

BUS 466

Entrepreneurship in Science & Engineering

<p>Credit: 3 credit hours Office Hours: 1:00pm – 3:00pm, T, TH Course site: blackboard.iit.edu Classroom: Main Campus 4C3-1 Professor: Dr. Jianwen (Jon) Liao Associate Professor of Strategy and Entrepreneurship Phone: 312.567.3895 Office: IGT-C 4A8-2 E-mail: liao@iit.edu</p>	<p>Professor: Victor Perez-Luna, Professor of Chemical Engineering Email: perezluna@iit.edu</p>
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COURSE DESCRIPTION

The subject of the course is the innovative transformation of knowledge into commercial products and services. Cross-disciplinary teams of students will assess various technologies ranging from life sciences, information technology, alternative energy, and nanotechnology for their commercial potential in terms of licensing and/or for venture development.

Technology entrepreneurship, in itself, is a spirited approach to business leadership that involves identifying high-potential, technology-intensive commercial opportunities, gathering resources such as talent and capital, and managing rapid growth and significant risks using principled decision-making skills. The course is designed to provide students with the perspective, tools and information necessary to evaluate the business potential of a technical idea, secure patent protection, understand start-up issues, appreciate the value of a technology incubator, obtain venture investment, understand IPOs and grow a technology-based enterprise. Emphasis will be placed on processes for managing the early stages of innovation through balancing marketing, manufacturing, research, financials, intellectual property and regulatory affairs. An understanding of each of these functions as they relate to technology development will be provided.

The course will utilize several methods of instruction: lectures, discussions, readings, case studies, guest speakers from the technology community and student projects. A constructivist approach will be used to develop students' knowledge of the beginning stages of the technology development process. Using student's current experience and knowledge, theoretical concepts will be developed and implemented. Learning will be student-centered and based on a collaborative approach. The instructor will serve as a facilitator and coach to guide students toward learning goals.

OBJECTIVES

The purpose of this course is to bring together scientific and business minds in what will be a highly synergistic and creative experience.

- Understand the patterns of innovation
- Assess innovation from business standpoints
- Understand the characteristics of a successful start-up enterprise.
- Assess the commercial viability of a new business concept.
- Perform marketing research to determine marketability of a new product.
- Develop a business plan.
- Understand the importance of cash flow and be able to read and understand financial statements.
- Understand the importance of domestic and international patent protection.
- Describe how to secure funding for a start-up enterprise.
- Describe the characteristics of an Initial Public Offering.
- Work successfully in teams.
- Describe the role of ethics in entrepreneurship.
- To understand the key concepts and options in technology entrepreneurship and technology commercialization.
- To understand how to assess technologies for their commercialization potential.
- To recognize and assess the potential value of a technical idea or concept
- To create value by developing a viable enterprise around your technology
- To understand the steps that a technology goes through in the journey from the laboratory to the marketplace.
- To explore the roles that intellectual property protection, and licensing play in the commercialization process.

With the materials we will build on seven critical skills for entrepreneurial leaders:

- Creativity and opportunity evaluation
- Real-time strategy and decision making
- Comfort with change and chaos
- Teamwork
- Evangelism, selling, negotiation, and motivation through influence and persuasion
- Oral and written communication
- Basics of start-up finance and accounting

Learning Outcomes:

- Understand the characteristics of a successful startup enterprise
- Assess the commercial potential and viability of a new business concept
- Perform marketing research to determine marketability of a new product
- Develop a business plan

- Understand the importance of cash flow, be able to read and understand financial statements
- Understand the importance of patent protection both domestically and internationally
- Understand how you go about securing funding for a startup
- Understanding an IPO
- The team, how to create it, nurture it and get it to produce results
- Components of good team, people, processes, trust
- Ethics, the essential foundation of trust, the one true cornerstone
- The whole process of technology commercialization

REQUIRED AND RECOMMENDED READINGS

Textbook (required)

Cases and reading package will be available through www.Xanadu.com

Course pack number **310854**

Books (Recommended)

