FULFILLING GCSP COMPETENCIES

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NAE GRAND CHALLENGES SCHOLARS PROGRAM

WHAT AN HONOR AND A PLEASURE TO BE AN ENGINEER & AN ENGINEERING EDUCATOR!

TO ENGINEER IS HUMAN

ENGINEERING FROM 1964-2014

"*Scientists study the world as it is; engineers create the world that has never been.*"

-Theodore Von Karman

NAE
GRAND
CHALLENGES
SCHOLARS PROGRAM

AGENDA

- Beihang University and the School of General Engineering
- Challenges faced with launching GCSP
- Expectations from the program for students & faculty
- Implementing competencies
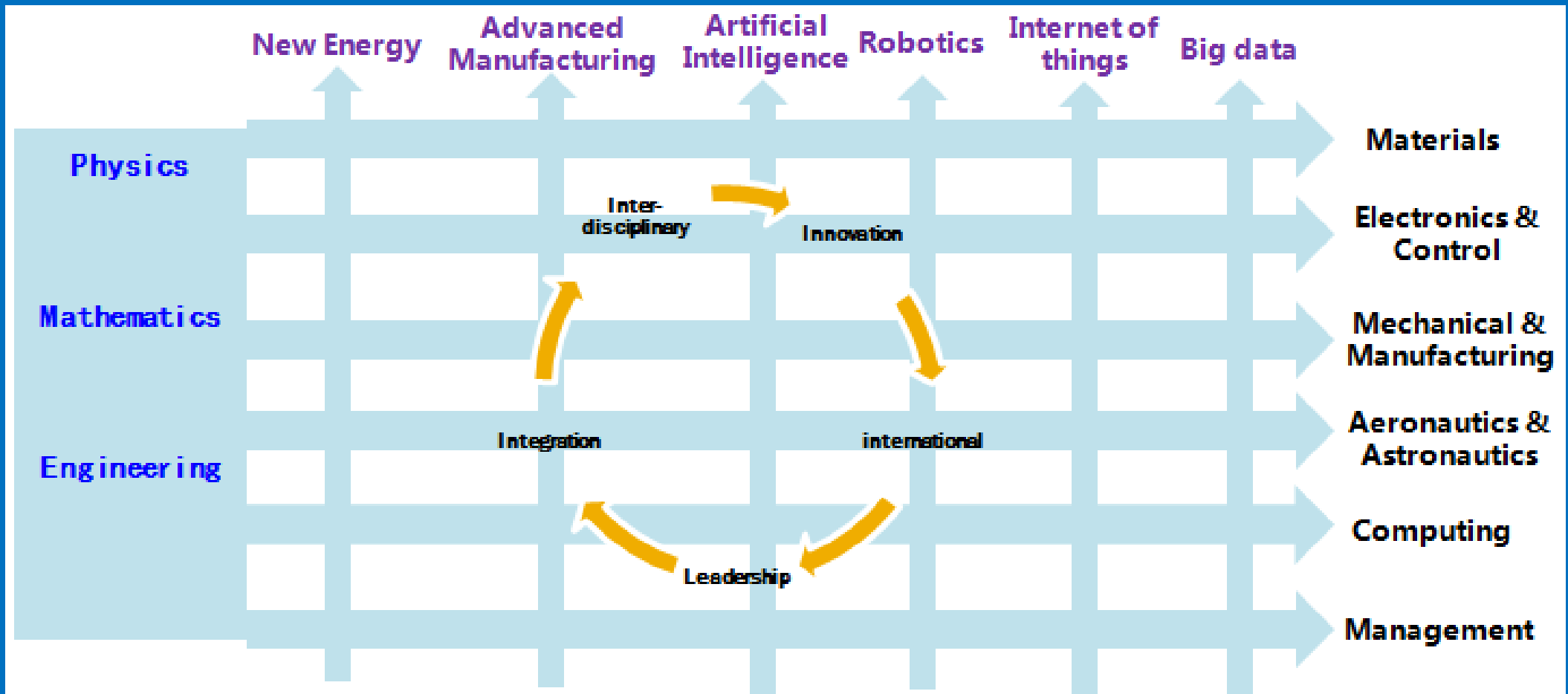- Supporting, mentoring, assessment progress

Engineering in the 21ˢᵗ Century

愿景：建设一流通用工程人才培养示范基地，培养具有全球视野、通专融合、系统创新能力的国际化工程领军人才。

Vision：To establish a leading engineering school in China to develop the I⁴L capabilities of students needed to tackle complex problems facing fast-changing world.

