국제공동협업설계 및 실습과목

서울대학교 차석원

Contents

- Engineering Design Process
- Global Product Design
- Global Design Team
- Conclusion

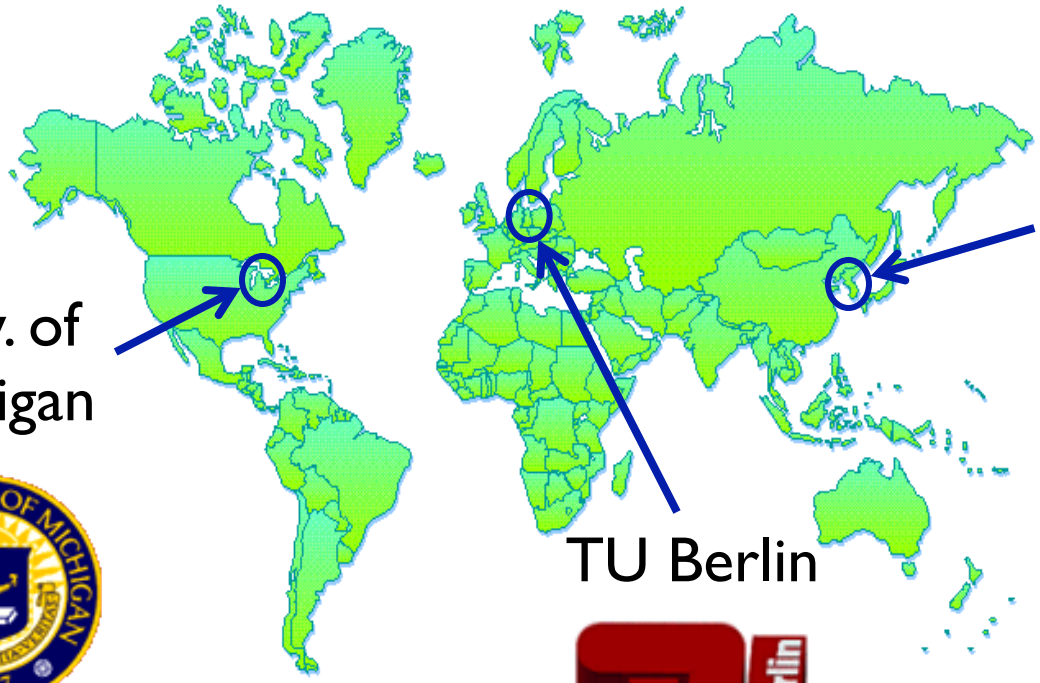
Engineering Design Process

협업에 의한 구현이 필수적

협업설계 교과목의 필요성 대두

글로발 협업설계 ???

Global Product Development (GPD)



Univ. of Michigan

Seoul National University

TU Berlin

Participating Universities

	Fall 2000	**Fall 2001**	**Fall 2002**	**Fall 2003**	**…….**
North America	University of Michigan (UoM)	UoM	UoM	UoM	UoM
Asia	Seoul National University (SNU)	SNU	SNU	SNU	SNU
Europe	TU Delft	Oxford	Oxford		
			TU Berlin	TU Berlin	TU Berlin

Contents

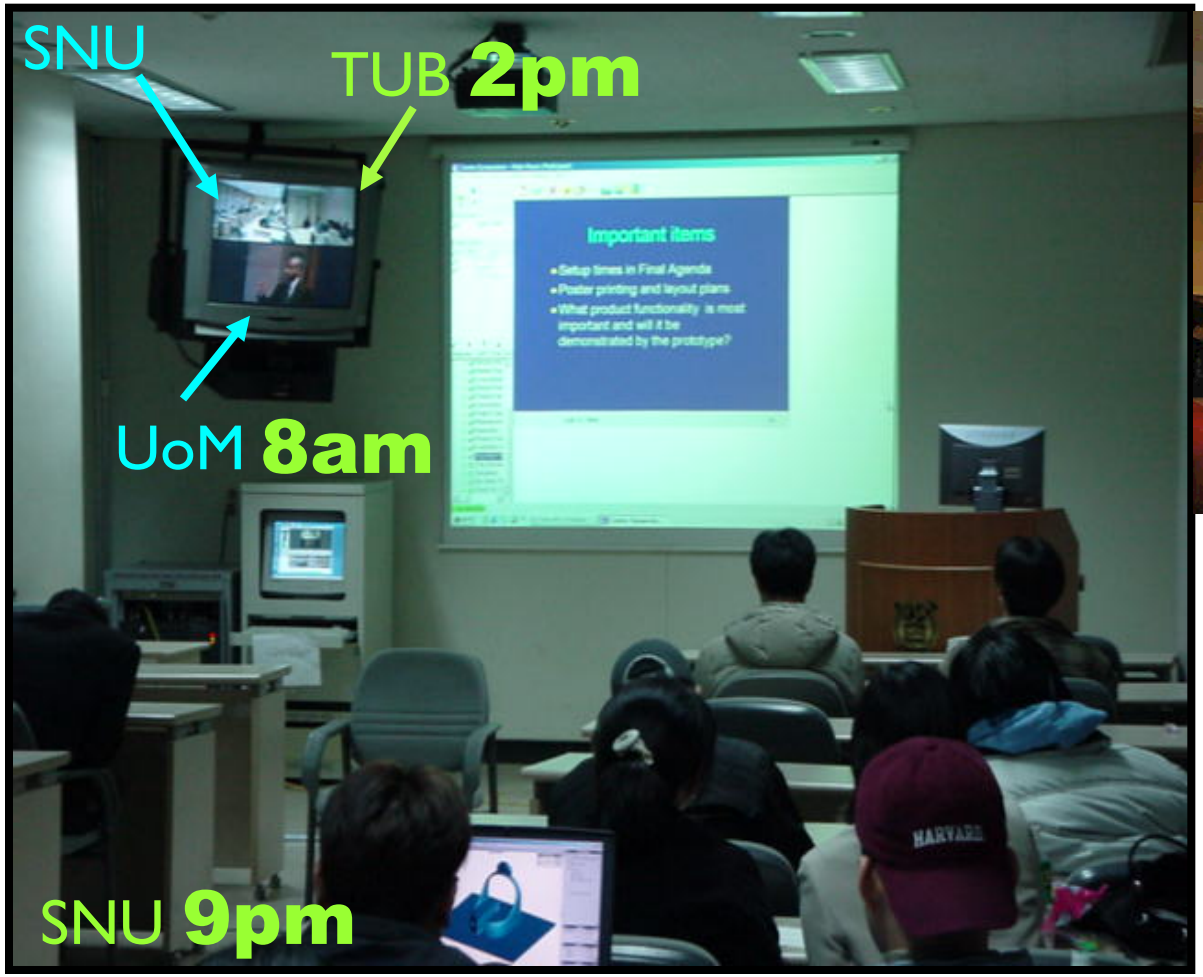
- Graduate level one semester course
- Internet-lecture given by experts from industry, research and educational institute
- Project-oriented development work in mixed German-Korean-US-student teams

