
IME 4010: Entrepreneurial Engineering III (Catalog #: 44391) (Facilities Planning and Logistics)

Fall 2010; MWF 10:30-11:20 am; Room C0136

2010-2011 Catalog Description: This course explores how traditional industrial engineering topics such as supply chain management, facility layout and location are relevant to entrepreneurial engineers. The course prepares students to effectively practice entrepreneurial engineering. *Prerequisite:* IME 3010.

Textbook:

1. Instructor Notes on "Are you an Entrepreneur?"
2. Instructor Notes on "Facilities Layout and Material Handling"
3. Harvard Business School Case Studies
4. Different web resources relevant to the course material.

Course Coordinator and Instructor:

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Office Hours: MWF: 1:30 - 2:30 pm

Course Overview: Welcome to the new competitive age. The business world in which you will manage people and organizations is a world defined by speed, dramatic change and high levels of ongoing turbulence, which means both more threats and more opportunities are confronting every business. A major result is that the new competitive landscape is characterized by a global entrepreneurial revolution. Today, the essence of competitive advantage does not lie in traditional areas such as low cost or high quality. Rather, competitive advantage is defined in terms of speed, innovativeness, adaptability, flexibility, and aggressiveness. In short, advantage comes from being more entrepreneurial than the competitor. Hence our focus in this course is entrepreneurial engineering and management.

Entrepreneurial Engineering III is a project-based capstone course. As your third course in Entrepreneurial Engineering and a capstone experience, the course is meant to serve an integrative role, bringing together all the pieces and parts of your undergraduate IEE education. The challenge in today's workplace is to move away from functional silos and adopt an innovative, cross-functional approach to problem-solving. Consistent with this challenge, our focus will be on entrepreneurship, or the pursuit of opportunity without regard to resources currently controlled. There is no aspect of business that is more inter-disciplinary and cross-functional than entrepreneurship.

Further, Entrepreneurial Engineering III is a course that explores ways of thinking and ways of acting. Accordingly, we shall approach entrepreneurial engineering as a mindset, an attitude, a way of engineering and managerial thinking. We shall also approach it as a behavior, an activity, a manageable process that can be applied in any organizational context. Ultimately, we shall try to convey entrepreneurship as a philosophy of life---as a philosophy for your life.

This is a course on implementation. The central focus will be on a project, where you not only have to come up with an innovative concept or idea, but you have to meet the test of implementation. You will also be responsible for addressing implementation issues as they apply to a series of cases.

Course Learning Objectives: The course is designed to accomplish a number of objectives over the next fifteen weeks. Upon completion of the course, you should be able to:

1. Recognize your own entrepreneurial potential and how that potential can be applied in a variety of professional contexts; assess your own creative problem-solving style.
2. Appreciate the requirements surrounding the creation of a new venture, the kinds of obstacles encountered, and approaches for overcoming those obstacles.
3. Appreciate and master the issues surrounding implementation of an entrepreneurial idea.

In particular the following four topics will be discussed:

1. *Acquiring competence in entrepreneurial engineering*
2. *Understanding the tools and techniques of designing and planning a new facility*
3. *Using mathematical models to find the optimum location of a facility in the supply chain*
4. *Gaining a better understanding of the logistics and supply chain management.*

My challenge to you is to use this course to explore your own approach to Entrepreneurial Engineering. You will be going over all aspects of entrepreneurial engineering, as it is the central requirement of the course. So, start with something truly innovative (something that makes a difference) and build a business that allows you to manufacture and sell the product that you are going to produce. Define yourself as an agent of change.

Relationship of Course Objectives to Performance Criteria and Student Learning Outcomes:

Course Objectives	Performance Criteria	ABET-EAC Outcomes
Acquire competence in entrepreneurial engineering	L3. Develops financial analyses and business plans, market strategy, pricing strategy. L6. Understand different aspects of entrepreneurial engineering.	L: An understanding of the entrepreneurial process including how to design, develop and bring new products and processes to market.
Understand the tools and techniques of designing and planning a new facility	C4. Develops appropriate design parameters (use, dimensions, economics, life cycle) considering identified constraints and criteria.	C: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
Use mathematical models to find the optimum location of a facility in the supply chain	L4. Develops distribution networks and identifies sourcing of materials.	L: An understanding of the entrepreneurial process including how to design, develop and bring new products and processes to market.
Gaining a better understanding of the logistics and supply chain management	J4. Assess the possibility of entering a global marketplace.	J: Knowledge of contemporary issues.