I4L

International
Innovation
Integration
Inter-disciplinary
Leadership

国际视野　通专融合　创新开放　领导领军　知行合一

目标定位|Goals

01 International 国际视野

Address local, national and global challenges and opportunities they will face in their careers 能够应对将来职业生涯中遇到的地域性、全国性、甚至是全球性的挑战和机遇。

02 Inter-disciplinary 通专融合

Apply current and innovative engineering technologies to **tackle complex and trans-disciplinary problems** 运用现有的创新工程技术，去解决（航空航天、机械、电子等多学科交叉融合的）复杂问题的能力。

03 Innovation 创新开放

Be creative and innovative **converting ideas into reality** 拥有创新精神，并将想法付诸实践。

04 Integration 知行合一

Provide quality service and contribute to the profession, the environment and society 提供优质服务，为所在行业、周围环境以及人类社会做出贡献。
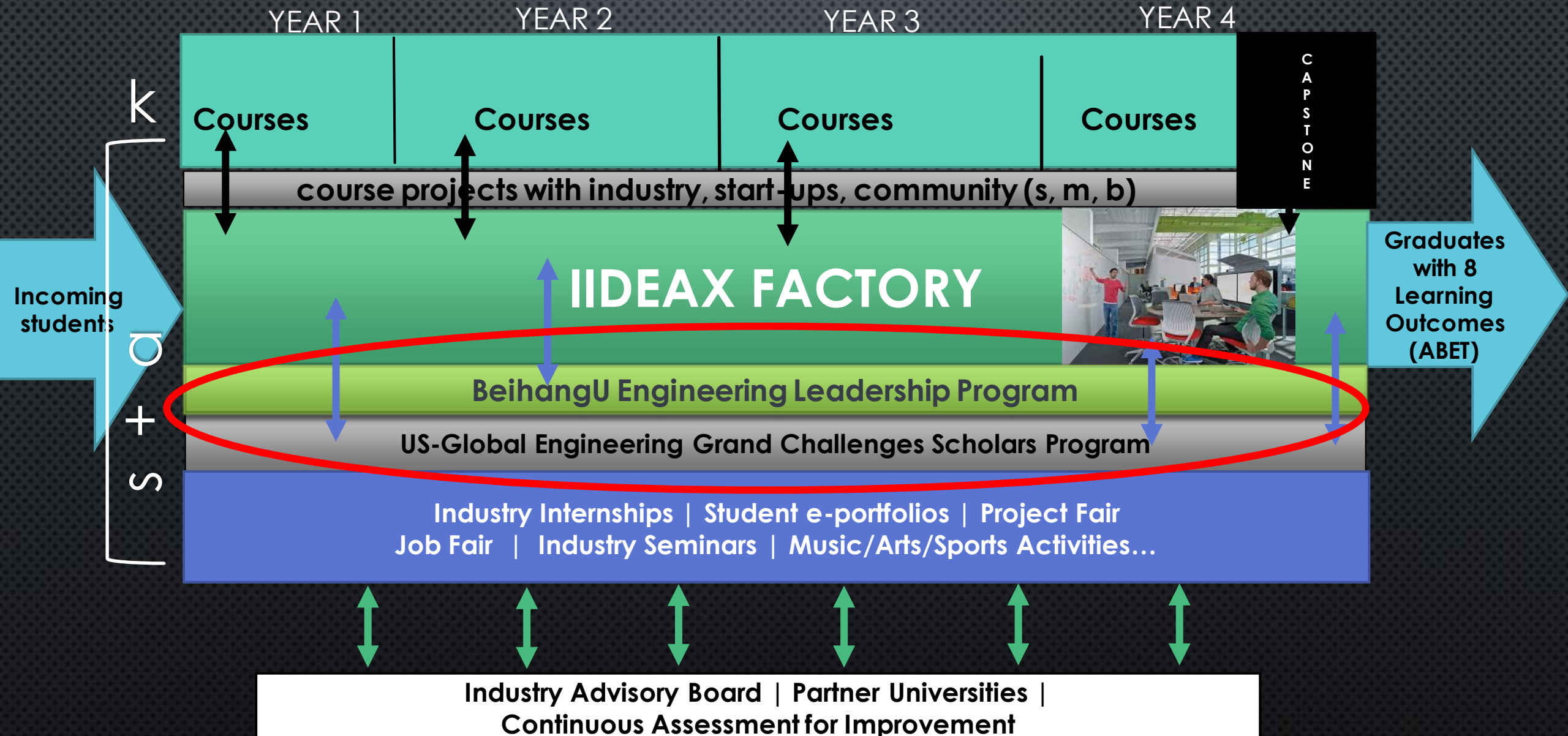
05 Leadership 领导领军

Be adaptive leaders that work effectively **in multidisciplinary teams in a multi-culture** and bilingual setting 成为适应力强的领导者，能够在双语环境下跨文化交流与多学科团队进行高效工作。

