics in Social Entrepreneurship

**BUSML 3241** - Introduction to Entrepreneurial Marketing

**BUSML 4240** - New Product Management

**BUSML 4241** - Entrepreneurial Marketing

Additional courses and activities may be approved by the GCSP Steering Committee.

**4) Global Dimension:** The GCSP incorporates a global learning component to instill an awareness of the international economy and worldwide growth and development. Scholars may pursue this requirement at varying depth through the following options. An in-depth immersion can be fulfilled by any one of the following:

- An international internship or study abroad experience relating to a GC of at least eight weeks
- An internship with significant international focus of at least eight weeks
- A minor in International Studies
- Successfully complete OSU Engineering's Global Option in Engineering Program - the program requires student involvement in study abroad programs, courses that contain international elements, and obtaining proficiency in a foreign culture/language

A medium-depth immersion can be accomplished by any one of the following:

- An international internship or study abroad experience relating to a GC of less than eight weeks
- An internship with significant international focus of less than eight weeks
- Domestic involvement with an internationally focused project and at least one of the approved courses
- International travel with an internationally focused project

A minimum-depth immersion can be accomplished by any one of following:

- Domestic involvement with an international project
- Shadowing and giving a report on a professional who works internationally focusing on a GC theme
- Participation in the London Honors Study Abroad Program as a 1st-year student
- Taking an approved course, examples are included below

The following is a list of approved courses. Additional courses may be approved by the GCSP Steering Committee.

**COMPSTD 1100(H)** - Intro to the Humanities: Cross-Cultural Perspectives

**COMPSTD 2340** - Introduction to Cultures of Science and Technology

**COMPSTD 3645(H)** - Cultures of Medicine

**COMPSTD 3646** - Cultures, Natures, Technologies

**COMPSTD 4597.01** - Global Studies of Science and Technology

**INTSTDS 2580** - Feast or Famine: The Global Business of Food

**INTSTDS 3850** - Introduction to Globalization

**INTSTDS 4320** - Energy, the Environment, and the Economy

**INTSTDS 4532** - Food Security and Globalization

**INTSTDS 4540** - International Commerce and the World Economy

**INTSTDS 4560(H)** - Cooperation and Conflict in the Global Economy

**INTSTDS 4597.01(H)** - Problems and Policies in the World Population, Food, and Environment

**5) Service Learning:** Grand Challenge Scholars are required to add a service element to their studies. This helps to familiarize scholars with different groups of people, exposing them to new perspectives. The service learning component must relate to at least one of the 14 Grand Challenges. This does not necessarily have to mirror the scholar's chosen Grand Challenge. There are multiple service learning opportunities through OSU. In-depth immersion would be accomplished by completing any one of the following:

- Two or more years of significant involvement in service oriented groups, such as: Engineers for a Sustainable World, Engineers Without Borders, Engineers for Community Service, Solar Education and Outreach and other service oriented organizations. Documentation is needed for approval
- Service oriented study-abroad trip or project (three weeks or longer)
- Completion of a two-semester University service learning trip and pre-course
- Completion of a two-semester service learning-based Capstone Design Project

Medium level immersion can be accomplished by one of the following options:

- Two or more service trips through Buck-I-SERV - a program that offers service trips in place of university breaks - or the college as a whole
- Involvement for one semester in a K-12 youth outreach program for the benefit of Columbus area schools, through organizations such as College Mentors, ASEE, and other outlets
- Completion of a one-semester University service learning trip and pre-course

Minimum level immersion can be accomplished by any one of the following:

- One service trip through Buck-I-SERV
- At least 30 hours of volunteer community service

Additional activities may be approved by the GCSP Steering Committee

## V. Assessment and Tracking of Scholars

GC Scholars will work with their mentor to devise a Plan of Study to be cleared by the steering committee. Each semester, every GC Scholar must meet with their mentor at least once to give an update of their progress. The student's Plan of Study will be a dynamic document to account for unforeseen adjustments in the curriculum. The Plan will be finalized in the second to last semester before the student's graduation. At that point, the document will outline the fulfillment of all the criteria set forth by the GCS Program and a GC Portfolio will be created by the student to thematically combine the components. The Portfolio will include a document relating their activities to a GC theme (or multiple themes), documentation of how the student completed the components, and the student's Plan of Study.

In order to keep students connected to other GCS alumni, OSU GC Scholars will be recommended to attend the annual NAE Grand Challenges Summit in order to network with their peers, industry leaders, and members of academia. Direct financial assistance for attendance is not available through the university, however, the College of Engineering helps support those with unmet financial need.