Evaluation: Your grade in this class will be based primarily on your demonstrated grasp of the material and ability to think entrepreneurially. If you ever have any question as to what this means in your assignments, ask the instructor immediately. The instructor also will expect you to challenge him throughout this class in deepening your understanding of the entrepreneurial process. There is almost nothing you cannot ask the instructor. Your final grade will be based on the following:

1) Quiz/Assignments/Active Class Participation	20%
2) Case Studies	20%
2) Term Project	20%
3) Midterm Assessment	20%
4) Final Assessment	20%

Grading Scale:	93 – 100	A	88 - 92	BA
	83 - 87	B	78 - 82	CB
	73 - 77	C	68 - 72	DC
	60 - 67	D	Below 60	E

Professional Component: This course addresses ABET Criterion 4 (EAC) requirements for professional component as follows:

a) College-level math, basic science	0 %
b) Engineering topics (engineering science and design)	3 credits or 100%
c) General education	0%

Attendance Policy: Attendance is *mandatory*. The student will receive a score of zero for any assessment item not submitted because of absence. This includes the assignments, presentations, projects, tests, and the final exam. Extreme circumstances will be considered on an individual basis, however, when possible arrangements must be made prior to the due date, and supporting documentation is necessary.

There will be several guest speakers who come to class to talk about their experiences with different aspects of entrepreneurship. During those sessions, you **MUST** be in class prior to the guest, ask appropriate questions, and act **VERY** professional. Your active participation in the class discussion is absolutely **ESSENTIAL**. In addition, there may be one or two occasions in which students are asked to attend a seminar, competition or plant tour, in which case, they are expected to make every attempt to free their day for such a visit.

Academic Honesty Policy: (Same as the university's policy). You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at <http://catalog.wmich.edu> under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

Class Contribution: In this course, you learn more from one another than from any other single source. You will be expected to make a meaningful and substantive contribution to the learning experience of your fellow students. This means coming to class prepared, answering questions posed by the instructor, raising questions, sharing your professional experiences, voicing opinions, and so forth. Attendance is not participation. Beyond regular class discussions, two of the components of your participation marks will be acting as the team-leader in at least one of the sessions and contributing to the case discussions.

The course will involve a discussion format with extensive interaction between students and the instructor. The teaching style will mix core content with practical applications. Students will be challenged to grasp a concept or idea, relate it to other concepts, and then apply it in real-world entrepreneurial contexts.

Homework/Case studies/Project: Homework assignments and case studies are to be turned in at the beginning of lecture on the day they are due. Assignments will be announced in the class. *Late submissions will not be accepted!* If you use software to solve a problem you must submit sufficient documentation to illustrate your approach to the problem, along with the appropriate output to justify your results. *You will receive a score of zero for each assignment that you fail to turn in at the specified time.* (Note: Only one copy of the written report is necessary for each team).

Assessment: The assessments will be administered during the lecture period on the days indicated in the schedule. You are responsible for the material up to the day of the assessment. Each assessment could consist of interim report on the project as well as questions and problems.

Term-Project: Facilities Planning and Logistics Group Project

The heart and soul of this course is the project. There will be a lot of coordination between this course and IME 2010, IME 3010 and 4160. As such, you *may* choose the same team members that you have in IME 4160. You are expected to use the knowledge gained in the course and IME 4160 to design and develop the facility that can be used to produce the product of your choice. It is recommended that you choose the same product that you designed in IME 3010; otherwise it must be built around an entrepreneurial, highly innovative, original concept. The selected product then becomes the focal point of the semester project.

The project involves taking your own product and:

- 1. Designing a facility that can economically manufacture it in a commercial, non-profit or public context.*
- 2. Locating the optimum location of the facility as related to the supply chain.*
- 3. Writing a Business Plan for the project.*

Criteria Used for Grading the Semester Project: Below is a set of criteria for assessing the extent to which you successfully implemented a business idea or concept that is your own creation.