The lecture is divided to the parts

- *conceptual design,*
- *product engineering and*
- *manufacturing and distribution*

an covers almost the hole development process and gives examples from industry.

Classroom

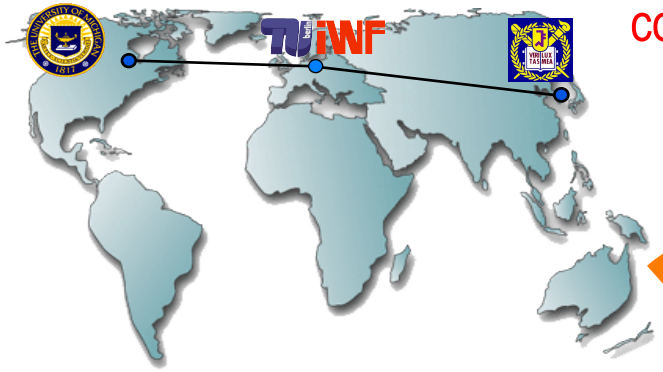


- Interactive video conferencing
- Teachers as Moderators
- Real-time sharing of PowerPoint slides

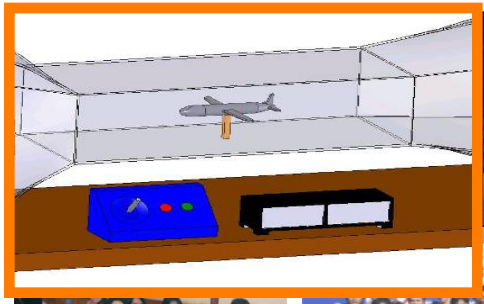
Project Work

Phase 0: multinational and interdisciplinary teams

Phase 1: marketing and product planning

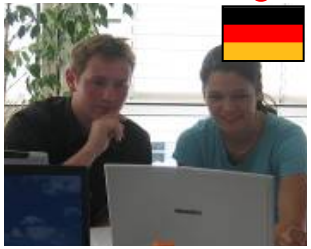


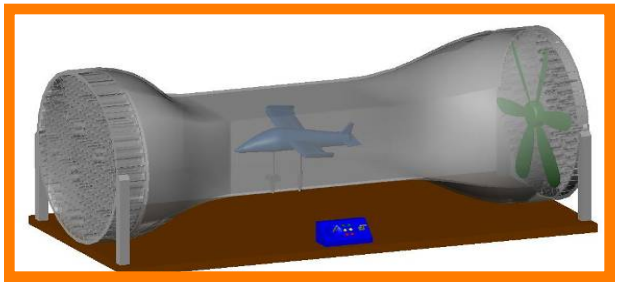
Phase 2: conceptual design

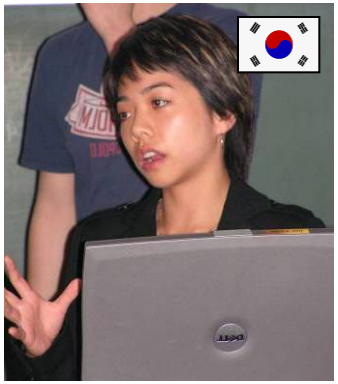


final exhibition

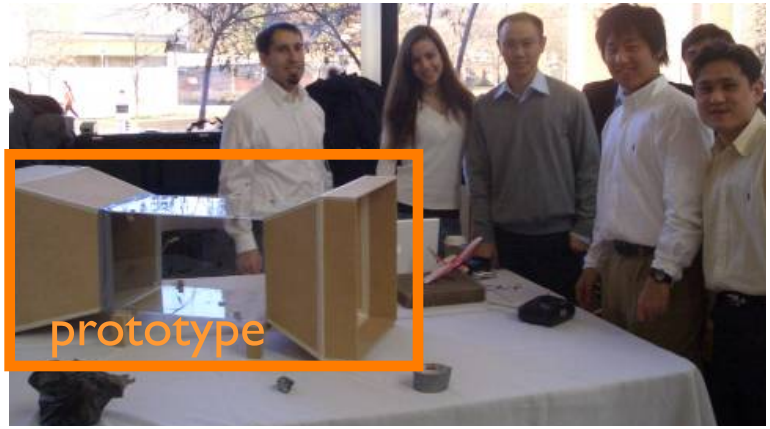
Phase 3: embodiment design







web based project work



GPD Objectives

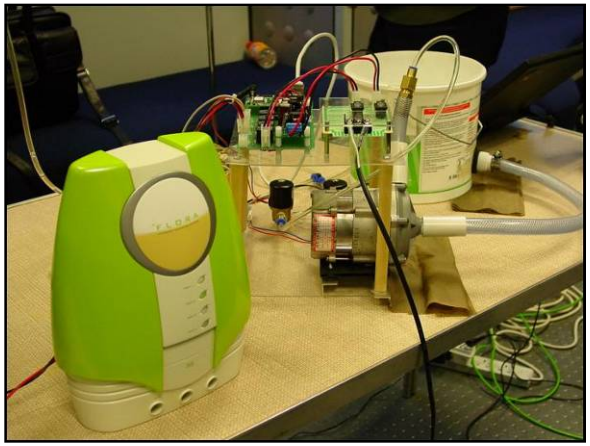
Students are facing the challenges of the competitive and global workplace from today. They will be

- prepared for the use of communication and collaborative development tools,
- prepared to work in multinational and interdisciplinary project teams on the spot as well as distributed,
- prepared to gaining knowledge on demand and
- sensitized for conditions of the global market characterized by different ecological, economical and social-political requirements.

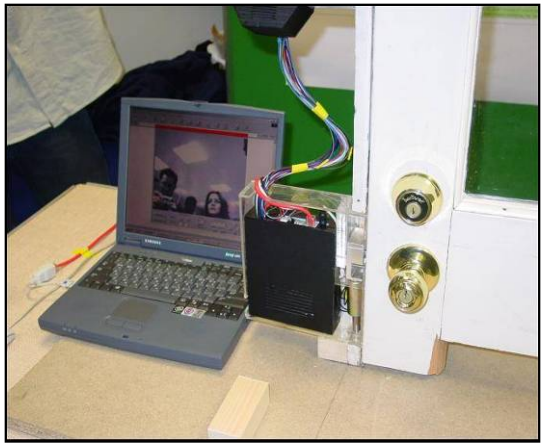
Project task of GPD 2001/02

Task: Develop/ design an Internet-ready Product:

- Add the "Internet-ready" function to an existing product, or
- Develop an Internet-ready product, for an unmet need