- Cooper, R.G. (2001) *Winning at New Products: Accelerating the Process from Idea to Market. Launch.* Perseus, NY
- Udayan Gupta. *Done Deals: Venture Capitalists Tell Their Stories*
- Paul A. Gompers, Josh Lerner. *The Money of Invention: How Venture Capital Creates New Wealth*
- *Piloting Palm, The Inside Story of Palm, Handspring and the Birth of the Billion-Dollar Handheld Industry*
- Randy Komisar. *The Monk and the Riddle*, , HBS Publishing, 2nd Edition
- Kaplan, J. (1996). *Startup: A Silicon Valley Adventure.* New York: Penguin. Paperback. ISBN: 014257314
- Adams, Rob (2002) *A Good Hard Kick in the Ass: Basic Training for Entrepreneurs.* Crown Business
- Bygrave, William, ed. *Portable MBA in Entrepreneurship* 2nd edition 1996
- Gupta, Udayan (2000) *Done Deals: Venture Capitalists Tell Their Stories.* Harvard Business School Press
- Robinson, Robert J. & Van Osnabrugge, Mark (2000) *Angel Investing: Matching Startup Funds with Startup Companies -- A Guide for Entrepreneurs, Individual Investors, and Venture Capitalists.* Jossey-Bass
- Gompers, Paul A. & Lerner, Joshua (2001) *The Money of Invention: How Venture Capital Creates New Wealth.* Harvard Business School Press
- Compers, Paul A. & Lerner, Joshua (1999) *The Venture Capital Cycle.* MIT Press
- Young, Jeffrey & Simon, William (2005) *iCon – Steve Jobs the Greatest Second Act in the History of Business.* Wiley & Son
- Berlin, Leslie (2005) *The Man Behind the Microchip.* Oxford Press

COURSE APPROACH AND KEY COMPONENTS

This course incorporates both individual and group efforts. Students form study groups early in the quarter and meet regularly to prepare for class discussion. We encourage students to build groups with people from a diversity of majors.

The Business Plan Project (Team)

Business plans serve two important purposes. First, for new businesses, the business plan serves as a selling document. It sells the business to potential financial backers and other stakeholders (including the entrepreneur). Second, and equally importantly, the business plan is an essential management tool. It helps the entrepreneurs understand critical assumptions underlying the strategic vision for the venture; identify milestone events in the startup process, and keeps managerial attention focused on key priorities.

Specifically, the business plan is a document that achieves the following:

- Provides a clear statement of the business concept and the market opportunity on which the new venture is to be built
- Presents the company's strategic objectives and its plans to achieve those objectives
- Demonstrates how the realization of the objectives will lead to a sustainable competitive advantage in the marketplace and economic profits that result from such advantages
- Identifies the milestones of the project and the assumptions underlying the venture
- Describes in detail how the business will be operated and plans will be implemented
- Discusses the resources required to achieve the goals of the venture and demonstrates the expected market and financial results.

The plan should be limited to 35 pages of text, including the executive summary. Spreadsheets and appropriate appendices can be added after the text portion of the plan. Written business plan is due in class on the week before the final.

Formal Business Plan Presentation (Team)

Each team will be required to deliver a formal presentation of your business plan. You will have 30 minutes to make your presentation. **This 30-minute time limit will be strictly enforced.** After your presentation, the judges will conduct a 15-minute question and answer session. Each member of the team **must** participate in the oral presentation of the plan. You are encouraged to use visual aids and state-of-the-art technology. Remember you are trying to pitch your business plan to potential investors. Effective presentation is as important as a well researched

business plan.

Elevator Pitch Assignment (Team/Individual): Students will be required to prepare and give, without notes, a two minute “elevator pitch” in which they are using a chance encounter in an elevator with an investor of the student’s choosing who just happens to be the perfect person to invest in the company that is developing the technology that is the subject of the business plan.

Case Studies and Case Study Briefs (Individual, due dates posted in the Course Schedule)

The course includes several case studies designed to demonstrate how real businesses are dealing with the issues related to technology commercialization. Case studies are used to analyze and explore typical problems encountered by scientists, engineers, and entrepreneurs in creating their ventures. The cases will vary in terms of their difficulty. Be forewarned that shorter cases are not always easier to analyze. Your conscientious participation is critical to the success of this aspect of the course. As there are rarely “right” answers, much of the learning comes from the exchange of ideas among the students. You should come to class prepared to present and support your views on the case. These views should be supported by the frameworks and ideas expressed in the readings for that day. Therefore it is important to do the readings first before beginning to address the case questions. Cases will be assigned and can be found either in the text or from the course blackboard site.