I⁴L

Beihang University SGE Curriculum Model

YEAR 1　　　　YEAR 2　　　　YEAR 3　　　　YEAR 4

k

| Courses | Courses | Courses | Courses | C A P S T O N E |

course projects with industry, start-ups, community (s, m, b)

a

IIDEAX FACTORY

Incoming students

BeihangU Engineering Leadership Program

US-Global Engineering Grand Challenges Scholars Program

Industry Internships | Student e-portfolios | Project Fair
Job Fair　|　Industry Seminars　|　Music/Arts/Sports Activities…

s + s

Graduates with 8 Learning Outcomes (ABET)

Industry Advisory Board | Partner Universities | Continuous Assessment for Improvement

Developing Engineering Leaders for the 21ˢᵗ Century

Lueny Morell

Vice Dean SGE

Top Key Leadership Competencies

Vision: Ability to create and share compelling image of the future

Initiative: Willingness to fulfill the vision through an appropriate course of action to move from abstraction to implementation

System Thinking: Understanding the linkages and interactions between the components that comprise the entirety of the system

Strategic Focus: Ability to look forward and see the bigger picture, to think at a higher level than what's on your daily action list

Resourcefulness: Willingness to embrace various views to respond to change, and take alternative courses of action when necessary

- Communication
- Interpersonal Skills
- Ethical Actions and Integrity
- Decision Making
- Responsibility and Determination
- Self-Awareness and Self-Improvement
- Engage and Connect
- Negotiate and Compromise

Engineering Leadership Certificate Program Summary
(4 badges; 4 credits)

BeihangU ELP Badge 1

BeihangU ELP Badge 2

BeihangU ELP Badge 3

BeihangU ELP Badge 4

Leadership Fundamentals I	Leadership Fundamentals II	Leadership Fundamentals III
1 credit	1 credit	1 credit
Summer 1	Summer 2	Summer 3
Delineate CEEL Profile & Launch PLDP	Leadership Feedback & PLDP Reassertion	Leadership Feedback & PLDP Closure
Emotional Intelligence (EI) Assessment	Emotional Intelligence (EI) Assessment - Follow-up	Leadership Development Labs
Leadership Development Workshops	Leadership Development Internship	
	Engineering Leader Interview	
Leadership Fundamentals IV		
1 credit		
Long-term project		
Major Project (GCSP or other approved)		

GCSP @ BEIHANG UNIVERSITY

Program approved in 2018

Open to **top students** in SGE and other schools' undergrads

Offers **alternative pathways** to fulfill competencies

Each competency earns a completion **"badge"**

北京航空航天大學
BEIHANG UNIVERSITY

CHALLENGES FACED IN LAUNCHING GCSP

- Making institutional decision to go ahead with the GCSP
  - Alignment with institutional vision
- Selecting the GCSP leadership team & GCSP leader
- Writing the proposal
  - GCSP themes (global and local themes)
  - How the institution can address the 5 competencies
  - Student selection process
  - Institutional support
- Selecting faculty mentors

PROPOSAL PROCESS

1 – Meeting and workshop with Rama to understand GCSP and proposal October 2017

GO AHEAD

2 – Identified Campus Coordinator. GC themes selection. Multidisciplinary team brainstormed how could students earn the 5 competencies
October 2017

STARTED PROPOSAL DRAFT

3 – Made list of possible elective courses, activities, application form, mentors' selection, assessment plan.
October – December 2017

PROPOSAL REFINED. TEAM EXPANDED

4 – Submitted proposal to US NAE
December-January 2018
FEEDBACK PROVIDED. PROPOSAL EDITED & RESUBMITTED

5 – Proposal Approved by US NAE
April 2018

6 – GCSP Program Kick-Off first student co-hort. Plan revision.

JULY 2018

ALIGNMENT OF GCSP GOALS WITH BEIHANG & SGE GOALS

BUAA-SGE/GCSP goals	International	Interdisciplinary	Integration	Innovation	Leadership
Research/Creative Project Experience		X		X	X
Multidisciplinary Curriculum		X			X
Business/Entrepreneurship	X		X	X	X
Global Dimension	X	X	X		
Service Learning	X		X		X