Internet-ready plant watering system

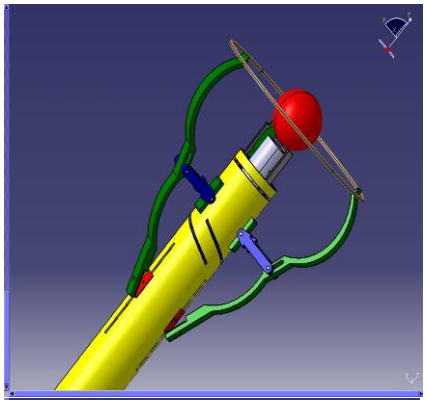


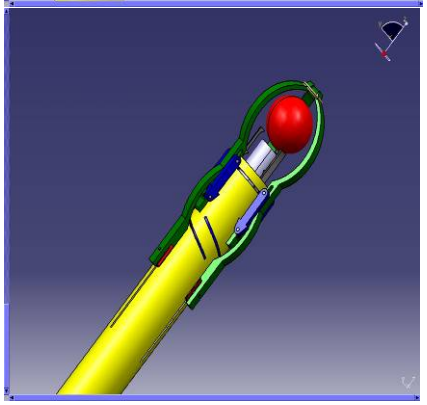
Internet-ready door looking system

Internet-ready teddy bear

Project tasks of GPD 2004

Task: Develop an environmental friendly dual use product





Left Top: Cooling system for water vendors

Center Top: Fruit dryer

Right: Fruit Wrappler

Left Bottom: Baby swing

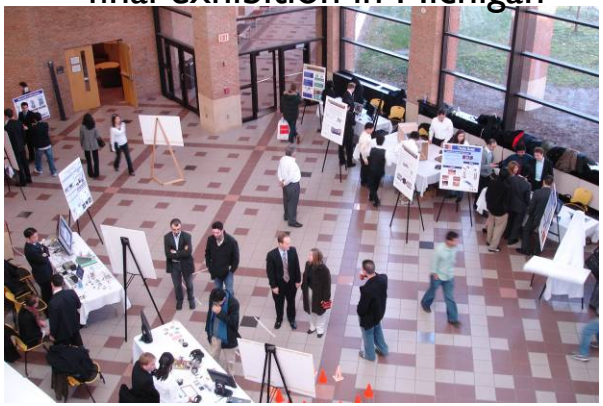
Center Bottom: Multifunctional frame

Final Exhibition at TU Berlin, Dec. 2006

final presentation

students at work

final exhibition in Michigan



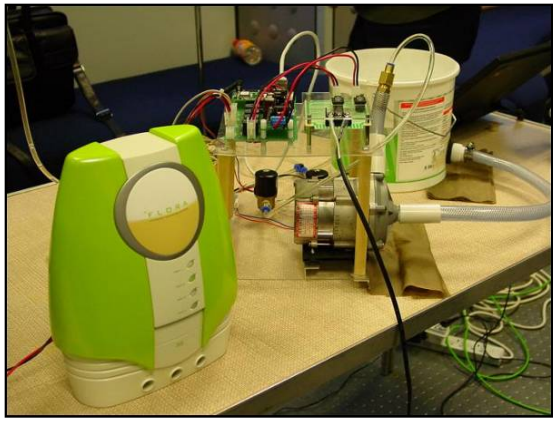
water tunnel

student in the workshop

expansion tower

final GPD dinner

Key Elements



Project selection

- Global importance
- Schedule
- Budget

Remote Meetings

- Self-organized meetings
- Communication device
- Frequency

Face-to-Face Meetings

- Kick-off (ice-breaking) and conceptual design
- Final presentation & Exhibition