Students graduating with GCS distinction will be given a Grand Challenge Scholars Certificate from the National Academy of Engineering and will receive a transcript designation of "NAE Grand Challenge Scholar" upon graduation.

Appendices:

- 1) Bingo Sheet for Advisors
- 2) Bingo Sheet for Students
- 3) Home page from website description of NAE Grand Challenge Scholars Program
- 4) GCSP National Steering Committee
- 5) Email from Dr. Jenna Carpenter indicating steering committee approval
- 6) Letter of Support from Fisher College of Business
- 7) Grand Challenge MOU sent to President Obama
- 8) Sample CBE and ECE curricula showing overlap between ENGR Honors Contract and GCSP

<b>Bingo Sheet for Advisors</b>					
<b><u>Depth of Engagement</u></b>	<b><u>Research</u></b>	<b><u>Interdisciplinary Curriculum</u></b>	<b><u>Entrepreneurship</u></b>	<b><u>Global Component</u></b>	<b><u>Service Learning</u></b>
<b>In-Depth Research Component (2)</b>	<ul style="list-style-type: none"> <li>- Senior Capstone</li> <li>- Equivalent 270 Hours of Research Work</li> <li>- Complete ≥ 8 Week GC Focused Research Internship/Co-op</li> <li>- Complete ≥ 8 Week GC Focused REU</li> </ul>	<ul style="list-style-type: none"> <li>- Complete ≥ 3 Approved Courses</li> </ul>	<ul style="list-style-type: none"> <li>- Placing in a Business Plan Competition</li> <li>- Involvement in the C.A.S.T. Program</li> <li>- Complete Minor in Business, Economics, or Entrepreneurship &amp; Innovation</li> <li>- Complete ≥ 3 Approved Courses</li> <li>- Complete ≥ 8 Week Immersion Experience in Business</li> </ul>	<ul style="list-style-type: none"> <li>- International Internship</li> <li>- Internship w/ Int'l Focus</li> <li>- Minor in Int'l Studies</li> <li>- Complete OSU's GO ENG Program</li> </ul>	<ul style="list-style-type: none"> <li>- 2 Years Involvement in Service Oriented Groups</li> <li>- Service-Oriented Study Abroad or Project (&gt; 3 Weeks)</li> </ul>
<b>Medium-Depth Components (2)</b>		<ul style="list-style-type: none"> <li>- Complete ≥ 2 Approved Courses</li> </ul>	<ul style="list-style-type: none"> <li>- Participating in a Business Plan Competition</li> <li>- Participating in the B.O.S.S. Program</li> <li>- Significant Involvement in Business/Entrepreneurship Organization</li> <li>- Complete 2 Approved Courses</li> <li>- Complete &lt; 8 Week Immersion Experience in Business</li> </ul>	<ul style="list-style-type: none"> <li>- Short International Internship</li> <li>- Short Internship w/ Int'l Focus</li> <li>- Int'l Service Project</li> </ul>	<ul style="list-style-type: none"> <li>- 2 or More Buck-I-SERV Trips</li> <li>- 1 Semester Involvement in Youth Outreach Program</li> </ul>
<b>Minimum-Depth Component (1)</b>			<ul style="list-style-type: none"> <li>- Complete 1 Approved Course</li> </ul>	<ul style="list-style-type: none"> <li>- Involvement in an Int'l Project</li> <li>- Taking an approved course</li> <li>- Career Professional Report</li> </ul>	<ul style="list-style-type: none"> <li>- 1 Buck-I-SERV Trip</li> <li>- 30 Hours of Volunteer Community Service</li> </ul>

### Bingo Sheet for Students

Student Name:	Engineering Major:
GC Focus:	GC Faculty Advisor:

<u>Depth of Engagement</u>	<u>Research</u>	<u>Interdisciplinary Curriculum</u>	<u>Entrepreneurship</u>	<u>Global Component</u>	<u>Service Learning</u>
In-Depth Research Component					
Second In-Depth Component					
First Medium-Depth Component					
Second Medium-Depth Component					
Minimum-Depth Component					



## PREPARING THE NEXT GENERATION OF ENGINEERS

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The **National Academy of Engineering Grand Challenge Scholars Program** is a combined curricular and extra-curricular program with five components that are designed to prepare students to be the generation that solves the grand challenges facing society in this century.

In 2008, the NAE identified **14 Grand Challenges for Engineering** (<http://engineeringchallenges.org>) in the 21st Century. The Grand Challenges are a call to action and serve as a focal point for society's attention to opportunities and challenges affecting our quality of life.

