Hub Center for implementing 4C in Innovation of Engineering Education

(Creativity, Convergence, Communication, Culture)
Yeungnam University Hub Center for Eng. Edu.
Participating in Universities: 11

Cooperative Universities: 8
- Mokwon U, Hannam U (in 2013)
- Sangji U (in 2014)
Background

Hub Center for Implementing 4C in Innovation of EE
(Creativity, Convergence, Communication, Culture)

2nd Phase Hub Center of Engineering Education

- Providing Vision and Goal of Innovation of Engineering Education
- Leading and Supporting Universities in Embodying Innovation Agenda
- Developing Platform for Cooperation among Univ., Industries, and Local Gov.
- Pioneering Development, Operation, Outcomes Propagation of Creative and Convergence Programs

1st Phase Hub Center of Engineering Education

<Outcomes>
- Supporting Implementation of ICEEs
- Propagation of Innovation Programs
- Usage of Excellent Programs of Hub Center and Universities

<Limits>
- Limited Exchanges in Innovative Ideas
- Limited Connection with Global Leading Universities in Engineering Education
- Limited Visions and Innovation Agenda of Hub Center Projects
Vision System of Hub Center

Implementing 4C in Innovation of EE
(Creativity, Convergence, Communication, Culture)

Vision

Mission

Goals

Agenda

Creativity
Leading Creative Engineering Edu.

Convergence
Spreading Convergence in EE

Communication
Supporting Glocal EE Exchanges

Culture
Education Good Engineers

EE Innovations In Creativity Convergence

Hub Function of EE Innovation

Good Engineering

Fusion CDP Programs
Enhancing Creative Problem
Students with Hands-on Exp.
Exchanges in Innovation Outcomes
Establishing Glocal Network

Engineers With Good Characters
Human Nature Based on Tradition
The business schedule of the year 2013

Apr.
- YU Hub Center kick-off Workshop on Innovative Engineering Education

May.
- First Experiencing Korea Squire Culture Center

Jun.
- Participation in international conferences (ASEE Conference 2013)

Jul.
- 2013 International Capstone Exchange and Global Field Training Program in Engineering Education (Japan)
- 2013 International Capstone Design Project Camp
- 1st Science Concert / 2nd Science Concert

Aug.
- Participation in international conferences (IEEE TALE 2013)
- 2013 Engineering Ethics Education Workshop

Sep.
- Second Experiencing Korea Squire Culture Center
- 2013 Students’ Portfolios Fair

Oct.
- 2013 Capstone Design Fair
- 3rd Workshop on Innovative Engineering Education / 2013 Creativity·Convergence Camp

Nov.
- Convergence curriculum workshop for the creative economy
- 2013 Engineering Education Festival (E²FESTA 2013)

2014 Jan.
- 4th Workshop on Innovative Engineering Education
- The Fifth International Workshop on Innovative Engineering Education (IEE 2014)
- Global Field Training Program 『Automotive Industry in USA』 (Atlanta)
### 2nd year Project Goals (1)

<table>
<thead>
<tr>
<th>Goals I. Engineering Education Innovations In Creativity Convergence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goals</strong></td>
</tr>
</tbody>
</table>
| 1. Fusion CDP Programs | 1) 2013 International Capstone Design Project Camp | **Date:** Jul. 15 ~ Jul. 20, 2013  
**Place:** YU Campus  
**Theme:** Mini-Baja  
**Participants:** (Domestic Universities 42 students, South China University of Technology 9 students, Bangalore Institute of Technology 10 students), Total 61 students |
| | 2) 2013 Capstone Design Fair | **Date:** Sep. 10, 2013  
**Place:** Kumoh N.I.T  
**Content:** Reflect increasing demand in an industry  
**Effect:** Added-value Creation of the Korean Industry, Improve collaboration, Understanding of the other major |