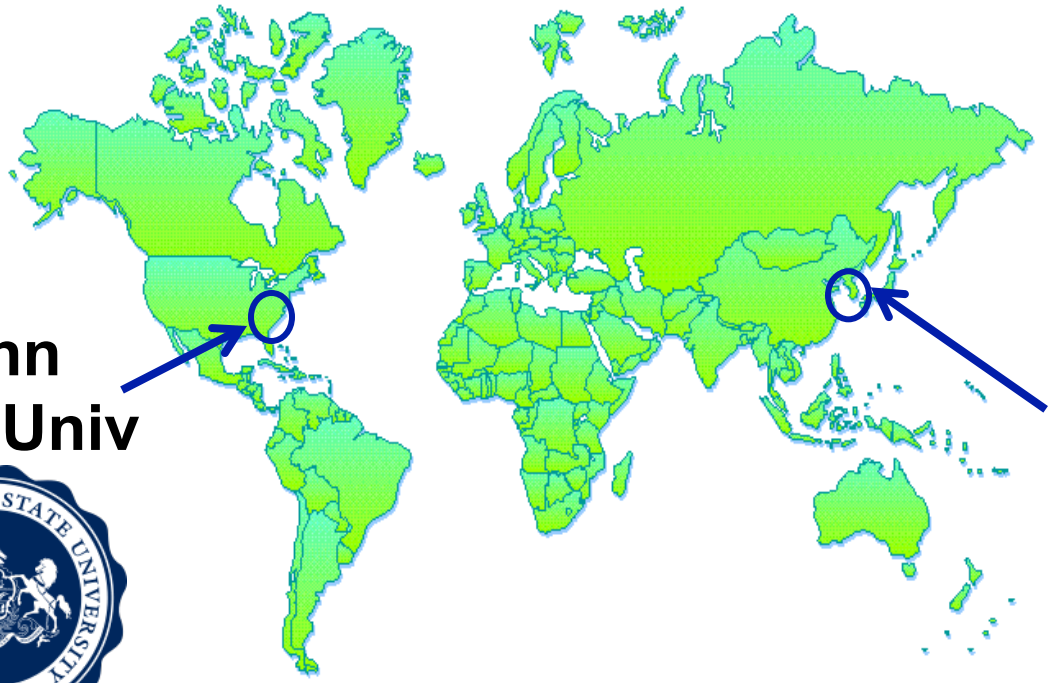
Scheduling

Lecture Plan for GPD 2006

Broad area	Date	Lecture title	Lecturer
Team work and conceptual design	Sep 05 (Tue)	Course introduction	SNU + TUB + UM
		Local organization issues (distribute a questionaire sheet for local team organization)	SNU + TUB + UM
	Sep 07 (Thu)	Project description	TUB
		Team work, student introductions, and communication	TUB
	Sep 12 (Tue)	Task clarification	TUB
		Conflict Management	
	Sep 14 (Thu)	Globalization	Brad Farnsworth, UM
	Sep 19 (Tue)	Patents + Deliverables for Kickoff meeting	Roberta Morris, UM
	Sep 21 (Thu)	Industrial Design	SNU
	Sep 25 - Oct 1	Kick-off Meeting	at TUB
		Project Management	TUB
		Learning process and engineer competence management system and global sustainability	[TUB + SNU + UM]?
Product engineering		Review of Engineering Design Methodology	Jongwon Kim, SNU
		Creativity techniques and morphological box	TUB
		DR #1 guidelines	TUB
	Oct 03 (Tue)	No global class - Korean/German holidays	
	Oct 05 (Thu)	No global class - Korean Thanksgiving	
	Oct 10 (Tue)	No global class - time for project work	SNU + TUB + UM
	Oct 12 (Thu)	DR #1 All teams - Class starts 1/2 hour early	SNU + TUB + UM
	Oct 17 (Tue)	UM - Fall break	
	Oct 19 (Thu)	Embodiment design and robust design	Jongwon Kim, SNU
	Oct 24 (Tue)	Design for assembly/disassembly	Kazu Saitou, UM
	Oct 26 (Thu)	Eco-design	Kazu Saitou, UM
Product manufacturing and business plan	Oct 31 (Tue)	Industry Case study - 1	SNU (from UM)
	Nov 02 (Thu)	Toward Prototyping + DR2 guidelines	Lalit Patil, UM
	Nov 07 (Tue)	Eco-manufacturing	Steve Skerlos, UM
	Nov 09 (Thu)	DR #2 All teams (class starts earlier)	SNU +TUB + UM
	Nov 14 (Tue)	Industry Case study - 2	UM
	Nov 16 (Thu)	Supply chain, distribution and risk	Romesh Saigal, UM
	Nov 21 (Tue)	Industry Case Study - 3	TUB
	Nov 23 (Thu)	Michigan Thanksgiving break	
	Nov 28 (Tue)	Product lifecycle management/End of life issues	Lalit Patil, UM
		Final presentation guidelines	
	Nov 30 (Thu)	Business plan + Venture capital	UM
	Dec 4 - Dec 8	**Global Design Exhibit**	at UM

- Academic calendar mismatch
- Holidays
- DR1, DR2, Final presentation
- Lecture scheduling for 3 time zone