[\(about\)](#)



[\(how-to-apply\)](#)



[\(students\)](#)

## PROGRAM COMPONENTS

### 1. RESEARCH EXPERIENCE

Project or independent research related to a Grand Challenge

### 2. INTERDISCIPLINARY CURRICULUM

Engineering+ curriculum prepares engineering students to work at the overlap with public policy, business, law, ethics, human behavior, risk as well as medicine and the sciences. Examples that span these disciplines with a coherent theme are Energy and the Environment, Sustainability, Uncertainty and Optimization, etc.

### 3. ENTREPRENEURSHIP

Preparing students to translate invention to innovation; to develop market ventures that scale to global solutions in the public interest

## AN OPEN INVITATION MAKE THIS A NATIONAL PROGRAM

Motivated by the National Academy of Engineering vision for the future and also by the increasing calls for a new engineering education paradigm, Duke's Pratt School of Engineering, The Franklin W. Olin College of Engineering, and the University of Southern California's Viterbi School of Engineering proposed this new education model to prepare engineers to be world changers. The program was endorsed by the National Academy of Engineering in February 2009.

Envisioned to initially attract and incent a select cadre of 20-30 students at each school, it is hoped that it will be replicated at many other outstanding engineering programs across the country to yield for the nation a pool of several thousand graduates per year uniquely prepared and motivated to address the most challenging problems facing the world and the nation. Moreover,

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## 4. GLOBAL DIMENSION

Developing the students' global perspective necessary to address challenges that are inherently global as well as to lead innovation in a global economy

## 5. SERVICE LEARNING

Developing and deepening students' social consciousness and their motivation to bring their technical expertise to bear on societal problems

Programs such as Engineers Without Borders or Engineering World Health may be adapted to satisfy this component and/or the Entrepreneurship component.

the program will also serve to pilot innovative educational approaches that will eventually become the mainstream educational paradigm for all engineering students.

It is anticipated that each participating institution will develop its own specific realization of the five components and that students who complete the program successfully will receive a distinction of Grand Challenge Scholar endorsed by their institution and the National Academy of Engineering.



## PREPARING THE NEXT GENERATION OF ENGINEERS

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## STEERING COMMITTEE

## CHAIR

**Jenna P. Carpenter**

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## COMMITTEE MEMBERS

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## Tomasko, David

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**From:** Jenna Carpenter <jenna@latech.edu>  
**Sent:** Friday, July 18, 2014 10:14 AM  
**To:** Tomasko, David  
**Cc:** Deep Shah (shah.713@buckeyemail.osu.edu); Neu, Adam R.; Ringel, Seth M.  
**Subject:** Re: OSU GCSP revisions

**Importance:** High

Dr. Tomasko, Deep, Adam and Seth,

It is my pleasure to inform you that the NAE Grand Challenge Scholars Program Steering Committee has approved the revisions to your proposal. Welcome to the NAE Grand Challenge Scholars Program family! Please note their comments, below. I do need a copy of your final operational document in order to update OSU's status on the GCSP website. Please forward that to me ASAP.

We will send out a note to the listserve. Do make sure that the appropriate person(s) have joined the listserve, since that is our primary mode of communication with GCSP programs.

If we can be of additional assistance, please let me know.

Congratulations!! We are looking forward to working with you.

Jenna

Ohio State has addressed the possibility for a student to revise the application and resubmit, which will assist in the development of this complex program, especially in the first years. For the Research Component, a grade and credit option is now offered- you might want to consider requiring the grade be a B or higher, to maintain quality in the program. (Currently a grade of C or higher is listed, or the research can be taken pass/fail, which is an acceptable option for Ohio State and this pass/fail option should be retained). The Entrepreneurship component now has a review process for experiences that are undefined, and they will be reviewed by the Scholar's GC Mentor for quality and appropriateness. The Service Learning Component is more fully described with specific time requirements for each of the three possible levels, and this is a significant clarification and strengthening of this component. If University approval for the addition of the NAE Grand Challenge Scholar designation on the transcript is obtained, it would be good to update the operating document to reflect that.

On 4/29/14, 7:53 PM, Tomasko, David wrote:

Jenna,

Attached is a revised proposal that the students and I have worked on. The pdf is a presentation highlighting our changes. Two of the students will be at the meeting tomorrow and perhaps we could find some time to discuss.