GCSP @ BEIHANG UNIVERSITY

Choices to comply with each of the competencies

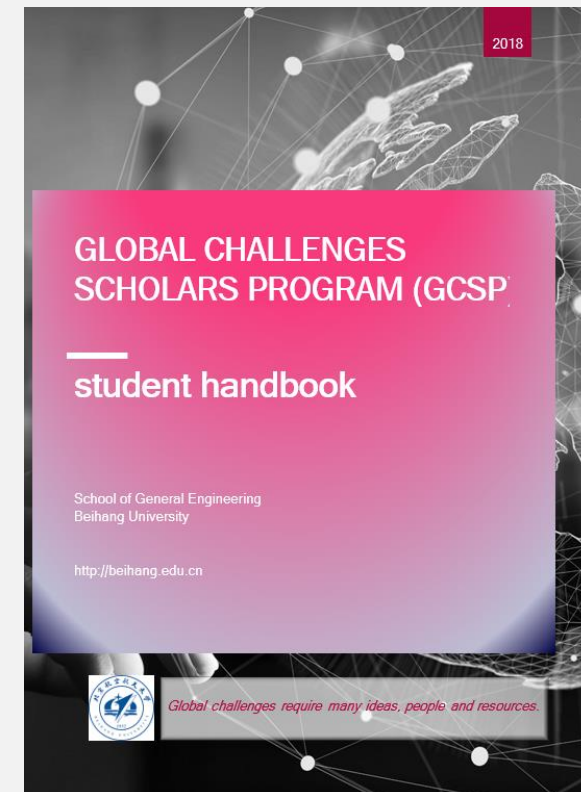| Competencies-Badges	Requirements
BADGE 1 Research/Creative Project Experience	**2 semester Senior Capstone Team Design Project** - a topic related to a GC theme chosen by the student. If the Senior Capstone Design Project is not related to a GC theme, a similar research/creative project experience (e.g., 2 semester undergraduate research experience project) may be approved by the GCSP Steering Committee.
BADGE 2 Multidisciplinary Curriculum	Courses: • Year 1- GCSP Introductory workshop with the goals of becoming aware of the program, the grand challenge, form teams and start the selection by each individual of a theme each team will address throughout the program. • Years 2-3: Take at least 1 elective course aligned with the chosen GC. See lists of courses and learning experiences students at BUAA that students may choose in one of the sections of this Handbook.
BADGE 3 Business/Entrepreneurship	• **Business/entrepreneurship** is covered under the Beihang **SGE Engineering Leadership** courses – See Appendix 4 for a description of this program And one of the followings in year 3 or 4: • Securing an **Internship** or other research experience and exploring active innovation, invention or related activity at Beihang University Science & Technology Park – See Appendix 5 for a description. • Become a member of **BUAA's Entrepreneur Club** – See Appendix 5 for description. • Participate in an approved local, national or international **Business Plan Competition** (e.g., China Challenge Cup entrepreneurship plan Competition, International Collegiate & Design Innovation Competition, etc.)
BADGE 4 Global Dimension	One of the followings: • Participate in Beihang SGE Summer School with international students and native high school students. The program for the Summer school will include development of a **GC Outreach Package** (ppt, videos, brochure, etc.) that will be used to share the GC Challenges to high school students in China in the following year. • Spend a one semester overseas and have a cultural experience in addition to technical courses – See Appendix 6 • Participate in an approved overseas competition (e.g., Robot competition, mathematical modeling contest, etc.) • Participate in an international Summer School in a foreign university or at BUAA
BADGE 5 Service Learning	One of the followings: • Be a member of the BUAA GCSP Student Club which would gather all students that elect to participate in the GC program (to be established) • Participate in the **GC Outreach Program** to middle and high schools in Beijing and throughout China (see above).

(Overlaid annotations):
- research or applied project
- workshop + elective course
- ELP + business competition, MOOC
- Internship, Int'l Summer School
- GCSP Club, outreach to hi-school

GCSP Steering Committee	Name	Email
Dean of SGE	Dongsheng Wen	d.wen@buaa.edu.cn
Vice Dean of SGE	Lueny Morell	lueny.morell@gmail.com
GCSP Director	Guangcun Shan	gcshan@buaa.edu.cn
GCSP faculty members	Name	Email
	Yang Liu	Liuyang15@buaa.edu.cn
	Yu Jingjun	jjyu@buaa.edu.cn
	Li Min	limin@buaa.edu.cn
	Zhang Youguang	zyg@buaa.edu.cn

