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**University of California, Berkeley
Management of Technology Program**

Course Syllabus

The Business of Nanotechnology

**2 credits
ENG 290.4**

**Fall 2009: Wednesdays 4:00 PM – 6:00 PM
Location: Hildebrand Hall, Room B51**

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Course Summary

The field of nanotechnology, at most ten years old, has emerged as an important new area for investment and business opportunity, and one that is already having an impact in many industries. Both established companies and young start-ups are developing businesses based on innovations in nanostructures and nano-scale developments in materials science, information technologies and the life sciences.

Offered for the first time in fall, 2005, this is UC Berkeley's first course focused on nanotechnology-based business opportunities. The course provides a comprehensive overview of the core elements in this emerging field, specifically the scientific and technical basis of nanotechnology, the emerging business opportunities, and the policy issues that represent both threats and opportunities to nanotechnology investors, innovators, and entrepreneurs. This course is particularly suited for those who anticipate founding or operating a technology company.

The course focuses on skills needed for the identification of opportunities that can lead to successful entrepreneurial ventures in nanotechnology, regardless of the individual's "home" skill set, whether managerial or technical. We examine in depth the many approaches being taken today to capitalize on opportunities in nanotechnology. Course material and speakers focus on executing marketing, technology development and strategic plans that integrate technological development with evolving customer requirements. A central goal of the course is to improve understanding of how the confluence of technological innovation, market forces and venture finance drives new technology ventures.

Readings

There is a moderate amount of reading expected in this course. Readings will be posted on the class site. You are also encouraged to read the book *Nanotechnology: A Gentle Introduction to the Next Big Idea*, Ratner et al.

Grading

- 10% Class discussant. You will be assigned to one of the guest speakers in class to assist in facilitation of class discussion.
- 30% Class participation. Your creative and constructive involvement in class discussion is an essential component of class.
- 60% Term paper. Please see description below.

Term Paper: examine or develop a business opportunity in nanotechnology; explore the broader economic, societal, and policy issues surrounding nanotechnology

You are required to prepare a term paper for this class, to be submitted in hard copy format at 4:00 PM on the last day of class. Your paper should be a maximum of 4,000 words in length, plus appendices. Each student selects their paper topic no later than the 4th week of class, and clears their choice with the instructor at that time. Teams of up to three people will be permitted; the expectation for creativity and depth is significantly greater for group papers.

Your term paper/project can be in one of three areas:

1. Opportunity Recognition

The goal of this project is to develop skills in market assessment, technology development planning and strategic planning necessary to develop an opportunity in high tech. You are to include the three basic elements of this course in your paper: the science, the business opportunity, and the public policy issues that are associated with the opportunity you are examining.

Included in your paper should be the opportunity and market assessment that you would include in a business plan. The nanotechnology opportunity you choose may be (a) one at an existing start-up or established company, (b) your own idea for a new venture or (c) an opportunity being pursued by a colleague or associate. Students are expected to synthesize business strategy from readings and discussions. The business opportunity described in your plan should be comprehensive enough to serve as a vehicle for raising capital and a roadmap to launch and grow a company. You should develop a detailed strategic vision.

2. Broader economic, societal, ethical, legal, and policy issues surrounding nanotechnology

The goal of this project is to have students make a meaningful (and hopefully influential) contribution to the regional, national and global discourse on the benefits and risks of nanotechnology. The emphasis is on “opportunity recognition” or “problem recognition” on a broader scale. For example:

- What strategies should the Bay Area pursue to strengthen its leadership in the convergence of bio, info, and nanotechnologies?
- Are companies, environmental organizations, insurance companies, the research community, and regulatory agencies acting appropriately to identify, manage, and mitigate the environmental and human health risks of nanoparticles? What lessons should stakeholders learn from asbestos and the public backlash (especially in Europe) against genetically-modified organisms?
- If nanosensors dramatically reduce the cost of monitoring air and water quality, how might this change environmental regulation and “community policing” of environmental regulation? Might it enable broader use of market-oriented mechanisms, such as the “tradeable permits” used to combat acid rain?
- What steps should be taken to ensure that the 4 billion people who earn less than \$2,000 benefit from nanotechnology (e.g. water filtration, nanotech-based anti-HIV microbicides, etc.) What role might UC Berkeley or LBNL play?
- Many promising discoveries fail to cross the “valley of death” between “proof of principle” and “reduction to practice” (demonstrating replicable, cost-effective, high-volume manufacturing). Is there an appropriate role for government here, or would the “cure” of government involvement be worse than the disease?

This project will require: (1) defining the “status quo” with respect to a particular problem, opportunity, or issue; (2) making the case for one or more goals that should inform the discourse on this issue; and (3) identifying the public and private strategies needed to achieve these goals. For this project, a traditional term paper may not be the most (or only) appropriate work product – it might also include the documents that would help implement the strategies proposed by the team.

3. Write a case study on a business based on an opportunity in nanotechnology

In this project option, you will write a case study in a standard format that can be used for instructional purposes in future semesters at UCB or at other universities. If you select this option, you will work under the guidance of the instructors, however, you will need to identify a company or a group of individuals who are working in nanotechnology and are willing to provide you with sufficient information about their

work to enable you to complete the case. The instructor will explain this option on the first day of class.

You are encouraged begin work on this project immediately, and to meet with the instructor regularly during the semester to verify that your work meets the requirements of the assignment.

Group Project FAQs

1. Utilize the tools we discuss in class and those in the posted materials.
2. Combine objective data, your synthesis of those data, and your own subjective views.
3. Use both primary and secondary sources.
4. Cite the sources of your data.
5. When in doubt, follow the description of the assignment in the syllabus.
6. You may organize your paper however you wish, but be sure to emphasize analysis and interpretation of the market and the opportunity, and place less emphasis on background data about the market landscape. A reasonable weighting is 30% on background and 70% on analysis and recommendations.
7. If you want to review your work with the instructor prior to completing it, please schedule a date to do so in advance.

Class Etiquette

1. Be on time. We will begin class at 4:10 PM.
2. Please use your name card throughout the semester. Please print one, in 100 point, if you don't have one.
3. Beverages are permitted in class, but food is not.
4. If you cannot make a class meeting, or if you will be late for class, send the instructor an email advising this in advance.
5. Laptops, PDAs, cell phones and similar electronic devices will be turned off during class and left in your backpack or briefcase.