Case study briefs should be typed single-spaced, not exceeding two page, and should answer the questions for each case study provided. Bullet-point format is acceptable.

Assigned Readings (Individual)

All assigned readings are to be completed before the session. Each required reading has been specifically chosen to provide a certain insight or skill; thus, every assignment is mandatory. Though there is no way to verify that students have read the material before class, all lectures, study questions, assignments, and exams assume a fundamental understanding of many concepts provided by the readings and chapters. Consequently, failure to keep up with the assignments will have an adverse effect on a student's grade.

Class Participation (Individual)

Your class participation and discussion is a major part of the course. Evaluation of contribution will be made on both quality and quantity and quality of contribution. Feedback provided to other business teams is also an important component of the evaluation.

Your overall commitment and attitude toward this course, and your daily active

verbal participation in class discussions, will be closely monitored. In grading class participation, we will look at both the quantity and quality of your class contributions/ interventions. Class participation is obviously a function of preparation, skills, attitude, and a willingness to actively commit yourself in front of us and your colleagues.

With regard to quality, the dimensions that we look for include:

Relevance -- does the comment bear on the subject at hand? Comments that do not link up with what the discussion is focusing on can actually detract from the learning experience.

Causal Linkage -- are the logical antecedents or consequences of a particular argument traced out? Comments that push the implications of a fact or idea as far as possible are generally superior.

Responsiveness -- does the comment react in an important way to what someone else has said?

Analysis -- is the reasoning employed consistent and logical?

Evidence -- have data from the case, from personal experience, from general knowledge been employed to support the assertions made?

Importance -- does the contribution further our understanding of the issues at hand? Is a connection made with other cases we have analyzed?

Clarity -- is the comment succinct and understandable?

Does it stick to the subject or does it wander?

All students will be formally called on to take the lead in various aspects of class discussions at least once or twice during the semester. If the student called upon is not present, is late, or is not sufficiently prepared to make a substantial contribution to the class discussion, he/she will lose points for class contribution. If the student makes helpful comments, he/she will accumulate points for class contribution. Since it is unlikely that there will be enough opportunities to call on each student more than once or twice, be warned that failure to be thoroughly prepared, on all occasions, can be devastating to your overall grade. The simple recitation of facts from the readings or case will receive some credit toward the student's class contribution score. Comments that do more than simply recite facts, however, will receive substantially more credit. For instance, comments that provide synthesis or raise counterintuitive points, will add much more to a student's class contribution score. Comments that contain factual misstatements, demonstrate lack of adequate preparation, or are distracting because they come too late in the discussion, are discouraged.

COURSE CONTENT (to be revised continuously)

Session 1 Entrepreneurship – the process & the person

Course Overview and Introduction

Reading: The heart of Entrepreneurship (Reprint 85216)
Pre-Start Analysis: A Framework for Thinking about Business Ventures (9-386-075)

Case: Vermeer Technology (9-397-078)

- What decisions did Charles Ferguson make and what actions did he take, from late 1993 through January 1995 to build an enterprise that attracted an offer from a group of venture capital firms to invest \$4 million for 51% of the company?
- As Charles Ferguson, would you agree with the proposed deal?

Class Discussion Questions

- What are the typical images of entrepreneurs in our mind? What common characteristics do entrepreneurs share?
- What is the essence of entrepreneurship? Are you an entrepreneur? By what definition?
- What are the relevant attitudes, attributes, skills and know-how for start-up entrepreneurs?
- What motive people to become an entrepreneur?
- Compare and contrast these roles: managers, strategists, and entrepreneurs. How are they different?
- Are entrepreneurs born or made?
- What are the barriers to the pursuit of entrepreneurship?
- What determines successful entrepreneurship?
- What is the entrepreneurial process?

