

ECE 482 Syllabus

Course: ECE 482
Credit Hours: 3
Course Title: Engineering Entrepreneurship and New Product Development I
Course Description:

ECE482 is a 3-credit course and part of the two-semester senior capstone design sequence of ECE482 and ECE483 (second semester). The students working in eTeams (entrepreneurship teams) develop project design and implementation plans for their senior capstone design which they will implement the following semester/year in ECE483. The course requires students to develop an original idea for a prototype product, to perform high-level engineering design and analysis, to analyze prototype product's economic viability in the marketplace and to create financial projections for growth. This course is a full-immersion engineering experience and has been holistically designed to integrate the skills and knowledge that students have learned in their engineering studies. This methodology provides the students a more in-depth exposure to new product development and the engineering profession.

Prerequisite(s): ECE383 (waived under special circumstances)

Textbook(s) and/or other required material:

'The Monk and the Riddle', by Randy Komisar, Harvard Business School Press, ISBN 1-57851-644-7 (paper), 2000, Price: \$11

'The Art of the Start, by Guy Kawasaki', PORFOLIO - published by the Penguin Group, ISBN 1-59184-056-2 (hardcopy), 2004, Price: \$17

'Getting Started as an Entrepreneur: A Guide for Students', by the National Collegiate Inventors and Innovators Alliance, 2002, Price: \$14

Reference Texts Only (Texts are made available for use by the students)

'Technology Ventures: From Idea to Enterprise', by Richard C. Dorf and Thomas H. Byers - published by McGraw-Hill, ISBN 0-07-304466-0, 2007, Price \$76

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

- 1) Identify a real-world problem and apply engineering skills to analyze and design a concept prototype product to solve the problem. Note that the physical implementation will be completed the following semester/year in ECE483
- 2) Use formal product development and project tools to create and track project development and management plans
- 3) Work effectively and efficiently as part of a team

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- 4) Demonstrate the basics of business planning and the fundamentals of engineering finance by applying analytical tools to create financial projections for product design and development, manufacturing and deployment of their prototype product
- 5) Calculate the basic financial ratios necessary for the interpretation of financial statements
- 6) Create a preliminary business plan
- 7) Create a high quality presentation as part of their final exam requirements
- 8) Compose a four to five page essay on the process of developing the early stages of a new product and business
- 9) Understand corporate formation and the importance of Intellectual Property
- 10) Evaluate the environmental, societal and ethical impacts of their new product and business ideas

Topics covered:

- 1) Project ideation and evaluation
- 2) Industrial Design Workshop
- 3) Design Process
- 4) Project Management
- 5) Product Design and Analysis
- 6) Intellectual Property Workshop: Researching and Understanding IP
- 7) Financial Analysis Workshop
- 8) Industry Analysis
- 9) Competitor Analysis
- 10) Market Analysis
- 11) Manufacturing
- 12) Functional Specifications
- 13) Design and Test Specifications
- 14) Fundamentals of Presenting
- 15) Corporate Formation
- 16) Business Planning

Class/laboratory schedule (sessions per week and duration of each session):

- 1) Course Organization (1)(75 minutes)
- 2) Project initiation and evaluation (2)(75 minutes each)
- 3) Senior Team Presentation (1)(75 minutes)
- 4) Industrial Design Workshop (2)(75 minutes each)
- 5) Seminar Speaker (1)(75 minutes)
- 6) Design Process (2)(75 minutes each)
- 7) Project Management (2)(75 minutes each)

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- 8) Product Design and Analysis (2)(75 minutes each)
- 9) Seminar Speaker (1)(75 minutes)
- 10) Intellectual Property Workshop: Researching and Understanding IP (2)(75 minutes each)
- 11) Financial Analysis Workshop (2)(75 minutes each)
- 12) Mid-semester Presentations (1)(75 minutes)
- 13) Technical Marketing and Analysis (2)(75 minutes each)
- 14) Manufacturing (1)(75 minutes)
- 15) Seminar Speaker (1)(75 minutes)
- 16) Fundamentals of Presentations and Mid-semester Presentation Reviews (2)(75 minutes each)
- 17) Seminar Speaker (1)(75 minutes)
- 18) Corporate Formation (1)(75 minutes)
- 19) Seminar Speaker (1)(75 minutes)
- 20) Business Planning (2)(75 minutes each)
- 21) Seminar Speaker (1)(75 minutes)
- 22) Seminar Speaker (1)(75 minutes)
- 23) Final Presentations (1)(75 minutes)

Contribution of course to meeting the requirements of Criterion 5 - other:

ECE482 is the first semester of a two semester senior capstone design course sequence (ECE482 and ECE483) in the Engineering Entrepreneurs Program (EEP). As such, ECE482 students are exposed to the engineering design practice. Here they learn how to incorporate engineering standards and real-world constraints to identifying problems and articulating their solutions. In addition, they learn how to work effectively and efficiently in multidisciplinary eTeams (entrepreneurship teams), and to create and apply ethical business and engineering processes into their eTeam management and culture.