- 1. Forecast the demand for the product*
- 2. Calculate the number of machinery and equipment, the resources, and the space needed to produce the product*
- 3. Identify the optimum layout of the facility*
- 4. Identify the types of material handling systems needed to handle all aspects of material movement in, within, and out of the facility*
- 5. Locate the optimum site to house the facility*
- 6. Categorize the cost of building this facility, and identify a potential funding agency that may be interested in raising a substantial sum of outside capital.*
- 7. Write a complete business plan.*

Oral and Written Presentations: Students will present their final projects orally during the previously announced sessions. These will be formal powerpoint presentations lasting 15 minutes each, followed by Q&A. Students will also submit a final written report summarizing their projects and the related implementation issues. This write up should be a formal plan, and must have a section summarizing how things were actually implemented. Personal reflections on the project must also be included in the final report. More detail description of the Semester Project, Due Dates and Expectations is in the attached document.

Case Studies: Entrepreneurship Studies

There will be several Case Studies that will be posted early in the semester and are due at certain preannounced dates. These cases are published by Harvard Business School and are focused on better understanding of **Entrepreneurial** Management issues.

Teams are expected to read these cases carefully, and report back to class their findings in a very concise and well-organized short report. On the due date of the cases, one student will be chosen to act as the **FACILITATOR** who will be in charge of engaging the teams in a constructive discussion aimed at "Fact-Finding Mission." The Facilitator will be given a maximum of 30 minutes to gain a better understanding of each teams main points, and to identify the commonality of the reviews.

A written report is also expected from each team on the due date. The report should be brief and avoid repeating the text of message, but to itemize the views of the team on the case. Some cases have a very clear expected outcome from your review, and some have no clear questions. In either case, each team is expected to critic the approach taken by the management involved in the case, and offer their solution.

CASE STUDY TOPIC

1. *Girls on the Run*
2. *ACTC Customer Service Department*
3. *Corporate New Ventures at Procter & Gamble*
4. *Alison Brown of Compass Records*
5. *Charles Schwab in 2002*

DUE DATE

- Friday: September 10, 2010*
Friday: September 24, 2010
Friday: October 8, 2010
Friday: October 22, 2010
Friday: November 19, 2010

Self-Study Readings: Are you an Entrepreneur?

On the instructor's web site there is a very brief description of topics on entrepreneurship, titled "**Are you an Entrepreneur?**" The note consists of 18 chapters that have been listed on your Schedule of Class as well. These notes are designed to give you a very important understanding of different aspects of entrepreneurship, and are easy to read and understand. Therefore, it is expected that students read the material on their own and be ready to discuss their findings in class. In addition, they are expected to respond to the questions, self-evaluation inquiries, and exercises at the end of the chapters.

In what follows a concise list of expectation on the topic of "**Are you an Entrepreneur?**" is listed:

1. *Read the chapters prior to the beginning of the week in which they are listed for in class discussion.*
2. *Answer all the inquiries listed at the end of the chapters in a very concise and well-formatted manner. Your response must be type-written. Majority of the inquiries are team-related, but some are individual assessment. In either case, one report from the team is due on Friday of the week they are scheduled.*
3. *Even though all teams are expected to familiarize themselves with the two topics assigned to that week, one team will be selected to prepare a 10-20 minute presentation for the class, followed by class discussion. This assignment will be repeated until all the topics are covered.*
4. *There will be quiz and test on these topics throughout the semester.*

Topics and Schedule

Please note that the topic schedule is a guide only; sometimes we will spend a little longer on one topic and a little less on another. The test and final exam times will occur on the dates listed, however, content of the tests may be altered based on the material covered prior to test time.

The topics are organized into four parts:

Part 1: Acquiring Competence in Entrepreneurship

Part 2: Facilities Planning and Design

Part 3: Facilities Location

Part 4: Logistics and Supply Chain Management

The first and last parts (*Part 1 and Part 4*) are distributed over the semester. We will try to allocate Fridays to these topics. All Teams are expected to read and familiarize themselves with the two topics assigned to that week, and submit their response to the self-assessment exercises at the end of both chapters.

Parts 2 and 3 will be covered on Mondays and Wednesdays, and your semester project will be lined up with the class coverage, so you will be exposed to the topic at least a week prior to the due date on your project.