**Design**  
**Processing**  
**Assembly**  
**Test**
## 2nd year Project Goals (2)

### Goals 1. Engineering Education Innovations In Creativity Convergence

<table>
<thead>
<tr>
<th>Goals</th>
<th>Project</th>
<th>Detail</th>
</tr>
</thead>
</table>
| 2. Enhancing Creative Problem Solving Capability | 1) Convergence curriculum workshop for the creative economy | Date: Nov. 21 ~ Nov. 22, 2013  
Place: Korea N.U.T  
Content: Workshop for Fusion Curriculum Development |
| | 2) The Fifth International Workshop on Innovative Engineering Education (IEE 2014) | Date: Jan. 8 ~ Jan. 10, 2014  
Place: Hyatt Regency Jeju  
Organized by: YU HCEE, Sungkunkwan Univ. HCEE, Chonbuk National Univ. HCEE |
| | 3) 2013 Creativity·Convergence | Date: Oct. 25 ~ Oct. 27, 2013  
Place: Commodore Hotel Gyongju  
Contents:  
- Educating Engineers with Creative Problem Solving Skill by using TRIZ Education  
- Lecture: Appropriate technology needed for Three countries (Bangladesh, Cambodia, Rwanda) by Park Chung Hee School of Policy and Saemaul Postgraduate students  
Theme: ‘Appropriate Technology’  
Participants: Engineering 74 students, Non-engineering 16 students, Total 90 Students |
Place: The University of Electro-communications Tokyo, Soka University (JAPAN)  
Visiting Companies: A AND A Co., Ltd. |
| | 2) Global Field Training Program『Automotive Industry in USA』 | Date: Jan. 14 ~ Jan. 20, 2014  
Visiting Companies: AJIN USA Industrial Co., Ltd, WOOSHIN USA Industrial Co., Ltd, Kia Motors Manufacturing Georgia, Mando AMERICA |
2nd year Project Goals (3)

Goals II. Hub Function of Engineering Education Innovations

<table>
<thead>
<tr>
<th>Goals</th>
<th>Project</th>
<th>Detail</th>
</tr>
</thead>
</table>
| 1. Exchanges In Innovation Outcomes | Workshop on Innovative Engineering Education | [KICK-OFF]
  Date: Apr. 4 ~ Apr. 5, 2013 / Place: Changwon Exhibition Convention Center / Theme: “Fashion and Convergence”
| | | [2nd Workshop]
  Date: Jul. 11 ~ Jul 12, 2013 / Place: Kangwon National University(Samchok) / Theme: “Humanity and Convergence”
| | | [3rd Workshop]
  Date: Oct. 22 ~ Oct. 25, 2013 / Place: Commodore Hotel Gyeongju / Theme: “Performance”
| | | [4th Workshop]
  Date: Jan. 7 ~ Jan. 8, 2014 / Place: Jeju Seogwipo KAL Hotel / Theme: “Performance Review”
| 2. Establish in Global Network | | Date: Mar. 5, 2014
Institutions: South China University of Technology (예정)
Shibaura Institute of Technology
Purpose:
1. Exchange of undergraduate students for international capstone design projects, study and research
2. Exchange of graduate and undergraduate students for study and research
3. Exchange of faculty members for research, lectures, and discussions
4. Exchange of academic materials and academic publications
5. Joint research activities

Signed a memorandum of understanding (MOU)
## Goals III. Good Engineering

<table>
<thead>
<tr>
<th>Goals</th>
<th>Project</th>
<th>Detail</th>
</tr>
</thead>
</table>
| 1. Engineers With Good Characters | 1) 2013 Engineering Ethics Education Workshop | **Date:** Aug. 30 ~ Aug. 31, 2013  
**Place:** Yonsei University Engineering Hall II  
**Auspice:** KSEE, YU HCEE, Yonsei University ICEE  
**Contents:** Korea Engineering Ethics Education Case Study, Course Operation, Deployment of education research, etc. |
**Contents:** Making 3D Robot, Making a ice cream, Freewheeler Experience, Perfume-making, etc. |
| | Andong Squire Culture Experience (Korea Traditional Culture) | **[1st] May 15 ~ May 16, 2013**  
**[2nd] Sep. 4, 2013**  
**Place:** Andong Dosan Squire Culture Center  
**Contents:**  
- Squire spirit lecture  
- Experience squire culture and tradition (Experiential Learning)  
- Tour famous places |
Major Programs (1) ICDP