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

ECE482 students are part of eTeams(entrepreneurship teams) that perform substantial amounts of engineering research, design and analysis. They will, at times, be expected to apply their understanding of mathematics and basic science to the design and development of their eTeam's new technology product. Some examples include statistical analysis, mathematical modeling and simulation, the use of design tools such as SolidWorks, and the use of modern computer systems and languages.

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

In ECE482, students apply fundamental engineering principles in identifying real-world problems and in articulating their possible solutions. This process is always an iterative one where students continually compare/contrast various solution options to the realities of budgets and deadlines. It is hoped that as students move through the course that they begin to develop, and continue to improve, an intuitive grasp of engineering design and its tradeoffs thereby providing a bridge between engineering theory and engineering practice.

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Contribution of course to meeting the requirements of Criterion 5 - general education:

ECE482 is part of the Engineering Entrepreneurs Program which is a full-immersion educational environment for new product and business prototyping that has been holistically design to improve the overall undergraduate educational experience. This is accomplished by creating multidisciplinary eTeams (entrepreneurship teams) comprised of undergraduate students from all grade levels in engineering, science, business, industrial design, and the arts and humanities. In addition to engineering, math and science, students are exposed to advanced technical writing, presentation skills, business and engineering ethics, intellectual property, and graphic and industrial design.

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students learn to identify real-world problems and to apply their engineering skills to analyze and design concept prototype products to solve the problems. Students use their engineering design and analysis skills in both the creation of product functional, design, and test specifications, and in the analysis of collected data at the various project milestones. In addition, they use formal project management tools to create, track and analyze their project development and management plans.
Outcome B	Major	In learning to identify real-world problems and to apply engineering skills to solve them, students are developing and honing their system design and
Outcome C	Major	

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome D	Major	<p>analysis skills. During this process, they evaluate the tradeoffs inherent in creating a new product that meets a customer need at a defined price-point, while working within a predefined budget.</p> <p>In prototyping a new product students work as members of multidisciplinary eTeams. eTeams are typically composed of undergraduate students from various engineering disciplines and business. But, have also included students from industrial design, and the arts and sciences.</p>
Outcome E	Major	<p>Students attend lectures on product design and development, project management, as well as seminars covering topics ranging from industrial design to product manufacturing. Students also lead brainstorming sessions - overseen by course instructors - on problem identification and solution evaluation.</p>
Outcome F	Intermediate	<p>Students attend seminars given by industry professionals on professional and ethical responsibility, and lead/participate in either in-class or out-of-class</p>

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome G	Major	<p>discussions on these topics as they specifically apply to their eTeam.</p> <p>Students attend special lectures/workshops given by a member of the English Department and by an NC State Librarian on technical writing, presentations and research. In addition, they are required to give three formal presentations and to create and submit the following documents/presentations: eTeam Recruitment Presentation, eTeam Organization Chart, Industry Analysis, SWOT Analysis, eTeam Member Agreements, Competitor Analysis, Logo, eTeam Webpage, Intellectual Property Search, Market Analysis, Project Plan, Functional Specification, Pro Forma Financial Projections, Marketing & Sales Plan, Design & Test Specifications, Investor Presentation, and Final Presentation.</p>
Outcome H	Major	<p>In addition to the significant amount of research and documentation required of the students, they</p>

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome I	Intermediate	<p>attend seminars given by industry professionals and academics on product development, corporate formation, sales and marketing, technical and business research, venture capital, intellectual property, and team dynamics, to name a few.</p> <p>Being eTeams leaders, these students are constantly faced with creating, completing, and assigning tasks that are typically outside their current knowledge and comfort zones. As such, they learn, with the help of their faculty, how to go about obtaining the knowledge they require to complete their tasks and to understand the impact that life-long learning will/has on their future success.</p>
Outcome J	Intermediate	<p>Students attend seminars given by industry professionals and academics on various contemporary issues. In addition, they learn the fundamentals of business research which exposes them to current news and events.</p>
Outcome K	Intermediate	<p>In comparing/contrasting potential new product ideas, the students define both individual and</p>

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		small group assignments that typically require the application of known skills and the acquisition of new ones that involve the use of modern engineering tools, i.e. MATLAB, php, SolidWorks, etc.

Person who last prepared this description and date of preparation:

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