Cheers,  
David



**David L Tomasko**

Associate Dean for Undergraduate Education & Student Services, **College of Engineering**

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Dr. Jenna P. Carpenter

Associate Dean, Undergraduate Studies

Wayne and Juanita Spinks Professor

Director, Office for Women in Science and Engineering

College of Engineering and Science

Louisiana Tech University

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Ruston, LA 71272

(318) 257-2101

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December 9, 2014

Dear David,

The Fisher College of Business fully supports the NAE Grand Challenge Scholars Program proposal from the College of Engineering.

Historically, we have seen more engineering students than any other major completing the Business minor, and engineering students are the second highest in number of students (behind our own business students) to complete the entrepreneurship minor. We expect the newly revised Entrepreneurship & Innovation minor to attract even more engineers given that the College of Engineering represents one of the three pillars in its development.

The Fisher College welcomes the NAE Grand Challenge Scholars and will do all we can to make sure there is room for them in the business courses listed in the proposal.

Sincerely,

Patricia West  
Associate Dean of Undergraduate Programs



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



## U.S. Engineering School Deans' Response to President Obama on Educating Engineers to Meet the Grand Challenges

July 2014

Responding to the Presidential call for our nation to lead the way in addressing 21<sup>st</sup>-century Grand Challenges, we, the undersigned deans of engineering schools across the United States, commit to educate a new generation of engineers expressly equipped to meet societal challenges identified through national initiatives including the White House Strategy for American Innovation, the National Academy of Engineering Grand Challenges for Engineering, and the United Nations Millennium Development Goals. These challenges include complex yet vital aspirations such as reverse-engineering the brain, making solar energy cost-competitive with coal, engineering better medicines, providing access to clean water for nearly a billion people who lack it, ending extreme poverty and hunger, securing cyberspace, and advancing personalized learning tools that deliver better education to more individuals.

We affirm the importance of such aims as a reflection of our core values, as a source of inspiration for drawing a generation to the call of improving the human condition, as a driver for our national and world economies, and as essential to U.S. and global security, sustainability, health, and joy of living in the decades ahead.

We further note that achieving these Grand Challenges requires technology and engineering, but that none can be solved by engineering alone. Hence, there is a crucial need for a new educational model that builds upon essential engineering fundamentals to develop students' broader understanding of behavior, policy, entrepreneurship, and global perspective; one that kindles the passion necessary to take on challenges at humanity's grandest scale.

Recognizing the urgency to prepare engineering students with the skillset and mindset to meet Grand Challenges over the course of their careers, the undersigned colleges/universities commit to establishing at each of our institutions a program that integrates the following key elements:

- **A creative learning experience connected to the Grand Challenges** such as research or design projects
- **Authentic experiential learning with clients and mentors that includes interdisciplinary experience** in fields such as public policy, business, law, medicine, ethics, and communications
- **Entrepreneurship and innovation experience** such as the start-up of a new venture, dissemination of technology, or coursework in entrepreneurship
- **Global and cross-cultural perspectives** gained through experiences that promote involvement with globally complex issues in unfamiliar environments, such as a semester abroad
- **Development of social consciousness through service-learning**, such as problem-based community projects that foster an appreciation of the impact of engineering and its role in serving human welfare and the needs of society

We will ensure that students in this program have *expertise* in one or more of these areas and *exposure or experience* in each of the others, providing opportunities for them to reflect on how such combined capabilities can empower them to become leaders in addressing societal challenges in the U.S. and abroad.



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



We also commit to development and sharing of open educational resources that will inspire and empower more students to address Grand Challenges.

A measure of success will be the flourishing of hundreds of successful projects across the nation and globe, each benefitting a community while ultimately leading to solutions for the Grand Challenges themselves.

Over the course of the next decade, we commit to graduating from each of our institutions a minimum of 20 students per year who are prepared with this unique combination of skills, motivation, and leadership to address the Grand Challenges for Engineering of the 21<sup>st</sup> century. These 10,000 formally recognized “Grand Challenge Engineers” will produce a “halo effect” that benefits the education of *all* students, engineers and non-engineers alike, and ultimately *all* people. Like “the 300” of ancient Sparta, whose special training and motivation saved a civilization, we envision the power of the 10,000 Grand Challenge Engineers to change the course of our civilization.

Finally, in order to facilitate an exponential expansion of this revolutionary movement in higher education, we are committed to sharing information with each other and the Administration about new and existing initiatives on our campuses in order to nurture development of Grand Challenge Engineers and ultimately address the 21<sup>st</sup> century’s Grand Challenges for Engineering.