Session 2 Opportunities in Science & Engineering: 10 faces of Innovation

Innovation approaches following Tom Kelley's and IDEO's Philosophy in "The Ten Faces of Innovation"

Innovation by Learning

- *The Anthropologist*: Science, technology and human needs (health, energy, food, safety, etc). Human needs extend beyond the most fundamental needs. Tangible (mobility, communication, shelter, nourishment, etc) and intangible (styling, prestige, love, group identity, etc) needs. Abraham Maslow's theory of human needs.
- *The Experimenter*: Prototypes in science and technology (how experimentation generates continuous innovation in science and technology). Many examples from science (atom models), experiments with particle physics, analytical instruments and their evolution into commercialization.

- *The Cross Pollinator*: Interdisciplinary innovation in science and technology (e.g.; bioinformatics, tissue engineering, biophysics, quantum computing, biomimetics and other examples illustrating the need to continuously learn from other fields).

Innovation by Organizing

- *The Hurdler*: Major advances in science have occurred when major problems have been treated with entirely new approaches that overcome hurdles to current knowledge (Rutherford's model of the atom, the ultraviolet catastrophe and the birth of quantum mechanics, discovery of DNA structure)
- *The Collaborator*: Interdisciplinary collaboration and innovation (Manhattan project, race to the moon, The Human Genome project, National Nanotechnology Initiative, Engineering's Grand Challenges)
- *The Director*: Major innovation projects require leadership (Manhattan project, race to the moon, The Human Genome project, National Nanotechnology Initiative)

Innovation by Building

- *The Experience Architect*: Some examples from Software (MATLAB vs. Fortran, MS-DOS vs. Windows), Scientific instruments and equipment, daily use devices (iphone, GPS), service, learning, organizations.
- *The Set Designer*: Research labs, libraries and offices as more than places to work. Concept of "watering holes" to promote innovation, crosspollination and others. Examples from IDEO.
- *The Caregiver*: How customer service can make a difference (e.g., Lexus, software, research and education).
- *The Storyteller*: Elevator pitches, proposals, business plans.

Readings

- ❑ Kelley, T., (2005). *The Ten Faces of Innovation*, Currency – Doubleday, New York, NY. ISBN 0-385-51207-4
- ❑ Lecture Notes: Patterns of Innovation

Team Assignments:

Statement of Interests.

Write a 2-page statement of interest for your new venture idea. The opportunity has to be science- or engineering-driven and will be continuously refined for the next few weeks.

This paper should state why you are interested in this business idea, how you see it positioned in the marketplace. Prepare a short presentation (one Powerpoint slide or Web page) as a summary to share with your colleagues. Please specifically address the following questions

1. What is your product or idea? Is your product or idea innovative?
2. What is the technology that underlies your product/ idea? Is your underlying technology unique?
3. Who is your market and initial customer group (who will buy it)?
4. What needs of your customers does your product or idea address (why will they buy it)?
5. Provide some indications of the general size of the market (i.e., numbers are not required).
6. What kinds of advantages does your product or service have as compared to competition?

Session 3 Opportunities in Science & Engineering: Patterns of Innovation & Disruptive Innovation

Discussion Questions:

- 1) Beginning question
 - a. Why major companies with technical and financial resources often fail and become insensitive and even ignorant in the race for innovation?
 - i. Google (Yahoo, Microsoft)
 - ii. Paypal (MasterCard, Visa, AmericanExpress)
 - iii. Apple iPod (Sony, Columbia)
 - iv. Digital photography (Kodak)
- 2) The challenges of conventional wisdom of strategy
 - a. Industry analysis
 - b. Segmentation and target customer
 - c. Organizational capability and core competencies
 - d. Competitive strategy: cost leadership and differentiation
- 3) What do we know about innovation?
 - a. The domain
 - b. The types
 - c. The patterns

Companies that identified the right opportunities for innovation

- ConAgra
- Genentech
- Affimetrix
- BIAcore

Some disruptive innovations

- Discovery of transistor
- Digital technologies, how they allowed some companies to disrupt markets and how the trends could have been foreseen (digital versus analog watches, digital photography, digital music). Relationship to Moore's law.

