SYLLABUS

ISE545: Technology Development and Implementation

Summer Session, 2012
(updated April 4, 2012)

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Course Sections: 31745D (for off-campus students)
31545D (for on-campus students)

Course Unit: 3 Units

Prerequisite: A graduate student standing in engineering is required.
(Or with a special approval by the Instructor)
This is a required course for MSPDE (the Master of Science in Product Development Engineering)

Class Hours: Mondays and Wednesdays, 1:00 pm to 4:10pm
- 1:00 pm to 2:30 pm (90 minutes) – session I
- 2:30 pm to 2:40 pm (10 minutes) – session break
- 2:40 pm to 4:10 pm (90 minutes) – session II

Class Location: USC Andrus Gerontology Center (GER 309)

Office Hours: 4:15 pm to 6:15 pm, on Wednesdays
- Face-to-face meetings held in OHE Room 430M
- Phone meetings via 213-740-0496
- Email appointments and confirmations are required for all meetings, both face-to-face and by phone

Teaching Assistant: TBD
Email: TBD
Cell Phone: TBD
Please work with TA by email and cell phone

Course material and syllabus content per S. Lu (C), used with permission, Summer 2012

Course Background:

Technology has become the key driver of our economy and competitiveness over the past few decades. Much of the economic growths (and "bubbles") that we have witnessed in recent years are the results of innovative technologies (or products, services, systems) developed by engineers in the laboratories and implemented by entrepreneurs on the market. In the technology-based economy today, the knowledge that governs the process of *technology development and implementation from research laboratories to dynamic markets* has become a key competitive edge of the engineering profession in industrial organizations.

A well-developed technology in the laboratory without a successful commercial implementation cannot lead to desirable economic returns. Hence, technology development and implementation must be studied as an integrated subject *between technology and market*. The complete process is a highly interdisciplinary one, crossing over the conventional engineering college and business school curriculums. Traditionally, engineering students are trained to look at this process from a more technical (or development) viewpoint, whereas business students are asked to learn the management (or implementation) side of the same process. This divided "development-vs.-implementation" training approach and the separation of domain knowledge make it very difficult for students to gain a comprehensive understanding of this interdisciplinary subject in order to master this important process effectively in their professional careers.

ISE545, *Technology Development and Implementation*, strives to overcome the above deficiency by offering students a holistic, interdisciplinary, and integrated view of the complete technology development and implementation process, ranging from laboratory to market considerations. In order to achieve a high level of focus, the course will emphasize principles and practices relate to **technological innovation** along this highly integrated development-implementation process in a modern industrial setting. Specifically, we will use **new product development process** as an example to explain how to (1) understand the industrial dynamics of technological innovation, (2) formulate technological innovation strategy, and (3) implement technological innovation strategy. In other words, the course blends the perspectives of organization, marketing, design, and manufacturing into a single approach to support new product development. Through classroom lectures, case studies, and team debates, students can develop a deep understanding of the realities of industrial practice, and the complex and essential roles played by the various members of a new product development team. In addition to academic theories, the course also provides practical methods that can be put into direct uses for new product development and technological innovation projects from laboratory to market.

Course Components:

Students' learning experience in this course will come from three (3) interrelated components:

- **Classroom Lecture**

  Lectures will discuss the relevant theories, methodologies, processes, tools, and practice of technological innovation and new product development process from laboratory to market. Specific lecture topics can be found in the Course Schedule of this syllabus. The class will use the textbook, "*Strategic Management of Technological Innovation, 3rd*

edition", by Melissa A Schilling. The lectures will follow the chapter sequence of the text; however, due to the board and the fast evolving nature of the course topics the lectures will contain significant material (i.e., PowerPoint slides), drawn from many reference books and technical papers. Lecture notes are available before lectures via the ISE545 course website on DEN. On campus students will receive a paper copy of these lectures notes in classroom. Off campus students should download a copy of the PDF file of these lectures notes before the class time. Reading assignments from various reference resources will be given throughout the semester as Recommended Readings. All students are encouraged to study these reading assignments as a "preview" for the lectures.