Signed:

Paul C. Johnson, Dean  
Ira A. Fulton Schools of Engineering  
**ARIZONA STATE UNIVERSITY**

Lex A. Akers  
Founding Dean of Engineering  
and Technology  
Caterpillar College of  
Engineering and Technology  
**BRADLEY UNIVERSITY**

Keith W. Buffinton, Dean  
College of Engineering  
**BUCKNELL UNIVERSITY**

James H. Garrett, Jr., Dean  
College of Engineering  
**CARNEGIE MELLON  
UNIVERSITY**

Anand K. Gramopadhye, Dean  
College of Engineering and Science  
**CLEMSON UNIVERSITY**

Kevin L. Moore, Dean  
College of Engineering and  
Computational Sciences  
**COLORADO SCHOOL OF MINES**



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



Joseph J. Helble, Dean  
Thayer School of Engineering  
**DARTMOUTH COLLEGE**

Joseph Blake Hughes, Dean  
College of Engineering  
**DREXEL UNIVERSITY**

Thomas Katsouleas  
Vinik Dean of Engineering  
Pratt School of Engineering  
**DUKE UNIVERSITY**

*Richard A. Behr*

Richard A. Behr, Dean  
U.A. Whitaker College  
of Engineering  
**FLORIDA GULF COAST  
UNIVERSITY**

Vincent P. Manno  
Provost and Dean of Faculty  
**FRANKLIN W. OLIN COLLEGE  
OF ENGINEERING**

Kenneth S. Ball, Dean  
Volgenau School of Engineering  
**GEORGE MASON UNIVERSITY**

Gary Stephen May, Dean  
College of Engineering  
**GEORGIA INSTITUTE  
OF TECHNOLOGY**

Lorraine N. Fleming, Dean  
College of Engineering, Architecture  
and Computer Sciences  
**HOWARD UNIVERSITY**

Natacha DePaola  
Carol and Ed Kaplan Armour  
Dean of Engineering  
Armour College of Engineering  
**ILLINOIS INSTITUTE  
OF TECHNOLOGY**

Dr. Robert Kolvoord, Dean  
College of Integrated Science  
and Engineering  
**JAMES MADISON UNIVERSITY**

Hisham Hegab, Dean  
College of Engineering & Science  
**LOUISIANA TECH UNIVERSITY**

*Richard Plumb*

Richard Plumb, Dean  
Frank R. Seaver College of  
Science and Engineering  
**LOYOLA MARYMOUNT  
UNIVERSITY**





# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



Wayne D. Pennington, Dean  
College of Engineering

**MICHIGAN TECHNOLOGICAL  
UNIVERSITY**

Brian F. Martensen, Interim Dean  
College of Science, Engineering,  
and Technology

**MINNESOTA STATE  
UNIVERSITY, MANKATO**

Robin N. Coger, Dean  
College of Engineering

**NORTH CAROLINA  
AGRICULTURAL & TECHNICAL  
STATE UNIVERSITY**

Louis A. Martin-Vega, Dean  
College of Engineering

**NORTH CAROLINA  
STATE UNIVERSITY**

Gary R. Smith, Dean  
College of Engineering

**NORTH DAKOTA STATE  
UNIVERSITY**

Nadine Aubry, Dean  
College of Engineering

**NORTHEASTERN UNIVERSITY**

*Oktay Baysal*

Oktay Baysal, Dean  
Batten College of Engineering  
and Technology

**OLD DOMINION UNIVERSITY**

Leah H. Jamieson  
John A. Edwardson Dean  
of Engineering  
College of Engineering

**PURDUE UNIVERSITY**

Edwin L. Thomas  
William and Stephanie Sick  
Dean of Engineering  
George R. Brown School  
of Engineering

**RICE UNIVERSITY**

Harvey J. Palmer, Dean  
Kate Gleason College of Engineering

**ROCHESTER INSTITUTE  
OF TECHNOLOGY**

Thomas N. Farris, Dean  
School of Engineering

**RUTGERS UNIVERSITY**

Theodosios Alexander, Dean  
Parks College of Engineering,  
Aviation and Technology

**SAINT LOUIS UNIVERSITY**



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



Marc P. Christensen, Dean  
Bobby B. Lyle School of Engineering

**SOUTHERN METHODIST  
UNIVERSITY**

*Thomas R. Currin*

Thomas R. Currin, Dean  
Southern Polytechnic  
School of Engineering

**SOUTHERN POLYTECHNIC  
STATE UNIVERSITY**

S. Keith Hargrove, Dean  
College of Engineering

**TENNESSEE STATE UNIVERSITY**

Margaret Katherine Banks  
Vice Chancellor and  
Dean of Engineering  
Dwight Look College of Engineering