Welcome to the Global Engineering Challenges Scholars Program

Lueny Morell
Vice Dean SGE
President InnovaHiEd
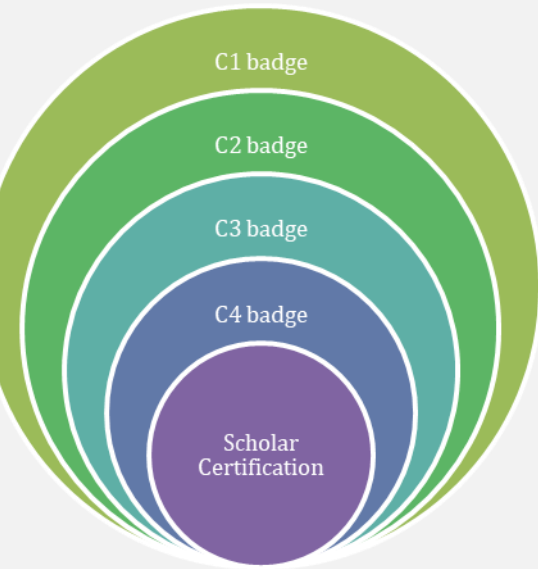
MENTORS		School	Email
1	Dongsheng Wen	School of General Engineering	d.wen@buaa.edu.cn
2	Haiyun Zhao	School of General Engineering	hyzhao@buaa.edu.cn
3	Guangcun Shan	School of Instrumentation Science and opto-electronic Engineering	gcshan@buaa.edu.cn
4	Jie Liang	School of Environmental Engineering	jieliang@buaa.edu.cn
5	Mingjun Hu	School of Material Science and Engineering	mingjunhu@buaa.edu.cn
6	Shuling Hu	School of Instrumentation Science and opto-electronic Engineering	hulxi@buaa.edu.cn
7	Yvru Zhang	School of Mechanical Engineering and Automation	yuru@buaa.edu.cn
8	Lei Peng	School of Electronic and Information Engineering	Peng.lei@buaa.edu.cn
9	Hua Tian	School of Humanities and Social Sciences	tianlily@sina.com
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11	Yang Jun	School of Chemistry	yangjun@buaa.edu.cn
12	Li Songmei	School of Material Science and Engineering	songmei_li@buaa.edu.cn
13	Bai Ming	School of Economics and Management	baimingbm@buaa.edu.cn
14	Jia Guozhu	School of Economics and Management	jiaguozhu@buaa.edu.cn
15	Diao Xungang	School of Physics and Nuclear Energy Engineering	diaoxg@buaa.edu.cn

C1 badge
C2 badge
C3 badge
C4 badge
Scholar Certification

2018

GLOBAL CHALLENGES SCHOLARS PROGRAM (GCSP)

—

student handbook

School of General Engineering
Beihang University

http://beihang.edu.cn

Global challenges require many ideas, people and resources.

COURSE PROPOSAL ---- Energy and Environment Grand Challenge Theme for GCSP		
1	B2F020170	Electromagnetic Energy and Electromagnetic Interference
2	B2G010130	Cleanliness Production and Sustainable Development
3	B2G050140	Fundamental Hydrodynamic
4	B2F050140	Introduction to Energy Science
5	B2G560360	Foundation of Entrepreneurship
6	B2G600170	Modern International Politics
7	B2F270130	Optoelectronic Polymer Materials and Applications
8	B2F270140	Nanoscience and Nanotechnology in Human Life

List of Course Electives by GCSP Theme

Student Application Form

The BUAA Grand Challenge Scholars Program

Please fill in the below form for your application for the BUAA Grand Challenge Scholars Program. When you have completed this application, please send the **form** as well as your application **essay** and one **recommendation letter** to gcshan@buaa.edu.cn.

Name: _____   School: _____

Phone: _____   Anticipated graduation year: _____

GPA: _____   Email: _____

Dean of SGE: _____ （signature）

If you are not an SGE student,

the Dean: _____ （signature）

Which Grand Challenges(s) most interest you? Please put a number next to the GC that you think you might be interested in. Number 1 indicates the most interested one, and 2 as the next favorite and so on.

Grouped into four larger themes, these challenges are:

ASSESSMENT –
A TEAM EFFORT

Five Competencies Badges	Requirements	Date of Completion for Competency Badge	Evaluation (grade from 1 to 5, deficient to excellent)
C1 - Research Experience/ Hands-on Project	__ 2 semester Senior CAPSTONE Team Design Project - a topic related to a GC theme chosen by the student. __ CAPSTONE Design Program __ Similar research/creative project experience (e.g., 2 semester undergraduate research experience/project) may be approved by the GCSP Steering Committee, if the Senior Capstone Design Project is not related to a GC theme.		
C2 - Interdisciplinary Curriculum	__ Year 1- GCSP Introductory workshop with the goals of becoming aware of the program, the grand challenges, form teams and start the selection process for the theme each team will address throughout the program __ Year 2-3 -at least 1 elective course aligned with the chosen GC to fulfil the interdisciplinary exploration		
C3 - Entrepreneurship	__ Business/entrepreneurship is covered under the Beihang SGE Engineering Leadership courses __ Securing an internship or other research/project experience that explicitly involves innovation, invention or related activity at Beihang University Science & Technology Park __ Become a member of BUAA's Entrepreneurs Club __ Participate in a BUAA Business Plan Competition		
C4 - Global Perspective	__ Beihang SGE Summer School with international students and native high		