Global Team Design

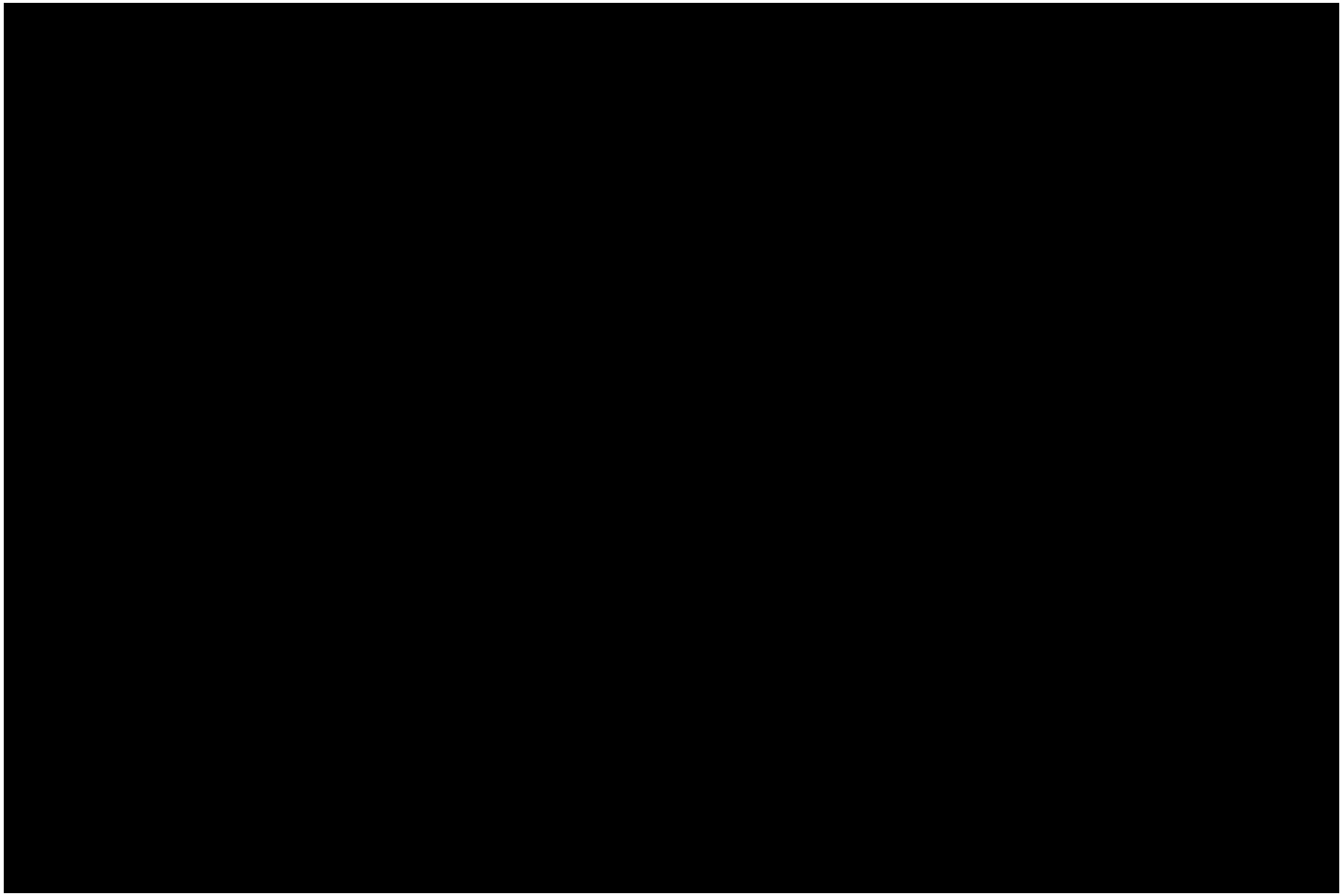


Penn State Univ

Seoul National University

Chonnam National University

In News



Contents

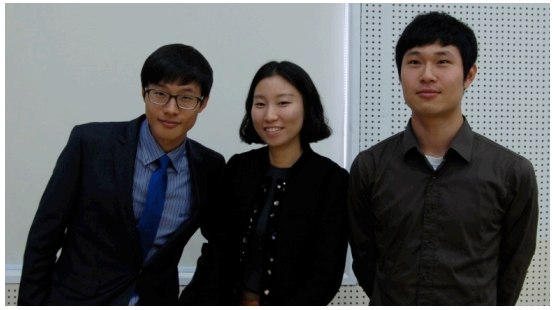
- Senior level one semester course
- Seminars and coaching session
- Individual team project in mixed Korean-US-student teams

The lecture is divided to the parts

- *project assignment*
- *conceptual design,*
- *product engineering and*
- *manufacturing and distribution*

an covers almost the hole development process and gives examples from industry.

Team Examples



CNU Air Product Team

