

NEW JERSEY INSTITUTE OF TECHNOLOGY

Department of Mechanical & Industrial Engineering

IE 466

Materials Handling and Facilities Layout

Spring 2024

INSTRUCTOR: **George Abdou**, Associate Professor, Room ME306

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OFFICE HOURS: *Wednesday 3:00 – 5:00 p.m.* and by appointment or good fortune

LECTURE: Monday: 2:30 p.m. – 3:50 p.m. (ME221)

Wednesday: 11:30 a.m. – 12:50 p.m. (KUPF206)

Course Lectures and Requirements: available at <http://canvas.njit.edu/>

TEXT: Facilities Planning, Tompkins/White/Bozer/Tanchoco, 4th Ed., John Wiley & Sons, 2010

References: 1. Plant Layout & Material Handling, Apple, James M., John Wiley & Sons, 1977.

2. Facilities Design: Sunderesh Heragu, PWS, 1997.

Course Description

Prerequisite: IE 439. Analysis of organized human activities typified by industrial and office operations. Recent methods are applied to optimize location and layout of facilities. Introduction to modern material handling systems, expert systems in plant layout, logistics of motion of people and materials, flow analysis, plant layout, and material handling techniques.

Course Objectives

- **Probability and Basic Statistics.** Understand how to apply basic statistical methods to interpret data, and to combine these methods with visual data displays to understand the effect of variability in controlling and improving quality and reliability.
- **Data Analysis.** Investigate combinatorial alternatives of Facilities Location and Warehouse Design.
- **Software Use.** Learn how to use MS Excel and Micro-CRAFT to analyze various alternatives: Concepts and Techniques of Plant Layout.
- **Problem Solving.** Learn different techniques and Standards to problem solving, and the most effective approach for optimum layout development and improvement.

GRADING: Final Exam ... 30%

Mid-term...30%

HWs/Projects...20%

Quizzes ...20%

Course Outline:

Week	TOPICS	Chapter	HW/Project
1/17-22	Facilities Planning: Introduction	Handout	P1. Hub & Feeder Network
1/24-29	Product/Process/Schedule Design	2	HW1: 2.16,17,28,29, 35,36,37,45,46
1/31-2/5	Departmental Planning & GT	3	HW2: 3. 14, 27,28,33,37, 38
2/7-12	Space/Personnel Requirements	Quiz #1 4	HW3: 4. 7, 9,10,11,12
2/14-19	Traditional Models to Facility Layout	Handout	P2. Travel Chart Techniques
2/21-26	MHS/Layout Planning & Design Algorithms	5, 6	HW4: 5. 9 6. 8, 11, 17, 22, 23
2/28-3/4	Computer-Aided Layout	Quiz #2 6	P3. Multi-Facility Locations
3/6	***** Mid Term *****		
3/10-16	*** Spring Recess; No Class Scheduled ***		
3/18-20	Palletization	Handout	HW5: Handout
3/25-27	Warehousing	7	HW6: 7. 22, 25, 26
3/29	*** Good Friday Recess ***		
4/1-3	AS/RS	10	H7: 10. 34, 37, 48,51,55
4/8-10	Manufacturing/Facilities Systems	Quiz #3 8, 9	HW8: 8. 24, 25,26 9. 4-8, 11-14
4/15-17	Quantitative Models	10	HW9: 10. 7, 9, 16, 17, 20, 24 & 25
4/22-23	Advanced Location Models	10, Handout	HW10: 10. 28, 29, 0, 31 & 32
4/29-5/1	Simulation/cost estimation	Quiz #4 10, Handout	HW11: 10. 126, 127, 128 & 129
5/3	***** Final Exam CKB220 at 2:30 *****		

Important Notes

1. The use of any electronic devices during class and laboratory sessions; including but not limited to: laptops, cell phones, tablets, social media, etc., is **prohibited** for non-class related functions.
2. Homework is due the week following the date they are assigned. It is expected that class participants will observe specified deadlines. There will be no deviations from scheduled due dates and test dates. The assignments **will not be accepted after the noted deadline**. However, because you know all deadlines and assignments by no later the second week of classes, deadlines should present no problems to class participants.
3. **Exams will consider all materials covered in the lectures, which may not be in the book.** Therefore, attendance of lectures is very important.
4. **HONOR & ETHICS:** The code of unspoken ethics in a professional work environment in the US will apply in the classroom. That is, honesty and ethical conduct will not only be expected, but demanded. Please see me if you have any confusion on what I mean. Clearly, cheating on an exam is not permitted. Students caught in violation of this policy will earn a failing grades on their exam. Cooperation in responding to homework questions is not only permitted, but encouraged, as part of the cooperative learning framework of the course. You may discuss homework problems but not copy someone else's work. Any persons caught copying as well s the person providing the homework will be penalized.

Software Applications

To help reinforce the use of computer software to solve HWs & Projects, there are three packages: Excel, VRP Solver and Micro-CRAFT. You will be required to submit your HWs & Projects in the format of the abovementioned software, and an additional worksheet with explanation. In many cases, the computations that you perform must be visualized by a graph.

BSIE Program Educational Objectives

1. Program graduates use the fundamental principles and major areas of Industrial Engineering in their professional practice.
2. Program graduates are life-long learners, pursuing graduate education, and professional growth in Industrial Engineering and related fields.
3. Program graduates pursue diverse career paths and advance in a variety of industries.

BSIE Student Outcomes

An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

- An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social and economic factors
- An ability to communicate effectively with a range of audiences
- ***An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and social contexts***
- An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- An ability to conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

IE 466 Outcomes of Instruction:

- 1 Understand how to apply Statistical Methods (1).
- 2 Apply Excel and CRAFT functions to Warehouses and Manufacturing Operations (1).
- 3 Understand the concepts of Layout Planning and Material Handling (1).
- 4 Develop more proficient problem solving skills (4).