Off-campus students are encouraged to watch the live web castings of classroom lectures whenever possible through the DEN systems (e.g., WebEx). Live lectures are recorded for later reviews by all students. Off-campus students can phone-in for questions during the live lecture period, and, if equipped with a desktop web camera, choose to participate in the question/answer with two-way live video via the DEN system. For technical questions regarding remote lecture/question participations, off-campus students should consult with DEN technical staff directly—DEN Webcasting & Technical Support, phone (213) 821-1321, e-mail: webclass@usc.edu , or Skype: map.den

- **Case Study**

Case study is a very important means in engineering education, especially for an inter-disciplinary subject like technology development and implementation, whose knowledge links directly to industrial practices. Successful industrial cases can reveal important knowledge about the appropriate process and methodology of technological innovation and product development; while well-documented business failures from the past can also help to improve the strategies and practices in the future. Two (2) detailed case study papers will be assigned to the class. Students are asked to study the assigned case paper and write a report, summarizing their analysis/diagnosis and, if appropriate, proposing a plan of action. Students are encouraged to refer to the theories, principles, models and other materials discussed in classroom lectures in their case study reports. All students are required to participate in classroom discussion of the two case studies led by the TA.

Off-campus students have the option of either coming to the campus to participate in this case study discussion, or using the DEN phone conference system to join the discussions with two-way live video/audio interactions remotely. A specific Discussion Board on the ISE545 Course Website will be created for the assigned case study. In addition to live in-class discussions, all students are encouraged to post their inputs, opinions and suggestions of the case onto this Discussion Board before and after the scheduled discussion session. These online contributions count as part of the class participations.

- **Debate Project**

There are no black-and-white answers to the questions addressed in this course. The best way to learn technology development and implementation is to work on a team project which has a plan for actions in the real world. All ISE545 students will be grouped into project teams of ~3 members. A set of technology development and implementation

topics will be selected from various technology industries. Each team will be asked to study an assigned topic, prepare and engage in two (2) live-debate sessions, and then develop a comprehensive report by the semester end. Detailed schedule of team debates and final project reports can be found in the Schedule section of this syllabus. The TA will coordinate the debate teams and lead the two debate events. The instructor and TA will assist teams to formulate their project scopes and define their debate positions during all stages.

All ISE545 project debate teams are encouraged to use the DEN system for their required team meetings throughout the semester. Each team will be assigned a separate virtual meeting room, which only its members (and TA and Instructor) have access. Members can have interactive audio/video supports when conducting virtual meetings at times of their own choice. These virtual meeting records will contribute to the debate grades.

Office Hours:

Office hours are from 4:15 – 6:15 pm, every Wednesday. On-campus students can come to OHE 430M for face-to-face meetings. Group meetings with the Instructor during office hours are also possible in the same manner. As well, students are encouraged to meet with TA during the TA office hours.

Reading Materials:

- "*Strategic Management of Technological Innovation, 3rd edition*", by Melissa A Schilling, the McGraw-Hill Irwin Company

Recommended Reference Books:

- "*Strategic Management of Technology and Innovation*", (3rd edition), by Robert A. Burgelman, Modesto A. Maidique, and Steven C. Wheelwright, the McGraw-Hill Irwin Company.
- "*Product Design and Development*" (3rd edition), by Karl Ulrich and Steven Eppinger, the McGraw-Hill Irwin Company.
- "*Product Ideas to Product Success*", Matthew Yubas, Broadword Publishing, Inc.
- "*The Mechanical Design Process*" (3rd edition), David G. Ullman, the McGraw-Hill Companies, Inc.
- "*Axiomatic Design – Advances and Applications*", Nam Pyo Suh, the Oxford University Press.
- "*Product Design – Techniques in Reverse Engineering and New Product Development*", by Kevin Otto and Kristin Wood, Prentice Hall
- "*Creating Breakthrough Products – Innovation from Product Planning to Program Approval*", by Jonathan Cagan and Craig M. Voget, Prentice Hall
- "*Jack Welch and the GE Way*", by Robert Slater, McGraw-Hill Company.
- "*Execution – the Discipline of Getting Things Done*", by Larry Bossidy and Ram Charam, the Crown Business Books.

The instructor may recommend additional reading materials and website reference resources during the semester whenever appropriate.

Course Website:

Students' learning of this course is supplemented by a specially designed course website on the DEN Blackboard instruction system (http://www.uscden.net). All registered students have access to this website (ISE545_20122). The course website structure is implemented to support the specific organization of the course instruction as described in this syllabus. All students should browse around the entire site to familiarize themselves with various areas and functions of this course website.