We will try to follow the schedule listed below:

Week 1 Sept 8-10	Understanding the Relevance of Facilities Planning A-1: Evaluating your potential as an entrepreneur A-2: Understanding the nature of small business	
Week 2 Sept 13-17	Team Presentation on the Case Study 1 Production, Process, and Schedule Design A-3: Making the most of marketplace opportunity A-4: Investigating global markets	
Week 3 Sept 20-24	Production, Process, and Schedule Design (continuation) B-1: Developing your business plan B-2: Finding help for your small business	* Will be collected for ABET (L3)
Week 4 Sept 27-Oct 1	Team Presentation on the Case Study 2 Flow, Space, and Activity Relationships B-3: Choosing the right type of ownership B-4: Developing a market strategy	* Will be collected for ABET (L3)
Week 5 Oct 4- 8	Flow, Space, and Activity Relationships (continuation) B-5: Finding the best location B-6: Developing a pricing strategy	* Will be collected for ABET (L3)
Week 6 Oct 11-15	Team Presentation on the Case Study 3 Flow, Space, and Activity Relationships (continuation) B-7: Financing your business B-8: Addressing legal issues	
Week 7 Oct 18-22	Personnel Requirements C-1: Managing basic business functions C-2: Managing your human resources	

Week 8 Oct 25-29	Team Presentation on the Case Study 4 Material Handling C-3: Promoting your business C-4: Maximizing sales	
Week 9 Nov 1-5	Traditional Facilities Layout First Test (Friday Nov 5)	* Will be collected for ABET (J4)
Week 10 Nov 8-12	Computerized-Aided Layout C-5: Maintaining accurate records C-6: Managing your finances	
Week 11 Nov 15-19	Receiving, Shipping and Warehousing C-7: Extending customer credit C-8: Minimizing risk	
Week 12	Team Presentation on the Case Study 5	
Week 13 Nov 29-Dec 3	Discrete Location and Layout Problems C-9: Maintaining operations C-10: Conducting e-commerce.	
Week 14 Dec 6-10	Team Presentation on the Term Project “Facilities Layout and Location” Continuous Location and Layout Problems	
Wed Dec 15	Final Test (Wed Dec 15; 8:00-10:00 am)	

Journals and Websites

Inc. Magazine	Entrepreneur Magazine
Fast Company Magazine	Journal of Business Venturing
www.entrepreneurmag.com	Entrepreneurship Theory and Practice
http://startup.wsj.com	Journal of Small Business Management
www.entworld.com	Journal of Developmental Entrepreneurship
http://stvp.stanford.edu/	Black Enterprise

Some Selected Books

<i>The Four Routes to Entrepreneurial Success</i>	<i>The Individualized Corporation</i>
<i>The Creative Priority</i>	<i>The Maverick Mindset</i>
<i>Circle of Innovation</i>	<i>Real Time</i>
<i>Relentless</i>	<i>Leadership Jazz</i>
<i>Successful Strategies Entrepreneurs Use...</i>	<i>Crossing the Chasm</i>
<i>Competing for the Future</i>	<i>Innovation that Fits</i>
<i>Blur</i>	<i>Leading the Revolution</i>
<i>The Marketing Imagination</i>	<i>Corporate Innovation: Marketing and Strategy</i>
<i>Competitive Advantage</i>	<i>Only the Paranoid Survive</i>
<i>Popcorn Report</i>	<i>The Empty Raincoat</i>
<i>The Change Masters</i>	<i>When Giants Learn to Dance</i>
<i>Intrapreneuring</i>	<i>Entrepreneurship as Strategy</i>
<i>Inside Corporate Innovation</i>	<i>Cracking Creativity</i>
<i>Creativity at Work</i>	<i>Barbarians to Bureaucrats</i>
<i>The “E” Myth Revisited</i>	<i>Growing a Business</i>
<i>Flash of Brilliance</i>	<i>Future Perfect</i>
<i>The Age of Unreason</i>	<i>Imaginization</i>

IME 4010: Project Requirement Guidelines

Students are teamed-up in-groups of two or three. By the time you enroll in IME 4010, you are expected to have identified a product (the one you prototyped in IME 3010). In this course, you are expected to design a facility that can be used to manufacture that product.

To do so, in the **First Report** you should list all the components of the product (i.e., part list and bill of material), decide whether to build or procure each component, and construct the component drawings (exploded view). Next, you should construct the route sheet, operation process chart, assembly chart forecast and any other supporting chart that will help you lay out your facility as efficiently as possible.

In the **Second Report** you should use a comprehensive approach to forecast the demand for your product (locally, nationally, internationally, weekly, monthly, and yearly).

In the **Third Report** you should calculate the required production space for your facility. To do so, you need to specify the required number of machinery and equipment (production rate, footprint, etc), the required space per workstation, and the overall required space for the production area.