**TEXAS A&M UNIVERSITY**

Charles C. Nguyen, Dean  
School of Engineering

**THE CATHOLIC UNIVERSITY  
OF AMERICA**

*David B. Williams*

David B. Williams, Dean  
College of Engineering

**THE OHIO STATE UNIVERSITY**

Amr S. Elnashai  
Harold and Inge Marcus  
Dean of Engineering  
College of Engineering

**THE PENNSYLVANIA  
STATE UNIVERSITY**

Robert E. Johnson, Dean  
The William States Lee  
College of Engineering

**THE UNIVERSITY OF NORTH  
CAROLINA AT CHARLOTTE**

Nagi G. Naganathan, Dean  
College of Engineering

**THE UNIVERSITY OF TOLEDO**

*Nicholas J. Altiero*

Nicholas J. Altiero, Dean  
School of Science and Engineering

**TULANE UNIVERSITY**

Jeffrey B. Goldberg, Dean  
College of Engineering

**UNIVERSITY OF ARIZONA**

John R. English, Dean  
College of Engineering

**UNIVERSITY OF ARKANSAS**



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



Enrique J. Lavernia, Dean  
College of Engineering

**UNIVERSITY OF  
CALIFORNIA, DAVIS**

Albert P. Pisano, Dean  
Irwin and Joan Jacobs  
School of Engineering

**UNIVERSITY OF  
CALIFORNIA, SAN DIEGO**

Michael Georgiopoulos, Dean  
Engineering and Computer Science

**UNIVERSITY OF  
CENTRAL FLORIDA**

Babatunde A. Ogunnaiké, Dean  
College of Engineering

**UNIVERSITY OF DELAWARE**

Gary A. Kuleck, Dean  
College of Engineering and Science

**UNIVERSITY OF  
DETROIT MERCY**

Larry Stauffer, Dean  
College of Engineering

**UNIVERSITY OF IDAHO**

Andreas C. Cangellaris, Dean  
College of Engineering

**UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN**

Alec B. Scranton, Dean  
College of Engineering

**UNIVERSITY OF IOWA**

Hesham El-Rewini, Dean  
College of Engineering and Mines

**UNIVERSITY OF  
NORTH DAKOTA**

*Peter K. Kilpatrick*

Peter K. Kilpatrick  
McCloskey Dean of Engineering  
College of Engineering

**UNIVERSITY OF NOTRE DAME**

Eduardo D. Glandt  
Nemirovsky Family Dean  
School of Engineering  
and Applied Science

**UNIVERSITY OF  
PENNSYLVANIA**

Sharon A. Jones, Dean  
Shiley School of Engineering

**UNIVERSITY OF PORTLAND**



# EDUCATING ENGINEERS TO MEET THE GRAND CHALLENGES



Yannis C. Yortsos  
Zohrab Kaprielian Dean  
of Engineering  
USC Viterbi School of Engineering

**UNIVERSITY OF SOUTHERN  
CALIFORNIA**

Don Weinkauf, Dean  
School of Engineering

**UNIVERSITY OF ST. THOMAS**

Wayne T. Davis  
Wayne T. Davis Endowed  
Dean's Chair in Engineering  
College of Engineering

**UNIVERSITY OF  
TENNESSEE, KNOXVILLE**

Sharon L. Wood, Interim Dean  
Cockrell School of Engineering

**UNIVERSITY OF  
TEXAS AT AUSTIN**

Cristina Amon, Dean  
Faculty of Applied Science  
and Engineering

**UNIVERSITY OF TORONTO**

*Philippe M. Fauchet*

Philippe M. Fauchet, Dean  
School of Engineering

**VANDERBILT UNIVERSITY**

Candis Claiborn, Dean  
Voiland College of Engineering  
and Architecture

**WASHINGTON STATE  
UNIVERSITY**

Ralph S. Quatrano, Dean  
School of Engineering  
& Applied Science

**WASHINGTON UNIVERSITY  
IN ST. LOUIS**

Zeljko "Z" Torbica, Dean  
Leonard C. Nelson College of  
Engineering and Sciences

**WEST VIRGINIA UNIVERSITY  
INSTITUTE OF TECHNOLOGY**

*S. Hossein Cheraghi*

S. Hossein Cheraghi, Dean  
College of Engineering  
**WESTERN NEW ENGLAND  
UNIVERSITY**

*T. Kyle Vanderlick*

T. Kyle Vanderlick, Dean  
School of Engineering  
& Applied Science  
**YALE UNIVERSITY**

\*The Semester schedules for both the CBE and ECE students assumes that the student comes in with no AP credit. However, we do not expect that to be true for most Honors students.

