

## Syllabus

**Purpose and nature of course:** Economics 211/Physics 201 aims to acquaint students with various aspects of innovation — its origins, pursuit, major characteristics, and desired outcomes — with a substantial focus upon scientific and/or technological innovation. A major component of the course involves projects to be pursued by student teams (usually three students per team) who aggressively conduct ambitious, course-long endeavors that illuminate the challenges that people encounter when trying to innovate. The course comprises two lectures per week and a third class meeting devoted to student projects, reports, presentations, and vigorous discussion/ debate among members of the class and project groups. If possible an outside resource person will be assigned to each project; this person will be experienced in innovation and prepared to offer advice and guidance to a particular project group. Selected readings drawn from books, articles and case studies will be discussed in class. Several visiting experts will interact with the class, and some members of the project groups may travel to relevant locations in support of group activities.

**Definition of Innovation:** Innovation, for the purposes of Economics 211/Physics 201, is defined as the creation, development, and successful application of new ideas, approaches, technologies, and/or methods to various products, processes, intellectual endeavors, and/or practices. In the most profound cases, such innovative changes are *disruptive* and lead to *paradigm shifts* that force realignments of entire fields and/or practices to such a degree that the previous products or approaches become obsolete. Some experts believe that innovation is most likely to occur at interfaces or intersections between contrasting or complementary fields. Assuming the validity of this point of view, an innovator's ability to contribute to interdisciplinary activities would appear to be pivotal, and hence a liberal education that emphasizes breadth offers a promising underpinning for innovative activities.

**Impetus of Course:** Economics 211/Physics 201 was conceived, in part, as a response to various reports, white papers, debates, and national legislation which assert that America needs a future workforce that is well-attuned to the art and pursuit of innovation if the US economy is to maintain a commanding position in the rapidly expanding global economy. Since the prevailing trend of rapid technological growth worldwide and outsourcing of routine work is likely to persist, the long-standing tradition (and associated comparative advantage) of innovation in the US is certain to become more and more important. Hence Economics 211/Physics 201 attempts to bring the attention and creative energy of Lawrence students to the pursuit of innovation to help prepare LU graduates for future challenges in a wide range of careers.

**Prerequisites:** With rare exception, students in this course will have junior or senior standing to ensure that they have substantial exposure to at least one discipline and/or relevant extra-curricular activity. This prerequisite is designed to enhance the prospect for students to undertake, as members of a small team, a carefully chosen and ambitious innovative project in an expeditious manner.

**Projects:** Projects in this course will be one of two types: either ones that focus upon a new, truly innovative activity that holds considerable potential for rapid development and partial realization, or ones that resemble and largely recreate an existing (and preferably recent) innovative enterprise that

has proven to be exemplary. These projects need not be brought to full realization, but substantial progress toward at least partial realization is expected. Projects should be reasonably bold and ambitious though realistic. Here are several examples that are suggestive of possible group projects:

- (1). Develop a modular object or product such as a piece of IKEA-like furniture, a new type of backpack gear, a piece of apparel, a creative CD, or a knowledge-based system based upon a distinctive algorithm.
- (2). Employ a “reversing the assumptions” approach or “reverse engineering” to develop a novel enterprise, cuisine, or health food such as the Scandinavian restaurant described in Johansson’s *The Medici Effect*.
- (3). Develop a *wireless* consumer product such as a personal ID system or remote key-entry system.
- (4). Develop a system for shopping whereby the customer carries a barcode-reading device for identifying a list of merchandise which automatically appears at the checkout counter.
- (5). Conduct a random intersection exercise (TRI) whereby one group of individuals explains five concepts from discipline X and another group five concepts from discipline Y. Then the participants examine possible innovative combinations of the various concepts.
- (6). Create an internet site that matches students with sources of student loans.
- (7). Develop a delicious, cheese-based, power beverage appropriate to Wisconsin.
- (8). Develop a web-based game that rewards players for non-violent and ethically-sound activities.
- (9). Devise a gadget for jamming nearby cell-phones.
- (10). Invent an energy-sparing system such as an electric generator mounted on a bicycle that powers an electrical motor on the same bicycle so as to create motion without expenditure of human power. Or develop a lightening farm that harvests the electrical energy contained in lightening bolts.
- (11). Conceive of a more secure credit card system.
- (12). Develop a handshake meter that measures the strength of weak or bone-crushing handshakes and uses the results to analyze the personality of the subject.

**Expectations and Grades:** Economics 211/Physics 201 is expected to be a rather demanding course that requires daily preparation, intensive classroom involvement, and many hours spent on the group projects. We strongly advise against taking this course only to satisfy the “speaking intensive” requirement. Project teams in this course will maintain a single, shared notebook that will *thoroughly document on a daily basis* the planning and execution of the project; each member of the team must plan to contribute his/her fair share to the maintaining of the notebook in a neat and comprehensive fashion. Grades in this course will be determined on the following basis: Hour exam (15%); final exam (25%); classroom participation (20%); contributions to projects (20%); shared project notebooks [each member of the team will be evaluated based on his/her entries] (20%).

**Readings:** Assigned readings in this course must be completed before class so that all students in the course are prepared to contribute actively to classroom discussion and interaction. Since this

course is a “speaking intensive course,” and since it aims to incubate active innovators among its survivors, frequent and vigorous participation, significant (daily) contributions, and uninhibited engagement in classroom activities are expected of all students. If the student is not prepared to embrace these objectives, greener pastures probably exist elsewhere. Frequent use of the word “like” is verboten in this course.

### **Sources:**

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*Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academies Press, 2007.  
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*The Lever of Riches: Technological Creativity and Economic Progress*, by Joel Mokyr, Oxford University Press, 1990.  
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*Against Intellectual Monopoly*, by Michele Boldrin and David K. Levine, Cambridge University Press, 2008.  
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### **Case Studies:**

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*IDEO Product Development*, HBS Case Study 9-600-143, 2007.  
*Accidental Innovation*, HBS Case Study 9-607-082, 2007.  
*Innovation and Invention - A Patent Guide for Inventors and Managers*, Kellogg School of Management Case Study KEL104, 2006.

### **Articles:**

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*The Discipline of Innovation*, by Peter F. Drucker, *Harvard Business Review*, 1985.  
*Innovation: The Classic Traps*, by Rosabeth Moss Kanter, *Harvard Business Review*, 2006.  
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*Turn Customer Input into Innovation*, by Anthony W. Ulwick, *Harvard Business Review*, 2002.