GCSP PLANNING

Year 1		Years 2 - 4	
Apply for the GCSP Program and Club Badge 5 TODAY		Internship, or Entrepreneurs Club or Business Plan Competetion Badge 3	
Leadership Fundamentals I DONE	Leadership Fundamentals II	Leadership Fundamentals III	
Participate in the GC Outreach Program to middle and high schools in Beijing and throughout China Badge 5 WINTER OR SUMMER HOLIDAY		One of the following: 1) Participate in Beihang SGE Summer School with international students and native high school students; 2) Spend one semester overseas and have a cultural experience in addition to technical courses; 3) Participate in an approved overseas competition; 4) Participate in an international Summer School in a foreign university or at BUAA. Badge 4	
Take GCSP Basics Workshop (or any other Project) TODAY	Take GCSP Topic elective Badge 2		
Apply for the GCSP Program			
Form project teams DONE			
Select GCSP other Project Topic DONE	Work on project	Work on project (year 3 or year 4) Badge 1	Work on project (year 3 or year 4) Badge 1
Select Mentor for Group DONE	Project Report (poster, oral presentation & written report)		

STUDENT PROJECTS @ 2019

Research project topic	Number of students	Research GCSP areas
Virtual reality modeling technology based on tactile texture feedback	5	Enhance Virtual Reality
Bionic flapping wing drone	4	Engineer the tools of scientific discovery
Energy-saving Room with Smart Window	5	Make solar energy economical
Small photovoltaic/photothermal/green building integration energy storage systems	5	Make solar energy economical
Variable stiffness serpentine arm robot	5	Engineer the tools of scientific discovery
Intelligent Home Care Monitoring System for Elderly People	5	Advance health informatics

Vice Dean of Engineering SGE and the GCSP Coordinator

HOW CAN WE FULFILL THE GCSP COMPETENCIES?

RESEARCH/CREATIVITY : DEPTH

MULTI-DISCIPLINARITY : BREADTH
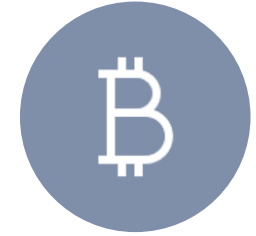
BUSINESS/ENTREPRENEURS HIP : VIABILITY

GLOBAL/MULTICULTURAL : PLANETARY VISION

SOCIAL CONSCIOUSNESS : DESIRABILITY

NAE GRAND CHALLENGES SCHOLARS PROGRAM

RESEARCH/CREATIVITY

All the Grand Challenges are complex and most probably cannot be solved in a short time and take multiple stakeholders to work together. But, you can…

- Have undergraduate students participate in on-going R&D projects aligned with the GC

- Have students undertake the GC as their capstone project

- Have the GC themes vertically integrated throughout the curriculum (VIP approach - vertically integrated projects). http://vip-consortium.org/

- Or, any other research/project initiative that provides students with an in-depth GC solution experience

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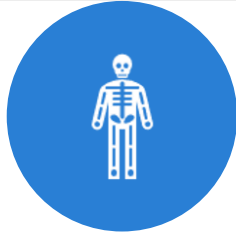
MULTI-DISCIPLINARITY

GC solutions are complex and multi-disciplinary, so students MUST have a multidisciplinary learning experience related to the GC topic they have chosen.

- Open the CGSP to all disciplines

- Have students take courses and learning experiences from various disciplines.

- Students work projects in multi-disciplinary teams

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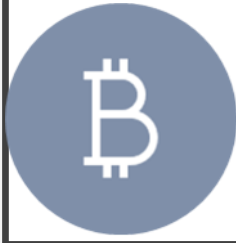
BUSINESS/ENTREPRENEURSHIP

GC solutions may result in a new idea, a new business. Students need to learn about business & entrepreneurship.

- Business & entrepreneurship competitions, clubs

- Business & entrepreneurship courses, workshops, MOOCs

- Internships, projects with start-ups or companies developing new products/services

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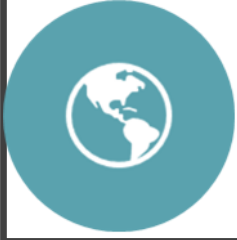
GLOBAL/MULTICULTURAL

GC need all ideas around the globe to be solved. Students need to have a global/multicultural experience to be able to develop their abilities to collaborate with others (students, industry, governments, NGOs) around the world.

- Internships, COOP experiences in other countries, or in-situ with international students/faculty

- Multicultural experiences within regions or country

- Collaboration in project/research work in other countries

- iPODIA-type of multinational, multidisciplinary project-based learning. http://ipodialliance.org/http://ipodialliance.org/

- Engineers Without Borders (www.ewb-usa.org)

- …

SOCIAL CONSCIOUSNESS

GC addresses many problems/opportunities that will enhance the well being of society in general. Students need to have an experience that links them to the community (local and global) to be able to become aware, define and collaborate with them.