- Announcements -- important announcements of this course (check it frequently)
- Course Information -- syllabus; information about instructor; how to use this website; etc.
- Lecture Webcasting -- video files of each lecture
- Lecture Notes (Slides) -- PowerPoint slides of lecture notes
- Paper Studies -- information about your paper studies
- Debate Projects -- information about your team debate projects
- Additional Readings -- interesting articles that are related to the course subjects
- Resource Links -- external links to websites that have relevant information to the course
- Communication -- all communication tools, including emails and roster
- Discussion Board -- share your thoughts about interesting subjects with the class
- Tools -- Digital Dropbox and other useful functions to manage your course work

Course Grading:

Students will be graded according to the following scheme:

- 20% -- two case study reports
- 10% -- participation (both real and virtual) in classroom lecture and case study discussion
- 30% -- final examination (there is no mid-term exam)
- 40% -- team debate projects, which consists of:
    - (10%) the first debate presentation
    - (10%) the second debate presentation
    - (20%) the final project report

Note that, while the first three components (60% of the final grade) are graded individually for each student; the last component (40% of the final grade) is based on the results of your team efforts. All project work done by the team is first given a team grade. This team grade is then weighted for each student in the team based on his or her confidential self-analyses at the end of the semester. Each student will be asked to fill out a questionnaire, which evaluates every team member (including him/herself) for the percentage contribution to the team project in different categories. The evaluations are averaged in order to find each student's contribution and the weighting factor is made proportional to the average. For example, if you have three students on your team and each makes the same (33%) contribution, then all will get the same grade as the team grade. However, if one of your team members makes a 40% contribution, one a 25%

contribution, and the third 35% contribution, then the individual grades will be corrected by the difference from 33%. Thus, if the team grade on your project presentation (or filed test, or product development file) is 85%, then the first student would get 92% (85 + (40-33)), the second would get 77% (85 + (25-33), and the third 87% (85 + (35-33)).

Each of the above grading components is described in more details below.

Grading Components:

- **Case Study Reports (20%)**

  Your case study reports should be **up to 8 pages** in length, 12 pt, type, typewritten, double-spaced, with maximum 1" margins. They should be organized with:
  - a short introduction
  - your diagnosis/analysis of the case
  - the recommended action plan (if appropriate), and
  - the conclusion

  You are expected to use and reference theories and models discussed in classroom lectures, if possible. Please avoid repeating the facts of the cases. Instead, focus on the analysis, diagnosis and rationale for the plan of action. Your case study reports will be graded based on the richness of analysis/diagnosis and the creativity of your action plans.

  The case study reports are due *at the beginning of the clas*s – on the day that the case is scheduled for the in-class discussion (see the Course Schedule below). The case study report should be submitted as a WORD file via the ISE545 course website. You can turn in your case study report one week late for 50% of the credit. No credit will be given afterwards.

- **Class Participation and Case Study Discussion (10%)**

  ISE545 is a highly interactive class where students are encouraged to express their opinions and contribute to the lecture contents. Class participation is more than just counting the attendance (which is also important). All students are expected to attend, or watch (via DEN), class lectures on time, to discuss case studies, readings, papers, to participate in Discussion Boards, and to interact and exchange experiences. Purposeful emails to the instructor with class input also are credited to your participation. For example, you can share additional points that were not raised during class lectures and/or case study discussions. Students who make meaningful contributions, or offer important materials, to case study discussions will be specially rewarded. Whenever appropriate, communication and collaboration records on the DEN system will be used as a base for class participation grades. Contributions to the Discussion Board entries throughout the semester are another important factor in deciding your class participation.

- **Final Examination (30%)**

  The final exam is scheduled from 1:00 pm to 3:00 pm on date TBD. The exam is **closed book** and limited to the materials that have been discussed in classroom lectures, case studies, and/or team projects. Questions are open-ended, but are made brief and point specific as much as

possible. They often require only short answers that show your comprehension of the concepts, definitions, approaches, and tools covered.

Make-up exams will only be offered, when there is absolute proven need for the students. Should you have to miss your exams, an individual oral exam will be scheduled with the instructor. No written make-up exams will be available. Final grades are due within 72 hours after the prescheduled "official" final exam date. Therefore, students must contact the instructor personally, ahead of time, to make arrangements to complete their make-up exams ahead of this prescheduled "official" final exam date.