Define, Design, Build, Test, Drive and Competition

* Capstone Design
  * Make it a Capstone Experience
  * Make it an Engineering Experience
    * Not an Craftsman Experience
  * Provide an Early Exposure
  * Provide Supports

* 2013 International Capstone Design Project Camp
Purpose
  * Understand and Practice Leadership
  * Improving Problem-solving skills
  * Improving Communication skills
  * Improving Intercultural understanding skills
  * Tied to student’s desires to help others
Capstone Design Projects Objectives

1. Good Design vs Good Design Experience
2. Complex Real Problems: Industry
3. Convergence: technology + liberal arts
   tech+
   - Form & Aesthetics (art)
   - Function, Usability & Interaction (technology+human)
   - Marketability, image & brand (business)
4. International Cooperation:
   - Global Market
5. Systematic and creative engineering design
Major Programs (1) ICDP

* **Date:** 15th(Mon.) ~ 20(Sat.) of July, 2013
* **Place:** Yeungnam University campus

< Learning Factory, Classroom, Dormitory >

* **Auspice:** Yeungnam University Hub Center for Engineering Education
* **Manage:** Yeungnam University Hub Center for Engineering Education,
  Gangneung-Wonju National University Innovation Center for Engineering Education,
  Kyungil University Innovation Center for Engineering Education,
  Keimyung University Innovation Center for Engineering Education,
  Andong National University Innovation Center for Engineering Education,
  Yeungnam University Innovation Center for Engineering Education,
  Changwon National University Innovation Center for Engineering Education

* **Corporate Sponsor:** HEESUNG ELECTRONICS LTD.
* **Participants:** 61 students, 4 international mixed teams (Students work in teams of 13-17 members)

<table>
<thead>
<tr>
<th>domestic Universities</th>
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</thead>
<tbody>
<tr>
<td>South China University of Technology (China)</td>
<td>9</td>
</tr>
<tr>
<td>Bangalore Institute of Technology (India)</td>
<td>10</td>
</tr>
</tbody>
</table>
### 2013 ICDP Schedule

<table>
<thead>
<tr>
<th>Timetable</th>
<th>07.15(Mon)</th>
<th>07.16(Tue)</th>
<th>07.17(Wed)</th>
<th>07.18(Thu)</th>
<th>07.19(Fri)</th>
<th>07.20(Sat)</th>
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</thead>
<tbody>
<tr>
<td>- 08:00</td>
<td>Breakfast</td>
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<td></td>
<td>Dormitory Restaurant</td>
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<td></td>
<td>(On Campus)</td>
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<td>(On Campus)</td>
</tr>
<tr>
<td>09:00-10:00</td>
<td>Lecture: Motor Control (Professor Dong-Cheon Lee, [HID No.115])</td>
<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112,113])</td>
<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112,113])</td>
<td>Car Practice (Track Field)</td>
<td>2013 BAJA SAE KOREA at Youngpum University (Track Field)</td>
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</tr>
<tr>
<td>10:00-11:00</td>
<td>Lunch: Dormitory Restaurant</td>
<td>Lunch: Dormitory Restaurant</td>
<td>Lunch: Dormitory Restaurant</td>
<td>Lunch: Dormitory Restaurant</td>
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<td>(On Campus)</td>
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</tr>
<tr>
<td>11:30-12:00</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
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<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
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<tr>
<td>12:00-13:00</td>
<td>Lunch: Dormitory Restaurant</td>
<td>Lunch: Dormitory Restaurant</td>
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<tr>
<td>13:00-14:00</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
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<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
</tr>
<tr>
<td>14:00-15:00</td>
<td>Opening/Orientation ([HID No.115])</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
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<tr>
<td>15:00-16:00</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
</tr>
<tr>
<td>16:00-17:00</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
<td>Team activities: Little Project - design ([HID No.110,111,112])</td>
</tr>
<tr>
<td>17:00-18:00</td>
<td>Go to the dormitory, dinner ([Dormitory Restaurant])</td>
<td>Go to the dormitory, dinner ([Dormitory Restaurant])</td>
<td>Go to the dormitory, dinner ([Dormitory Restaurant])</td>
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<td>Go to the dormitory, dinner ([Dormitory Restaurant])</td>
</tr>
<tr>
<td>18:00-19:00</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
<td>Rest</td>
</tr>
<tr>
<td>19:00-20:00</td>
<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112])</td>
<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112])</td>
<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112])</td>
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<td>Team activities: Little Project - the manufacturing of vehicles - ready for presentation ([HID No.110,111,112])</td>
</tr>
<tr>
<td>21:00-22:00</td>
<td>Go to bed [Dormitory A]</td>
<td>Go to bed [Dormitory A]</td>
<td>Go to bed [Dormitory A]</td>
<td>Go to bed [Dormitory A]</td>
<td>Go to bed [Dormitory A]</td>
<td>Go to bed [Dormitory A]</td>
</tr>
</tbody>
</table>