- Internal (within university) & external (other universities) GCSP awareness & student recruitment

- Interaction with and capacity building (workshops, seminars, materials, etc.) for elementary, middle and high school students & teachers

- Service Learning – like EPiCS (www.epics.purdue.edu)

- Engineering Without Borders (www.ewb-usa.org)

- …

ANOTHER WAY… CURRICULUM TRACKS
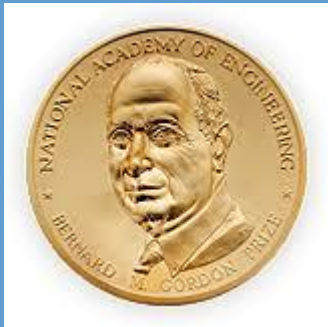
Learning Factory© Model

US NAE Gordon Prize 2006

Allen Soyster, John Lamancusa, Lueny Morell, José Zayas, Jens Jorgensen
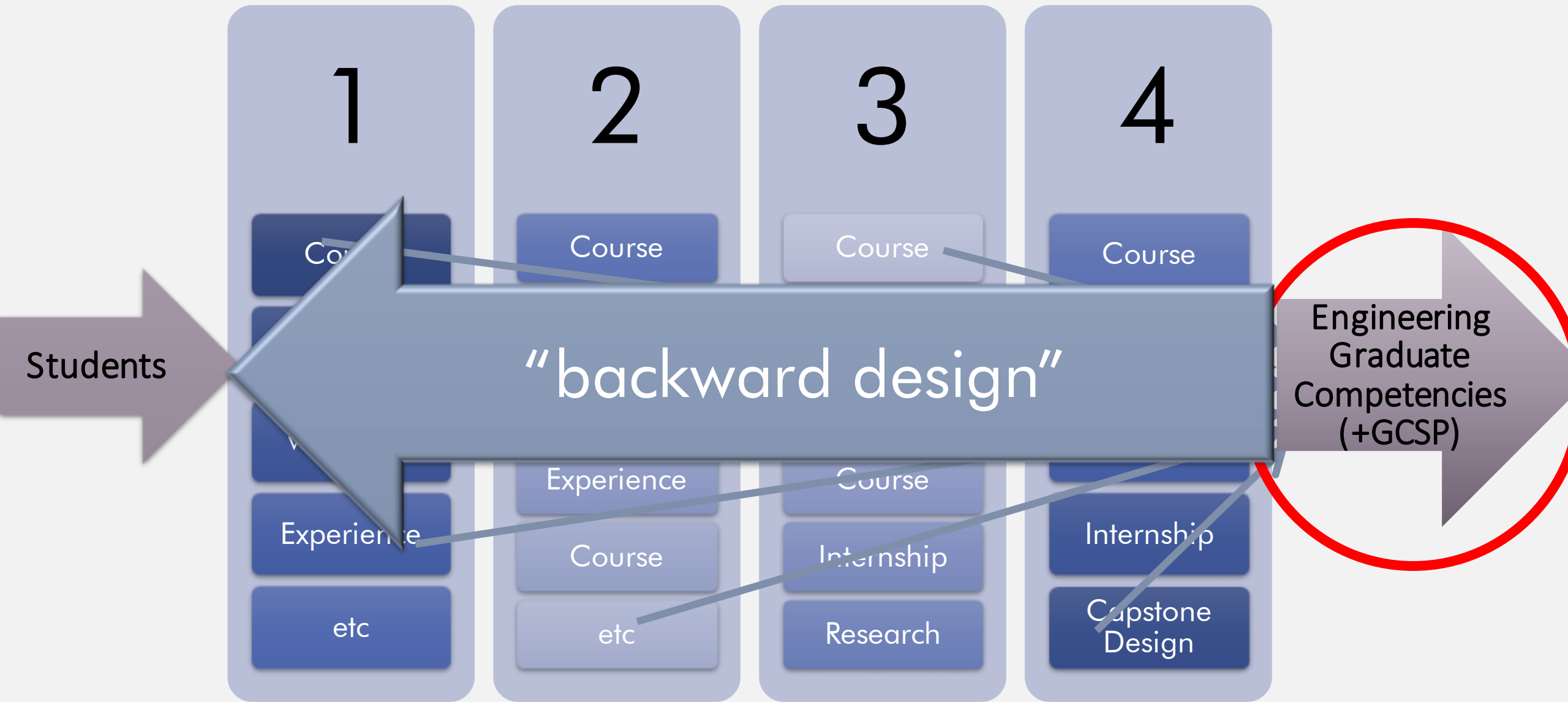
GC THEMES 'TRACKS'

Sanitation Track, Clean Water Track, Cybersecurity Track...

Vertically Integrated

- Major research or capstone project (poster presentations, possible int'l collaboration thru iPodia, etc.))

- Entrepreneurial experience (participate in business plan competitions, take a MOOC on business start-ups, internship with start-up)

- International experience (iPodia, ICTIEE multinational student GC-related activity, seminar, workshop, poster session, etc.)

