

Course: IENG 446 – Plant Layout and Material Handling

Semester: Fall 2018

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: Bhaskaran Gopalakrishnan, Ph.D., P.E, CEM, CPEenMS, LEED Green Associate
Professor and Director of the Industrial Assessment Center
IMSE Department
Email: bgopalak@mail.wvu.edu
Phone: 304 293 9434
<https://bhaskarangopalakrishnan.faculty.wvu.edu/>

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 ability to acquire and apply new knowledge as needed, using appropriate learning strategies, and formulate and solve complex problems by applying principles of engineering, science, mathematics, and industrial engineering knowledge, skills and tools. (Outcome 3). The key abilities the students will acquire are as below.

- a) Develop recommendations that are specific, practical, and cost effective
- b) Conduct an analysis of different alternatives and make appropriate recommendations
- c) Gather information from a variety of sources including publications, the internet, and reference materials

3. The ability to work individually, on teams, to create a collaborative and inclusive environment of leadership and establishing goals, plans, and objectives. (Outcome 5). The key ability the students will acquire is as below.

Design and implement integrated plant layout and material handling systems.

4. The ability to develop and maintain professional ethics and professional responsibilities in applying engineering design to address problems through informed judgments, considering the impact of engineering solutions in global, cultural, economic, environmental, and societal contexts. (Outcome 7). The key ability the students will acquire is as below.

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. 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 – October 8, 2018 – 30%, Quizzes (can be given any class period) – 20%

Homework, assignments - 20 %, Final exam – December 3, 2018 – 30%

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 taking a quiz or an exam will not

be allowed to make it up, and will receive a score of zero, **except** in the case of a **legitimate** emergency that is well documented and presented to the instructor for approval, within one working day from the day of the missed quiz or exam. The instructor will review the student's excuse and decide if the student will be allowed to take the quiz or exam along with the final exam or will receive a zero on the quiz or exam. If a student misses taking a quiz due an instructor approved legitimate reason then the missed quiz or quizzes will be added to the student's final exam noting that the added quizz(es) will not be the same as the original quiz(es) in scope or level of difficulty. Students who miss taking the first exam due to an instructor approved legitimate emergency related reason will have the exam added to the final exam. Students who miss the final exam due to an instructor approved legitimate emergency related reason will receive an incomplete grade.

Communication:

The WVU MIX email system and E Campus will be used for all communication. The students are responsible for checking their MIX email and E Campus 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.

Inclusivity Statement:

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in your classes, please advise your instructors and make appropriate arrangements with [the Office of Accessibility Services](https://accessibilityservices.wvu.edu/).
(<https://accessibilityservices.wvu.edu/>)
More information is available at the [Division of Diversity, Equity, and Inclusion](https://diversity.wvu.edu/)
(<https://diversity.wvu.edu/>) as well.

Other academic policies that will be adhered to will be in accordance with information on <https://tlcommons.wvu.edu/syllabus-policies-and-statements#15>

Prepared By: B. Gopalakrishnan, IMSE, Statler CEMR, Date : 08/13/18