



University of Puerto Rico. Mayagüez Campus
College of Engineering.
Industrial Engineering Department



Course Syllabus

General Information

Course Number: InIn 6045

Course Title: **Material Handling Systems**

Credit-Hours: Three

Course Description

Fundamentals of material handling systems including types of equipment and their applications, relationship between material handling and design of facilities, computer control and automation.

Prerequisites

Authorization of the Director of the Department

Textbook and References

- Tompkins, J.A., White, J.A., Bozer, Y.A., and Tanchoco, J.M.A. 2003, Facilities Planning, 3rd ed., John Wiley and Sons, Inc. (ISBN: 0471413895)
- Groover, M.P., 2000, Automation, Production Systems, and Computer Integrated Manufacturing, 2nd Edition, Prentice-Hall. (ISBN: 0130889784)
- Francis, R.L., McGinnis, L.F., and White, J.A., 1998, Facility Layout and Location: an Analytical Approach, 2nd edition, Prentice Hall. (ISBN: 0132992310) (Next edition 2008)
- Heragu, S., 2006, Facilities Design, 2nd Edition, Universe. (ISBN: 0595359388)
- Mulcahy, D.A. 1998, Materials Handling Handbook, McGraw-Hill. (ISBN: 007044014X / 978-0070440142)
- Frazelle, E.H. 2001, World-Class Warehousing and Material Handling, McGraw-Hill. (ISBN: 0071376003 / 978-0071376006)

Purpose

This course is designed primarily for Industrial Engineering graduate students within the Manufacturing Systems Option; however it is appropriate for anyone interested in material handling systems. The purpose of the course is to prepare the students to apply quantitative techniques for designing modern material handling systems. The students should have a basic understanding of probability and statistics, and the basic principles of facilities layout.

Course Goals

To provide skills on the fundamental concepts of the analysis, design and implementation of material handling systems. The student should recognize the applicability of specific material handling systems to given production/distribution situations. In addition, the student should be able to use analytic or computer based methodology to solve design and control problems related to material handling systems.

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Requirements

All students are expected to :

- Complete all lessons.
- Do all assigned readings and related homework.
- Come to class prepared to discuss assigned readings.
- Come to class all the time and on time.
- Pass all tests to receive credit for the course.

Department and Campus Policies

Class attendance: Class attendance is compulsory. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student. (Bulletin of Information Undergraduate Studies)

Absence from examinations: Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed. (Bulletin of Information Undergraduate Studies)

Final examinations: Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays. (see Bulletin of Information Undergraduate Studies).

Partial withdrawals: A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar. (see Bulletin of Information Undergraduate Studies).

Complete withdrawals: A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes. (see Bulletin of Information Undergraduate Studies).

Disabilities: All the reasonable accommodations according to the Americans with Disability Act (ADA) Law will be coordinated with the Dean of Students and in accordance with the particular needs of the student.

Ethics: Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

Campus Resources

General Library and University Computer Center is available to obtain professor=s reference materials.

Course Syllabus

General Topics

| Lecture | Topic | Reading |
|---------|--|--|
| 1 | Material handling definitions, principles, design and equipment | Tompkins 5.1-5.4, 5.6, 5.B |
| 2 | Material handling equipment (cont.), unit load | Tompkins 5.B, 5.5 Groover 10.1-10.5 |
| 3-4 | Models for material handling system design and equipment selection | Sule 9.1 Heragu 6.6 Muther 1,3 |
| 5-6 | Storage systems | Tompkins 7, 10.3, 10.5 Francis 5 |
| 7 | Automated storage and retrieval systems | Tompkins 10.6 Groover 11.4-11.5 |
| 8 | Order picking systems | Tompkins 10.7 |
| 9-10 | Queueing analysis and simulation | Tompkins 10.9-10.10 |
| 11-12 | Conveyor Theory | Tompkins 10.8 |
| 13 | Automated Guided Vehicles and vehicle systems analysis | Groover 10.2, 10.6.2 |
| 14 | Industrial robots in material handling | Groover 7 |
| 15 | Shop floor control and automatic identification systems | Groover 26.4, 12 |

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