- **Debate Project (40%)**

Debate Subjects: Three debate subjects related to technological innovation will be selected for the Summer Session 2012. Details of these subjects will be announced in class in late May, 2012. The purpose of debates is to encourage the students to apply the theories and methodologies in the course to analyze the real industry situation and make their own recommendations. All students are encouraged to first study the general background of these subjects, and indicate their subject/position preferences, if any, to the TA.

Team Formation: The whole class will be divided into up to six teams, each with no more than six students. Ideally, all debate teams should be composed of members with different professional background and experiences. Students should indicate their preferred topic/position to the TA, and any special requests for team membership. The TA will announce the debate teams and subject assignments in class in late May, 2012 based on multiple factors. Changes of team membership made after this date will only be granted on very special situations. Since this course emphasizes virtual teaming, off-campus and on-campus students from various locations are encouraged to team up to complete their projects.

Debate Preliminary Summary: Each debate team will submit a 3-slide summary of their debate materials in PowerPoint, bulletized format. Slide 1: Concise statement of issue. Slide 2: Key propositions/arguments in favor of their position. Slide 3: Expected key propositions/arguments from opposition. This will be graded pass/fail and teams are free to modify their approach prior to the debate.

Live Debates: Each debate team will study the assigned subject to prepare for two live debates in early-June and late-June. During these debates, the goal of each team is to convince the *judges* (i.e., the instructor, the TA, and the rest of the class) of their position and views by providing supporting evidences with logical analyses and convincing arguments. Meanwhile, a team attacks their opposing team's position by finding flaws in their arguments and reasoning. Specific debate procedures will be announced one week before in the class. Each debate team should arrange for ALL its members to take on some representing/responding roles during the two debate presentations.

The rest of the class (i.e., all students except for those who are part of the two opposing teams of a topic) will act as the "judges" of these debates, whose scores will contribute partly to the grading of each team. For all debate teams, an electronic copy of the presentation materials in PowerPoint file format, and other optional supporting materials, are due at the

end of each debate session.

Debate Final Report: Final team debate reports are due right before the scheduled final exam time. These final reports should summarize all findings and recommendations of the debate team throughout the semester. The reports should be prepared professionally with supporting facts. The reports are to be up to 40 pages in length (excluding the appendix), double-spaced, 12 pt. type, typewritten. Paper length is strictly enforced. Your project final reports are graded based on: (1) creativity/ innovativeness, (2) professionalism of presentation and writing, (3) depth of literature, methodology, analysis, (4) quality of recommendations, and (5) likelihood of and steps for implementation.

Academic Integrity:

"The Viterbi School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus. Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course."

Students with Disabilities:

Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213)740-0776.

Course Schedule (subject to change based on course enrollment):
The Instructor reserves the right to change this schedule and topics during the semester.

Class No	Date	Class Session I	Text Chapter	Class Session II	Text Chapter	**Case Study** and **Debate Project**
1	5/16	Overview Introduction Syllabus	1	Sources of Innovation Explanation of Team Debates	2	Course Syllabus Handout **Explanation of Debates** **Case Study 1 Kickoff**
2	5/21	Types and Patterns of Technological Innovation (The S-Curve and the Segment Zero Prin.)	3	Standards Battles and Design Dominance Debate Topics	4	**Assignment of Debate Teams and Subjects**
3	5/23	Timing of Entry of Technology Introduction	5	Defining Organizations Strategic Direction	6	**3-slide Debate Preliminary Summary (graded P/F)**
	5/28	University Holiday, Memorial Day				**Debate Preference Inputs Due** Student Self-Introduction Due on Web Site
4	5/30	Choosing Innovation Projects	7	**Case Study 1 In-Class Discussion (led by TA)**		**Case Study 1 Report Due** **Case Study 2 Kickoff**
5	6/4	**1st Round of Team Debates**				**1st Debate Slides Due**
6	6/6	Collaboration Strategies (Compare Outsourcing and Off-shoring Strategies)	8	Protecting Innovation	9	
7	6/11	Organizing for Innovation	10			
8	6/13	Managing the New Product Definition Process	11	**Case Study 2 In-Class Discussion (led by TA)**		**Case Study 2 Report Due**
9	6/18	Managing New Product Development Teams	12	Crafting a Deployment Strategy	13	
10	6/20	**2nd Round of Team Debates**				**2nd Debate Slides Due**
11	6/25	Final Exam (2 hours)				**2nd Debate Final Report Due**