- Service-learning activity (perhaps EPiCS, promote GCSP in other universities, visit high schools for GC awareness, show videos, create flyers)

- 2 elective courses (to select from a multidisciplinary list)

WWW.INNOVAHIED.COM/SHOP

proceedings will go to scholarship fund

ESSENTIALS FOR INNOVATING ENGINEERING & RELATED CURRICULA
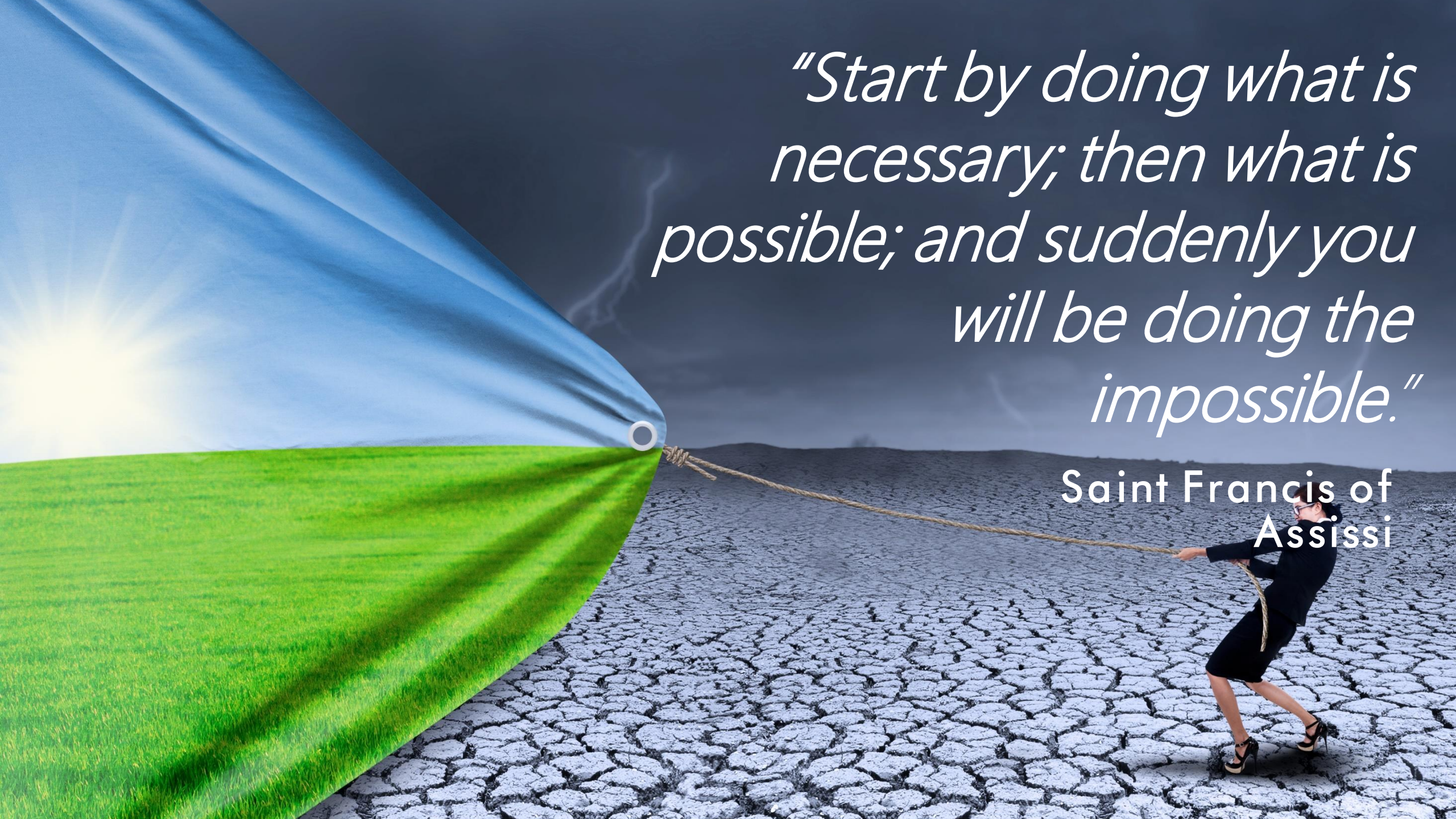
A must reference guide to navigate through a vital process

By Lueny Morell, MS, PE, IGIP.Ing.Paed
© InnovaHiEd, 2017

www.igip.education

"Start by doing what is necessary; then what is possible; and suddenly you will be doing the impossible."

Saint Francis of Assissi

GRACIAS, OBRIGADA
THANK YOU

Questions?

ELEMENTS OF A SUCCESSFUL PROGRAM

- Focus on leadership and its relevance and integration with GCSP
- Institutional alignment and support
- Selecting the right leader
- Industry engagement
- Locally/globally themes
- Locally pertinent and globally competent engineers