OSU CHEMICAL ENGINEERING UNDERGRAD WITH GCS FOCUS: MAKING SOLAR ENERGY ECONOMICAL (SUSTAINABLE ENERGY)

Key  
GEC/GE - General  
Education Course

SEMESTER BINGO SHEET							
1st year	<b>Fall Semester</b>			<b>Spring Semester</b>			<b>Extracurricular Involvement</b> INVOLVEMENT WITH ENGINEERS WITHOUT BORDERS OR INVOLVEMENT WITH SOLAR EDUCATION OUTREACH - HAITI PROJECT OR INVOLVEMENT WITH GENERAL GLOBAL REACH
	Math 1161.02	Calculus I	5	Math 1172	Engineering Math A	5	
	Chem 1210	General Chemistry	5	Chem 1220	General Chemistry II	5	
	ENG 1191	Fundamentals of Engineering 1	2	ENG 1192	Fundamentals of Engineering 2	2	
	ENG 1100	Engineering Survey	1	Biology 2100 (Quantitative Biology)		4	
	CLASSICS 2200 - GEC		3				
	<b>Total</b>	<b>16</b>		<b>Total</b>	<b>16</b>		
2nd year	<b>Fall Semester</b>			<b>Spring Semester</b>			BUCK-I-SERV TRIP DURING SOPHOMORE YEAR
	Math 2177	Engineering Math III	4	Physics 1251	Physics II	5	
	Physics 1250	Physics I	5	Chem 2520	Organic Chemistry II	4	
	Chem 2510	Organic Chemistry I	4	CBE 2420	Transport Phenomena I	4	
	CBE 2200	Process Fundamentals	4	CBE 2523	Separation Processes	3	
	<b>Total</b>	<b>17</b>		<b>Total</b>	<b>16</b>		
3rd year	<b>Fall Semester</b>			<b>Spring Semester</b>			BUCK-I-SERV TRIP DURING JUNIOR YEAR
	Chem 4300	Physical Chemistry I	3	CBE 3610	Kinetics	4	
	CBE 3521	Transport Phenomena II	4	Chem 2540	Organic Chemistry Lab	2	
	CBE 3508	Thermodynamics	4	CBE 3631	Unit Operations Lab I	2	
	CBE 4999H	CBE Honors Research Thesis	3	Second Writing - DIVERSITY - Honors		3	
	English 1110.02H	First Year Writing	3	CRPLAN 3500	The Socially Just City (GEC & ID)	3	
	<b>Total</b>	<b>17</b>		<b>Total</b>	<b>17</b>		
4th year	<b>Fall Semester</b>			<b>Spring Semester</b>			INVOLVEMENT IN B.O.S.S PROGRAM
	CBE 4624	Process Dynamics and Control	3	CBE 4764	Process Simulation and Product Engineering	4	
	CBE 4760	Process Design, Economics, and Strategy	4	CBE Tech Elective		3	
	CBE 4999H	CBE Honors Research Thesis	3	ENR 2300	Environment and Societies (GEC & ID)	3	
	CBE 5772	Air Pollution (CBE TE & ID)	3	GEC - HISTORY		3	
	CBE 3631	Unit Ops Lab II	2	ETHICS 1332		3	
	<b>Total</b>	<b>15</b>		<b>Total</b>	<b>16</b>		

**Brutus CBE Honors Contract**

<b>Part A: Honors &amp; Graduate Coursework (points min: 18 hrs)</b>		
<b>Course</b>	<b>Credit Hours</b>	<b>Points</b>
1161.02	5	5
1172	5	5
1191	2	2
1192	2	2
1110H	3	3
2367.02H	3	3
<b>Total A</b>		<b>20</b>

<b>GCSP Aim</b>		
<b>In depth</b>	<b>Intermediate</b>	<b>Minimum</b>
Research	Service	Global
Interdisciplinary	Entrepreneuership	

<b>Part B: Investigational Studies (points min: 20)</b>	
<b>Activity</b>	<b>Points</b>
Honors Thesis	20
Present Denman	5
<b>Total B</b>	<b>25</b>

<b>Part C: Leadership &amp; Service (points min: 10)</b>	
<b>Activity</b>	<b>Points</b>
2 Buck-I-SERV	8 (80 hours community service)
Leadership on CoE Student Project team	5
<b>Total C</b>	<b>13</b>

<b>CONTRACT TOTAL</b>	<b>58</b>	50 pts min required
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\*The Semester schedules for both the CBE and ECE students assumes that the student comes in with no AP credit. However, we do not expect that to be true for most Honors students.