PSU Air Product Team

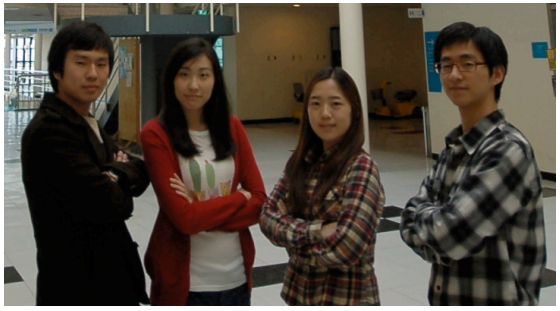
SNU Air Product Team

CNU Mando Team

PSU Mando Team

SNU Mando Team

CNU SNU Precision Team

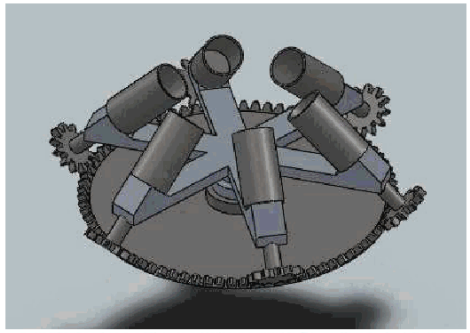


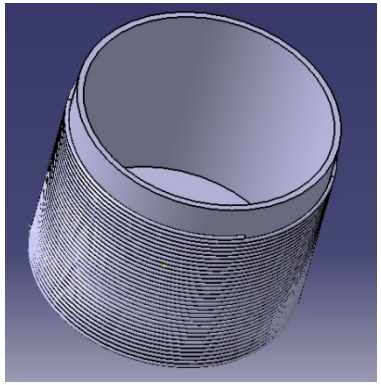
SNU SNU Precision Team

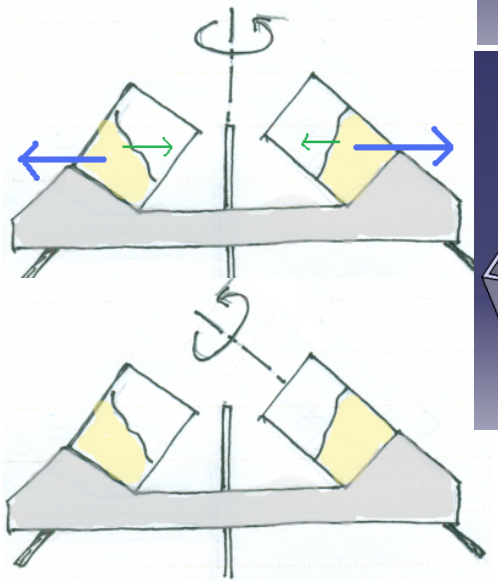
Project Example

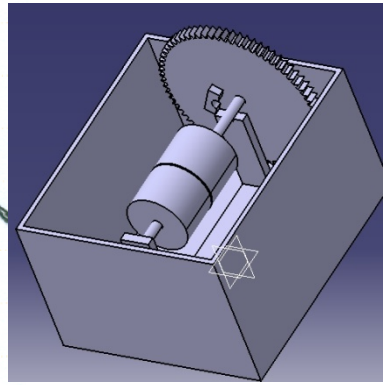
- Sponsor : Air Product (USA)
- Project description
  - Design a device that removes bubbles in viscous fluids to assist viscosity measurement in a short time
  - Build a prototype to degas 8oz liquid sample in 15 min at 25 ±0.2 ℃