### Day 1
- lecture
- planning
- design
- process
- Assembly
- PPT
- UCC
- TEST
- complete
Preparation of used cart frame from some cart company

Engines were removed from the Cart! Extensive prior preparation and Technical meetings were necessary.
Conceptual Design: electric vehicle, Idea generation, function structure, evaluation, selection and build process

**Brainstorming**
- Vehicle design: safety, efficiency, originality
- Safety: Belt, Clothes, Helmet, Front & main loops, Brake Closer to foot, Add a Bumpers...
- International team: name, logo

**Materials**
- Motor: 아그니 모터, 모터컨트롤러, 펜달, 스프라켓, 스프라인, 체인
- Structure: 프레임, 타이어, 훨, 핸들, 샵시, 범퍼, 원형파이프, 각재앵글
- Battery
- Safety: 킬스위치, 키스위치, 전기브레이크, 브레이크 패드
- Tools: 렌치, 드라이버, 니퍼, 롱노즈, 줄자
- Etc: 전기테이프, 작업용 장갑 및 마스크, 볼트, 너트, 용접용 봉
- Driving safety device: 보호장갑, 안전벨트, 헬멧

**Design: CAD + CAE s/w**
- S/w: ANSYS, CATIA, UG, Solidwork, Fluent, CFX
- Place: HRD bldg 119 studio
Preparation of important parts and technical drawings
Major Programs (1) ICDP

Orientation & Lectures

Lectures:
1. “Baja Car Design”
2. “Motor Control”

Icebreaking

1. Self introduction
2. Make your Team Name & Team Logo!

Design

Design: CAD + CAE s/w
1. Using s/w: ANSYS, CATIA, UG, Solidworks, Fluent, CFX
2. Place: Design Room No.119, Learning Factory
Major Programs (1) **ICDP**

1. **Mini-Baja Car production**
   - Period: 3 days
2. **Safety Considerations**:
   - Belt, Clothes, Helmet, Front & Main Loop, Brake Closer to Foot, Add a Bumpers, etc.

**Processing: Laser Cutting**

**Assembly**

**Test**
Presentation
1. Presentation: PPT, UCC, etc.
2. Limited-time: 10 minutes
3. Definition of the problem and proposal of integrated solution for the problem

1. 2013 Baja SAE Korea at Yeungnam University
2. Date: Jul. 19, 2013
3. International Friend Prize: SCUT, BIT
ICDP camp was a big success! Design Camp provided excellent Environment to design, build, Test a real vehicle.