- Microelectromechanical Systems (MEMs) and micro total analysis systems (μ TAS)
- Genentech, Human Genome Project, microelectronics and biology, National Nanotechnology Initiative, National Academies Grand Challenges
- BIAcore

Theory-in-Action (team assignment): mini case report and presentations

- Which industry has been, is being or will be disrupted? By whom? And why? What types of disruption?

Session 4 Opportunities in Science & Engineering: Value Innovation

Team Assignments:

- Make a comparisons of Nintendo Wii, Xbox, PS3. How are they different in terms of technical specifications, market focus, competitive focus and market performance? What do you think the reasons behind Wii's success in the last two years?

Discussion Questions

- What is unique about value innovation? How is it different from conventional approaches?
- What are the steps for value innovation?
- How do we redefine the industry boundary?

Theory-in-Action (team assignment): mini case report and presentations

- Identify a product or a service in an industry and demonstrate how value innovation can change the rules of engagement for that industry.

Session 5 Opportunities in Science & Engineering: Open Innovation

Team Assignments:

- How has iPhone's business model changed in the last two years?
- Examine the business models of the following companies
 - Wikipedia
 - BigIdeas.com
 - Innocentive.com
 - Linux
 - Others....

Discussion Questions:

- 1) What lead to the emergence of open innovation? Why conventional closed innovation is not working?
- 2) What are the implications of open innovation?

Other models of open Innovation

- National Academies, NIH, NSF, DoE, DoD, NineSigma, Innocentive, open source software
- Making use of unused computing power
(<http://www.nsf.gov/news/overviews/computer/screensaver.jsp>,
http://www.int.iol.co.za/index.php?click_id=117&art_id=qw1035368640495S432&set_id=1, http://genomeathome.stanford.edu/science/Horizon_Review.pdf,
http://publications.nigms.nih.gov/computinglife/protein_fold.htm,
<http://setiathome.ssl.berkeley.edu/>)

Session 6. Entrepreneurship – the Opportunity and the business model

Reading:

Knowing a winning business idea when you see one (Reprint R00510)
How venture capitalists evaluate potential venture ideas (9-805-019)

Case: ZipCar (HBSP [803096](#))

- Evaluate this potential venture and the progress that Chase has made.
- What is the business model, and how has it changed between December 1999 and May 2000? What do the data from actual operations in September say about how the business model is playing out in practice? Does the data give your comfort or concern?
- What actions should Chase take as a result of the September operating results?
- What is the strongest argument Chase could make to a potential investor about the attractiveness of this venture? What, specifically, should her elevator pitch be at the Springboard forum?

Discussion Questions

- What is the difference between an idea and a business opportunity?
- How do we evaluate a business opportunity? Do you see anything in common in terms of how VCs evaluate potential opportunities?
- What makes an effective elevator speech?

Session 7. The Business Plan

Reading: Business Plan (9-389-020)

How to write a great business plan (Reprint 97409)

Case: Heather Evans (9-384-079)

Assignment: Discussion Questions

- Evaluate the opportunity for Heather Evans
- Evaluate Heather Evans efforts to date.
- Evaluate the business plan
- Evaluate each of her financing alternatives
- Who should she approach and on what terms?

Team Assignment

- Develop a business plan template for the opportunity you choose your team pursue.
- Develop a business plan evaluation template.

Discussion Questions

- What are we looking for in a business plan?
- What purposes does a business plan serve?
- What are the typical pitfalls of a business plan?

Session 8 Legal Framework – Legal form

Reading: Legal forms of business (9-898-245)

Legal Aspect of Entrepreneurship – a Conceptual Framework
(9-802-161)

Legal Protection of Intellectual Property (9-898-230)

Case: Sheila Mason and Craig Shepherd (9-803 – 095)

- Evaluate the situation in which Mason and Shepherd find themselves with respect to their existing employers. What legal and ethical issues do you see and how would you advise them to proceed?
- Evaluate the non-disclosure agreement and its potential impact on venture capitalists considering an investment in Intelisoft. Do you think it is reasonable to expect potential investors to sign such an agreement? As a VC, why would or wouldn't you sign? What are the effects of the “residual clause” suggested in Exhibit 4? Should Mason and Shepherd agree to this?
- Do Mason and Shepherd need a lawyer? How should they select one?
- What actions should Mason and Shepherd take in order to terminate their employment relationship with current employers?