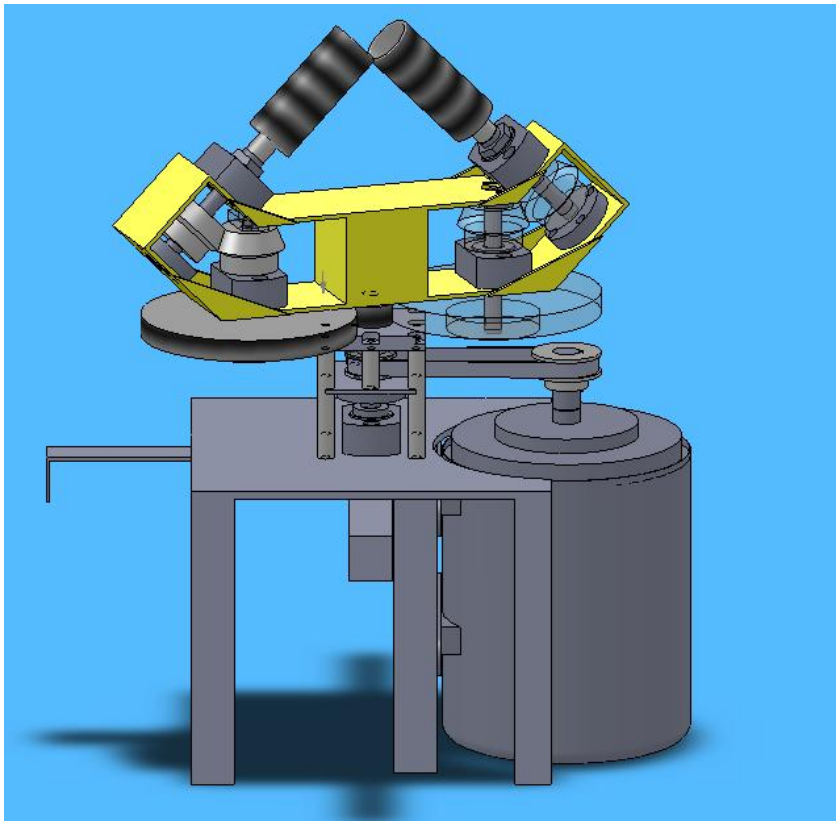
Conceptual Design





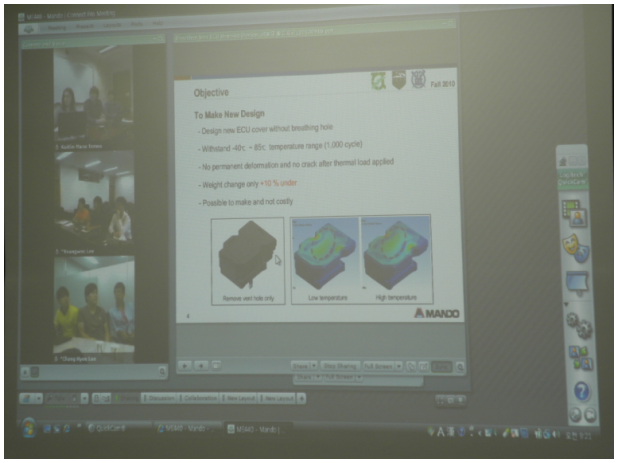






Cooler design (CNU, PSU)
Degaser design (SNU)

Internet Meetings

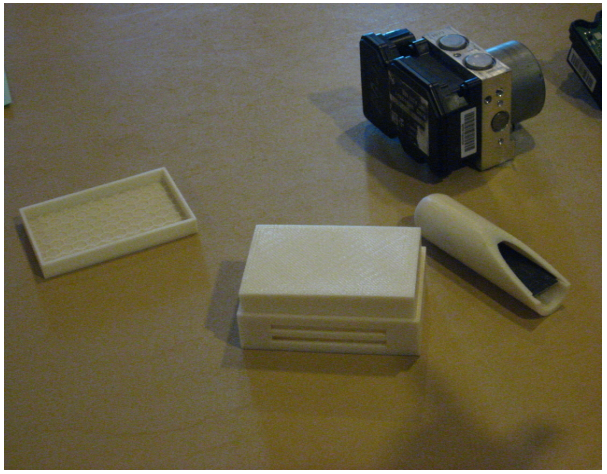


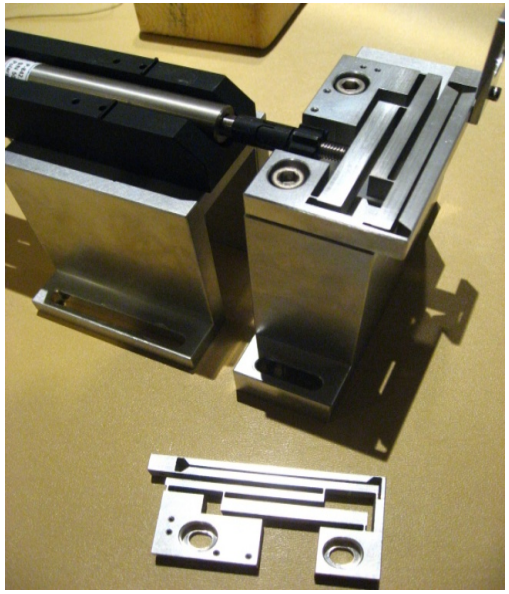
During sponsor meetings, students teams understand project objectives