We wish we had this kind of Good engineering camp in Our country also.
Feed back: from students

- Importance of ICDP Camp

<table>
<thead>
<tr>
<th>Item</th>
<th>Graph Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global exchange among students</td>
<td>4.00</td>
</tr>
<tr>
<td>real mfg. experience</td>
<td>4.00</td>
</tr>
<tr>
<td>Design solving real prob.</td>
<td>4.00</td>
</tr>
<tr>
<td>global Comm.</td>
<td>4.00</td>
</tr>
<tr>
<td>global teamwork</td>
<td>4.00</td>
</tr>
</tbody>
</table>
Effects

- Cost Effectiveness by Inbound international exchange compared to outbound international student exchange
- Enhancing the engineering problem-solving capability by design and manufacturing of electric vehicles
- Multi-dimensional Professionals (Communication skills, Technical skills)
- Global awareness, International collaborations
- Intercultural competence (national, ethnic, religious, etc.)
- Engineering design (What is design thinking)
- Thinking and communication in several design languages
Creativity·Convergence Camp For Enhancing Creative Problem Solving Capability

**Date:** 25th(Fri.) ~ 27(Sun.) of Oct, 2013  
**Place:** Commodore Hotel Gyeongju  
**Purpose:**  
- Educating Engineers with Creative Problem Solving Skills by using TRIZ Education  
- Experiencing Multidisciplinary, Engineering / Non-engineering Fusion Education  
- Students deal with limited time  
- Improving Student Teamwork  
**Theme:** ‘Appropriate Technology’

**Participants:**
- **Engineering** 74 students, **Non-engineering** 16 students, Total 90 students  
- 16 teams (students work in teams of 5-6 members)

**Contents:**
- Educating Engineers with Creative Problem Solving Skill by using TRIZ Education  
- Lecture: Appropriate technology needed for Three countries (Bangladesh, Cambodia, Rwanda)  
  by Park Chung Hee School of Policy and Saemaul Postgraduate students

**Schedule**
- Day 1: Creative Projects Methods, TRIZ lectures, Brainstorming, Team activities  
- Day 2: Doing Projects with materials, flip charts, UCC using TRIZ methods  
- Day 3: Contests (Products Display and Presentation), Prize
**Teamwork:**
Short Course: Coaching Design Project Teams to Victory
By Rudy J. Eggert, Boise State University

Coaches mentor & advise not teach!

<table>
<thead>
<tr>
<th>Sport</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitors</td>
<td>Companies</td>
</tr>
<tr>
<td>Team owners</td>
<td>Investors</td>
</tr>
<tr>
<td>Coaches</td>
<td>Managers</td>
</tr>
<tr>
<td>Referees, umpires</td>
<td>Lawyers, judges</td>
</tr>
<tr>
<td>Communication</td>
<td>Coordination</td>
</tr>
<tr>
<td>Fumbles, injuries</td>
<td>Mistakes, losses</td>
</tr>
<tr>
<td>Individual skills</td>
<td>Specializations</td>
</tr>
<tr>
<td>Team skills</td>
<td>Interpersonal skills</td>
</tr>
</tbody>
</table>

[http://coen.boisestate.edu/reggert/ME481/teamwork/teamwork.html](http://coen.boisestate.edu/reggert/ME481/teamwork/teamwork.html)
Major Programs (2) C·C Camp

- 2013 TRIZ lecture + paper Design, build, test, and competition!
Applying TRIZ to solve problem: 2012 Happy smile gate

- Dangerous Alley
- entrance restriction
- security moving walk
- spotlight
- wall painting
- shelter
Enhancing Creative Problem Solving Capability

Enhancing Systematic Problem Solving Capability

Improving the ability of the implementation of ideas

Improving teamwork skills in Interdisciplinary Convergence Team

Improving communication skills
Mostly enhanced capability
50% creativity, 34% problem solving cap., 14% comm. skill

Recommendation to friends
96% positive
Thank you