Discussion Questions

- What are the various legal options for starting a business? How are they different? What are the implications?
- What are the legal issues an entrepreneur may face during the startup process?
- How to find, screen and eventually work with a lawyer?

Session 9 Venture financing

Reading: Bootstrap financing (Reprint 92601)

A note on venture capital industry (9-295-065)

Case: ONSet Ventures (9-898-154)

- What is OnSet's model for the factors that create an attractive opportunity?
- Do you agree or disagree with each of the elements of this model?
- How much should Onset raise in this latest fund?

- Evaluate Onset's actions with respect to TallyUp so far. How should the firm deal with the issues presented at the end of the case?

Meeting with each team with regard to the business plan.

Session 10 Venture Financing – Deal Structure and Terms

Reading: You can negotiate with venture capitalists (Reprint 87207)

Venture capital negotiation: VC vs Entrepreneur (9-800-170)

Case: Term sheet negotiation

(An Exercise: to be distributed in class)

Meeting with each team with regard to the business plan.

Session 11 Entrepreneurial Marketing

Reading: Marketing Strategy: An Overview (9-500-005)

Team Assignment: Design a marketing strategy for your business opportunity

- Reaching your customers: methods of sales, promotion, and distribution.
- Branding, differentiation, and identity.
- How do you scale sales and promotion? Creating a strategy of first customers, segmentation, and long term growth.
- The key role of public relations, testimonials, and building legitimacy.
- How about pricing strategy?

Please make sure to prepare the marketing strategy in conventional way and non-conventional way (i.e., gorilla marketing etc..).

Session 12 Managing Venture Growth

Reading: The challenges of growth (9-393-106)

Managing transition in growing enterprises (9-393-107)

Case: Johnsonville Sausage (A) (9-387-103)

- Has Johnsonville Sausage made the transition from entrepreneurial to professional management firm successfully?
- What changes in its firm and management would you cite as evidences of a transition?
- What pressures forced these changes?
- How should Ralph Stayer react to Palmer Sausage's request?

Team Assignment

- What are your growth strategies of the venture?

Discussion Questions

- What are the challenges an entrepreneur faces in a growing enterprise?

- How can an entrepreneur prepare for the challenges of a fast growing enterprise?

Course Wrap-up; Team evaluations and course suggestions due. Each person submits an evaluation of themselves and their teammates on the Business Plan projects. Allocate 100 points among the members to reflect overall contributions.

GRADING:

The grades for this course will be based on the following point system:

Business Plan	30%
Business Plan Presentation	15%
Case Reports	20%
Participation	10%
Final Exam	25%

VALUABLE WEB SITES to VISIT

- 1) Study Skills: <http://www.ucc.vt.edu/stdysk/stdyhlp.html>
- 2) Galileo On-Line Access: <http://www.galileo.peachnet.edu/Homepage.cgi>
- 3) Entrepreneurship 10 Question Quiz:
<http://www.aibn.com/contents/education/assess.html>
- 4) Entrepreneurship 30 Q Test:
http://new.innonet.ch/all_active/sp_e/info/startup/utest_form.asp
- 5) Entrepreneur Self Assessment Quiz:
<http://www.wd.gc.ca/apps/amiantent.nsf/59e1527d29d9592285256832007f2bbc?OpenForm>
- 6) Profit Magazine Entrepreneurship Test: <http://www.cybf.ca/cybf-cgi-bin/quiz.cgi>
- 7) Patents 101/Anatomy of a Patent Claim:
http://www.webpatent.com/news/news10_00.htm
- 8) Business Plan Resources (MIT Enterprise Forum):
http://www.mit.edu/afs/athena/org/e/entforum/www/Business_Plans/bplans.html
- 9) The Business Plan (SBA):
<http://www.sbaonline.sba.gov/starting/wideindexbusplan.html>
- 10) "Writing an Effective Business Plan"
<http://www.us.deloitte.com/growth/guidebooks/busplan.htm>
- 11) Elevator Speech: <http://www.powerfulpresentations.net/article1024.html>