In the **Fourth Report** you should identify all the non-production areas needed for the proper operation of the facility (the receiving area, the shipping area, the administration offices, tool room, tool crib, locker rooms, etc). Furthermore, you should investigate the most efficient material handling system needed to handle product movement throughout the facility (within the receiving area, production area, shipping area, and between these areas).

In the **Fifth Report** you should put together the findings of the previous reports to produce a layout of the facility showing the position of each department in the facility along with the number of required docks and the access roads to the facility. Furthermore, you should identify the best location of the facility based on subjective and objective analysis.

The grade is based on the complexity of the production system, the elegance and completeness of the analysis model, and the quality of the written report and oral presentation.

Each team is free to choose any product, but they are expected to adhere to this guideline:

The production facility should involve:

1. A minimum of six components with at least four different machines
2. A minimum of two different types of material handling systems
3. A minimum of 10 employees
4. A minimum of one locker room and an eating area
5. A minimum of four types of administrative office
6. A minimum of one dock for receiving/shipping area

Each team should submit five reports during the course of the semester along with a disk-copy of the report and supporting material. The proposed due dates are selected so that you will not be overwhelmed with submitting a comprehensive report for the whole project at the end of semester.

The nature of the reports and the corresponding due dates for these reports are as follows:

- | | |
|----------------------------------------------------------|------------------------|
| 1. Report 1: Supporting Drawings | Due Friday October 1 |
| 2. Report 2: Forecasting Demand | Due Friday October 15 |
| 3. Report 3: Space Calculation for Production Area | Due Friday October 29 |
| 4. Report 4: Total Space Calculation & Material handling | Due Friday November 12 |
| 5. Report 5: Location Analysis and Final Report | Due Friday December 3 |
| 6. Final PowerPoint Presentation | Friday December 10 |

First Report (Supporting Drawings): The First Report should include:

- ❖ One paragraph description of the product
- ❖ Part List and Bill of Material showing all the components and their hierarchy
- ❖ Detailed drawing of each part and the exploded view of different assemblies
- ❖ Decision of Make or Buy of each component and the justification for each
- ❖ All the Route Sheets detailing the name of the operation, the setup time, operation time, and needed jigs and fixtures
- ❖ Operations Process Chart
- ❖ Assembly Chart
- ❖ Any additional supporting chart needed to clarify the product complexity.

Second Report (Forecasting Demand): The Second Report should include:

- ❖ List of the raw data used in the forecast
- ❖ Final forecast model and its characteristics
- ❖ The procedure that you followed to get to the best forecast model, including:
 - Measure of error(s) used in the analysis
 - Your approach to seasonality
 - Your treatment of variability and use of sensitivity analysis
 - Your use of qualitative versus quantitative models.
 - Your approach to the local, national, or international demand and justification.

Third Report (Production Area Space Calculation): The Third Report should include:

- ❖ List of machinery and equipment needed for production
- ❖ Characteristics of each machine including the manufacturer, purchase price, design cycle time, setup time, needed jigs and fixtures, scrap rate, required utilities, the foot print of machine, etc.
- ❖ Required space for each equipment (workstation) that includes space for incoming material, outgoing material, operator, repair, etc.
- ❖ Overall required space for the production area.

Fourth Report (Total Space Calculation and Needed Material Handling): The Fourth Report should include:

- ❖ List of all non-production (Service) facilities
- ❖ Calculation of allocated area for each service facility
- ❖ Detail description of the material handling methods used for each step of the production
- ❖ List of the required material handling equipment
- ❖ Characteristics of each material handler including the manufacturer, purchase price, design specifications, required utilities, the foot-print, etc.

Fifth Report (Location Analysis and Final Report): The Fifth Report should include:

- ❖ Show the raw data used to identify the best site for the facility
- ❖ Identify the best site for the facility and show the procedure used in the analysis
- ❖ Identify the rate of flow in and out of the facility
- ❖ Calculate the number of needed docks and design them into the layout.
- ❖ Final overall layout of the facility
- ❖ Overall cost of building the facility.

*** The final Report will be collected for ABET(C4 and L4)**

Final PowerPoint Presentation: Each team will have 10 minutes to present their project to the class and answer questions and concerns. The presentation should include:

1. Description of the product
2. List of machines and material handlers
3. List of personnel and their responsibilities
4. List of different departments of the facility and corresponding space
5. Most efficient layout of the facility with overlaying material and personnel flow
6. Cost of building the facility
7. Site Analysis.

I hope that everyone is clear as to the procedure that is to be followed.