OSU ELECTRICAL ENGINEERING UNDERGRAD WITH GCS FOCUS: REVERSE ENGINEER THE BRAIN

**KEY**

**Global Dim** - Fulfills Global Dimension Component  
**TE** - Technical Elective  
**ID** - Counts towards Interdisciplinary Component  
**A&H** - Arts & Humanities  
**Social Sci** - Social Sciences

SEMESTER BINGO SHEET							
1st year	<b>Fall Semester</b>		<b>Spring Semester</b>		<b>Extracurricular Involvement</b>		
	Math 1161.02	Calculus I	5	Math 1172		Engineering Math A	5
	Chem 1250	Chem for Engineers	4	Physics 1260		Physics I	5
	ENG 1191	Fundamentals of Engineering 1	2	ENG 1192		Fundamentals of Engineering 2	2
	ENG 1100	Engineering Survey	1	First Year Writing - 1110			3
	Psych 1100		3	Honors 2396H		London Honors (Global Dim)	3
		<b>Total</b>	<b>15</b>			<b>Total</b>	<b>18</b>
2nd year	<b>Fall Semester</b>		<b>Spring Semester</b>		LEADERSHIP IN SERVICE ORG		
	Math 2568	Linear Algebra	3	Math 2415		Diff eq & Complex math	3
	Physics 1261	Physics II	5	ECE 2100		Intro to ECE II	4
	ECE 2000	Intro to ECE I	4	ECE 2560		Microcontrollers	2
	ENR 2100	Intro to Environmental Sci (TE & ID)	3	ECE 3030		Semiconductor Electronic Devices	3
	Tech Elec 2		3	Ling 2367.02		Language & Advertising (GE & 2nd Writing)	3
		<b>Total</b>	<b>18</b>			<b>Total</b>	<b>18</b>
3rd year	<b>Fall Semester</b>		<b>Spring Semester</b>		LEADERSHIP IN SERVICE ORG		
	Stats 3470	Probability & Statistics	3	ECE 3040		Engery & Power Systems (ID)	3
	ECE 3010	RF & Optical Engineering	3	ECE 5200		Digital Signal Processing	3
	ECE 3020	Intro to Electronics	3	ECE 5530		Fund of Semiconductors for Microelectronics	3
	ECE 3050	Signals & Systems	3	ENGR 2361		History of Ancient Engineering	3
	Yiddish 3371	Yiddish Literature (GE - A&H)	3	ECE 4999H		ECE Honors Thesis Research	3
	Tech Elec 4		3	Tech Elec 5			3
	<b>Total</b>	<b>18</b>		<b>Total</b>	<b>18</b>		
4th year	<b>Fall Semester</b>		<b>Spring Semester</b>		LEADERSHIP IN SERVICE ORG		
	ISE 2040	Engineering Econ	2	ECE 3551		Intro to Feedback Control Systems	3
	ECE 3080	Ethics & Professionalism	1	ECE 5137		Photonics Lab	0.5
	ECE 3090	Technical Writing	1	ECE 3027		Electronics Lab	0.5
	Econ 4100	Evolution of Economic Thought	3	SOCIOL 3302		Tech & Global Society (GE - Social Sci & Ethics)	3
	Theatre 2100	Intro to Theatre (GE - A&H)	3	BUSMHR 2500		Entrepreneurship	3
	ECE 5206	Medical Imaging & Processing	3	BUSMHR 3660		Innovation Practice	3
ECE 4999H	ECE Honors Research Thesis	3	Dance 2367	Writing about Dance	3		
	<b>Total</b>	<b>16</b>		<b>Total</b>	<b>16</b>		

Brutus ECE Honors Contract

Part A: Honors & Graduate Coursework (points min: 18hrs)		
Course	Credit Hours	Points
1161.02	5	5
1172	5	5
1191	2	2
1192	2	2
1160	5	5
2396H	3	3
1161	5	5
<b>Total A</b>		<b>27</b>

GCSP Aim		
In depth	Intermediate	Minimum
Reserarch	Interdisciplinary	Global
Service	Entrepreneurship	

Part B: Investigational Studies (points min: 20)	
Activity	Points
Honors Thesis	20
Present Denman	5
<b>Total B</b>	<b>25</b>

Part C: Leadership & Service (points min: 10)	
Activity	Points
2 yrs leadership in Service org	10
<b>Total C</b>	<b>10</b>

<b>CONTRACT TOTAL</b>	<b>62</b>	50 pts min required
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