

**Course:** IENG 446 – Plant Layout and Material Handling

**Semester:** Spring 2015

**Number of credit hours:** 3

**Description:** Facility design and economic selection of material handling equipment in a production/service facility. Emphasizes optimization of materials and information flow.

**Prerequisite:** IENG 220 and IENG 350

**Textbook:** Facilities Planning, Tompkins, J.A., White, J.A., Bozer, Y.A., Tanchoco, J.M.A., John Wiley and Sons Inc., 4th Edition, 2010.

**Instructor:** Kenneth Currie, Ph.D., P.E.  
Professor and Chairperson of IMSE Department  
Email: [krcurrie@mail.wvu.edu](mailto:krcurrie@mail.wvu.edu)  
Phone: 304.293.9431  
<http://www.imse.statler.wvu.edu/faculty/faculty-detail.php?id=1054&type=faculty>  
Office Hours: MW 2-4 p.m. and after class by appointment; 321-A MRB

**Course Goals:**

1. To provide students with the basic concepts related to the interactions between the production system parameters and their impact on materials handling systems design.
2. To provide students with methods for the generation of plant layouts.
3. To provide students with information on materials handling systems design for various aspects of the manufacturing and service industry.

**Student Learning Objectives:**

Upon completing the course, the student will be able to:

- a) Describe and determine the effect of product, process, and schedule design parameters on plant layout and materials handling systems design.
- b) Identify the characteristics of product and process layouts and their needs in terms of materials handling.
- c) Develop and analyze plant layouts using manual and computer aided software methodologies.
- d) Identify and select various types of material handling equipment.
- e) Design material handling systems for a variety of scenarios pertaining to manufacturing and service industry.

**Course Topics:**

Introduction to facilities planning and materials handling  
Product, process, and schedule design  
Flow systems, activity relationships, and space requirements  
Principles of material handling  
Plant layout generation  
Warehousing operations  
Manufacturing systems and material handling  
Facilities systems  
Quantitative techniques for facilities planning

Evaluating, selecting, and implementing the facilities plan

**Course Contribution to Professional Component:**

Engineering topics 100%. This course has significant design content.

**Course Relationship to Program Educational Outcomes:**

The course relates strongly to the following program educational outcomes.

1. The course enables the students to acquire the ability to use modern and classical industrial engineering methodologies pertaining to facilities planning and material handling (Outcome 1). The key abilities the students will acquire are as below.
  - a) Facilities design methodologies including location and layout
  - b) Material handling system design
2. The course enables the students to acquire the ability to shape materials handling system design recommendations so that results will be achieved and communicate findings effectively (Outcome 3). The key abilities the students will acquire are as below.
  - a) Analyze and interpret system data
  - b) Develop recommendations that are specific, practical, and cost effective
  - c) Conduct an analysis of different alternatives and make appropriate recommendations
  - d) Gather information from a variety of sources including publications, the internet, and reference materials
3. The course enables the students to acquire the ability to work individually and on teams to identify, formulate and solve problems in materials handling systems design (Outcome 4) The key abilities the students will acquire are as below.
  - a) Identify, formulate and solve problems
4. The course enables the students to acquire the ability to design integrated material handling systems that include people, materials, information, equipment, and energy (Outcome 5). The key abilities the students will acquire are as below.
  - a) Design, implement, and improve facilities layouts and/or material handling systems

**Performance Indicators:**

The student performance indicators that are associated with the key abilities are:

1. Students will be able to use appropriate tools to generate and evaluate layout alternatives during the facilities planning process.
2. Students will be able to solve facility location problems using relevant techniques.
3. Students will be able to design and analyze material handling systems.
4. Students will be able to identify, formulate, and solve facility layout problems using relevant software. Students will be able to identify appropriate tools for solving facility layout problems.
5. The students will be able to understand how changes in one facilities planning and material handling system impact the integrated production system.

**Grading:** 90-100 (A), 80-89 (B), 70-79 (C), 60-69 (D), less than 60 (F)

Exam #1 – Wednesday, February 25, 2015 – 25%

Exam #2 – Wednesday, April 15, 2015 – 25%

Design Project – Monday, April 20, 2015 – 15%

Material Handling Presentations – March 2-11, 2015 – 10%  
Final exam – Monday, May 4<sup>th</sup>, 2015 from 8:00 am – 10:00 am – 25%

**Statement on Attendance:**

Student attendance is mandatory unless excused by the instructor. The basis for an excused absence will follow University and IMSE policy. Students who are absent from class for any reason are responsible for all missed work. Students who miss an exam will not be allowed to make it up, **except** in the case of a family or other **legitimate** emergency that is well documented and presented to the instructor. A student who misses an exam will be sent an email. A response from the student with a legitimate emergency related excuse with documentation should be received within one working day from the receipt of the email. The instructor will review the student's excuse and decide if the student will be allowed to re-take the exam as early as possible. Students who miss the exam due to a legitimate emergency related reason will have the exam added to the final exam.

**Final Exam:**

The final exam is comprehensive and will be given on Monday, May 4<sup>th</sup> from 8-10:00 a.m. If students are at the midpoint of a letter grade or higher for the number of points allowable prior to the final, s/he can opt out of the final and take the current letter grade. For example, if a student has accumulated an 85% average or better on the available assignments in the class just prior to the final, they can opt out of the final with a letter grade of B. If they have a 92% average, they can still opt out of the final but the letter grade awarded would be a B+.

**Communication:**

The WVU MIX email system will be used for all communication. The students are responsible for checking their MIX email regularly for information regarding assignments, lecture information, and any other important course related information. Students may be asked to print out information from the attachment in their email and bring it to class. Not all material will be sent in electronic form. Some material only in the form of hard copies will be distributed in class.

**Student behavior:**

Students are expected to be attentive in class and not be disruptive when the instructor is teaching. This means no talking, laughing, or other similar disruptive behavior during the class period when the lecture is ongoing. Disruptive students will be warned and then if the behavior continues this will result in the student being removed from the class and referred to the Office of the Department Chair and/or Associate Dean for Academic Affairs.

**Statement on Social Justice:**

West Virginia University is committed to social justice. I concur with that commitment. I expect to foster a nurturing learning environment that is based upon open communication, mutual respect, and non-discrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, you must make appropriate arrangements through Disability Services (293-6700). They will identify the nature of the accommodation your disability requires.

**Prepared By: Ken Currie, IMSE, CEMR**

**Date: 01/12/15**