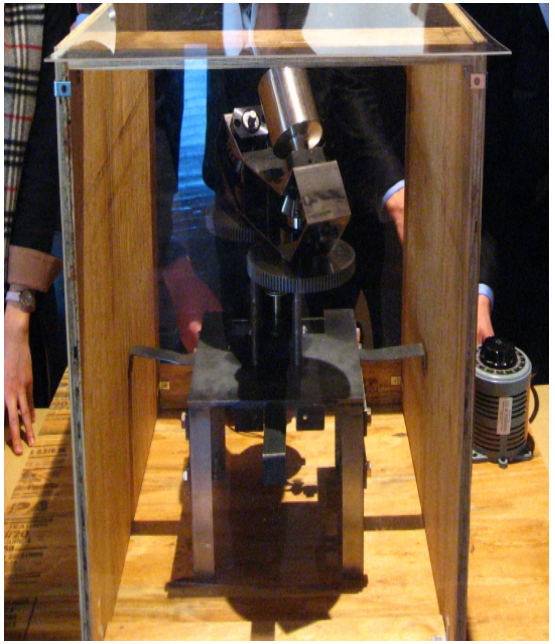
Design Reviews

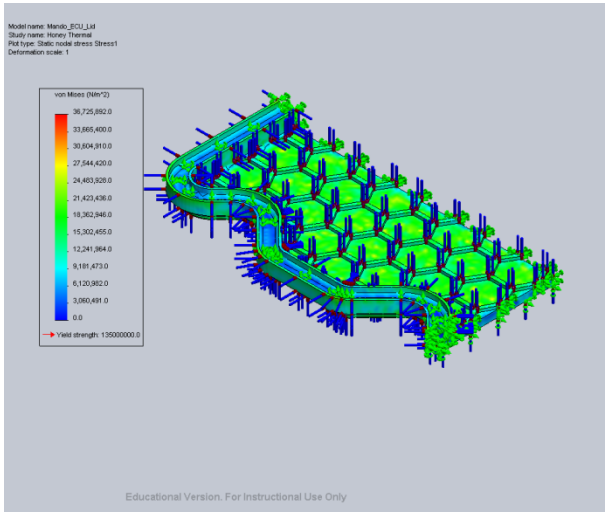
Highspeed Polycom system at SNU, CNU and PSU.
Lecture, students and sponsor participates.

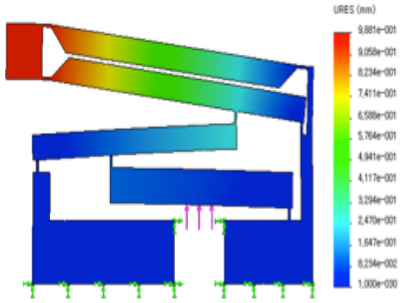
Design, Analysis and Prototyping





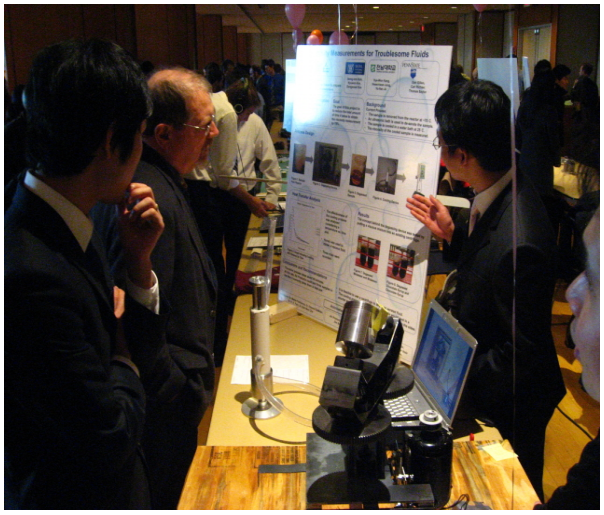


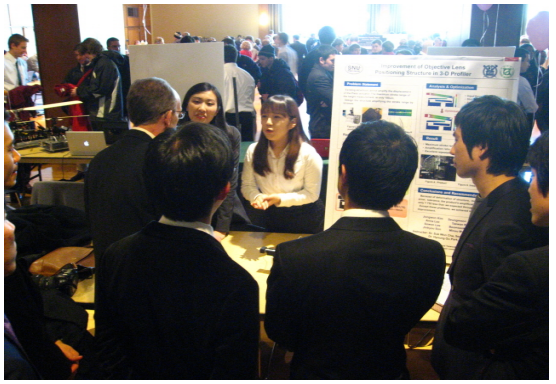




- Input force : 100N
- Stroke range : 988um
- Amplification ratio : 11.24
- Safety factor : 1.77

Final Design Expo at PSU





Conclusion

- Creative and self-motivated engineering solution
  - Coaching and team conflicts
- Communications
  - Ice-breaking
  - Time zone issue
  - Devices: Polycom, Adobe Connect, Skype
- Scheduling is everything
  - Academic calendar: holidays, exams
  - Sponsor meeting, DR1, DR2, EXPO and delivery
- Engineer in global market
  - Language is not a barrier. Communication is important
  - Status recognition