IE 4330: Facilities Planning

Winter 2019
Department of Industrial and Systems Engineering
Wayne State University

**Instructor:** Jeremy L. Rickli  
**Office:** 2173 Manufacturing Engineering Bldg.  
**Phone:** 313-577-1752  
**Office Hours:** T, Th – 3:00pm-5:30pm  
Upon request/appointment & if door is opened

**Grader:** Oluwatoba Osoba

**Email:** jlrickli@wayne.edu

**Class Schedule:**  
T TH: 1:00pm – 2:15pm  
MANO 0112

**Textbook:**  

**Course Description:** Facilities planning (IE4330) introduces the theory and concepts involved in model formulation for design and analysis of facility plans. The course covers such areas as facility layout, facility location, and material handling system design from a theoretical and practical perspective. Course work presents the opportunity to apply quantitative tools and techniques for flow analysis, layout planning, and automated material handling system design.

**Teaching Methods:** The course will use a variety of teaching methods including but not limited to: lecture-discussion, presentation, student lead topics, small group work. A major portion of the course will focus on the MHI student design competition, where student will work on a real problem with real data.

**Major Topics:** Facility layout, material handling systems, warehousing and storage, facility location

**Course Objectives/Learning Outcomes:** Upon completion of the course, students will be able to…

<table>
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<tr>
<th>Terminal Objective</th>
<th>Description</th>
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<tbody>
<tr>
<td>IE4330.01</td>
<td>Describe the objectives for facility analysis and design, both analytically and practicallly</td>
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<tr>
<td>IE4330.02</td>
<td>Evaluate facility layouts and operations with analytical and simulation tools for facility construction and improvement (greenfield vs. brownfield)</td>
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<td>IE4330.03</td>
<td>Evaluate material handling equipment for performance and design</td>
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<td>IE4330.04</td>
<td>Recognize personnel requirements and building systems in facility design</td>
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<td>IE4330.05</td>
<td>Identify current facilities layout and location issues in relation to societal, economic, and environmental impact (such as global outsourcing and global production systems)</td>
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<tr>
<td>IE4330.06</td>
<td>Identify who should be involved in the facility planning team and how to determine</td>
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what data is needed and how to obtain that data

<table>
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<tr>
<th>Course Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>IE4330.07</td>
<td>Demonstrate effective engineering teamwork in designing or re-designing a facility layout or operation and effectively communicate in a written and oral report</td>
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Abet outcomes addressed by the aforementioned learning outcomes are highlighted below.

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. 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, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. 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.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Grading:
- Homework: (6) 30%
- Presentations: (2) 10%
- Course Projects: (1) 25%
- In-Class Assignments: (TBD) 10%
- Mid-Term Exam: 10%
- Final Exam: 15%

Grading Scale:
- A: 94% - 100%
- A -: 90% - 93%
- B +: 85% - 90%
- B: 83% - 84%
- B -: 80% - 82%
- C+: 77% - 79%
- C: 77% - 76%
- C -: 70% - 72%
- D +: 65% - 69%
- D: 60% - 64%
- D -: 55% - 59%
- F: Less than 55%

Religious Holidays: Because of the extraordinary variety of religious affiliations of the University student body and staff, the Academic Calendar makes no provisions for religious holidays. However, it is University policy to respect the faith and religious obligations of the individual. Students with classes or examinations that conflict with their religious observances are expected to notify their instructors well in advance so that mutually agreeable alternatives may be worked out.

Academic Dishonesty – Plagiarism and Cheating: Academic misbehavior means any activity that tends to compromise the academic integrity of the institution or subvert the education process. All forms of academic misbehavior are prohibited at Wayne State University, as outlined in the Student Code of Conduct (http://www.doso.wayne.edu/student-conduct-services.html). Students who commit or assist in committing dishonest acts are subject to downgrading (to a failing grade for the test, paper, or other course-related activity in question, or for the entire course) and/or additional sanctions as described in the Student Code of Conduct.

Cheating: Intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information or assistance in any academic exercise. Examples include:
(a) copying from another student’s test paper; (b) allowing another student to copy from a test paper; (c) using unauthorized material such as a "cheat sheet" during an exam.

Fabrication: Intentional and unauthorized falsification of any information or citation. Examples include: (a) citation of information not taken from the source indicated; (b) listing sources in a bibliography not used in a research paper.

Plagiarism: To take and use another’s words or ideas as one’s own. Examples include: (a) failure to use appropriate referencing when using the words or ideas of other persons; (b) altering the language, paraphrasing, omitting, rearranging, or forming new combinations of words in an attempt to make the thoughts of another appear as your own.

Other forms of academic misbehavior include, but are not limited to: (a) unauthorized use of resources, or any attempt to limit another student’s access to educational resources, or any attempt to alter equipment so as to lead to an incorrect answer for subsequent users; (b) enlisting the assistance of a substitute in the taking of examinations; (c) violating course rules as defined in the course syllabus or other written information provided to the student; (d) selling, buying or stealing all or part of an un-administered test or answers to the test; (e) changing or altering a grade on a test or other academic grade records.

Course Drops and Withdrawals: In the first two weeks of the (full) term, students can drop this class and receive 100% tuition and course fee cancellation. After the end of the second week there is no tuition or fee cancellation. Students who wish to withdraw from the class can initiate a withdrawal request on Pipeline. You will receive a transcript notation of WP (passing), WF (failing), or WN (no graded work) at the time of withdrawal. No withdrawals can be initiated after the end of the tenth week. Students enrolled in the 10th week and beyond will receive a grade. Because withdrawing from courses may have negative academic and financial consequences, students considering course withdrawal should make sure they fully understand all the consequences before taking this step. More information on this can be found at: http://reg.wayne.edu/pdf-policies/students.pdf

Student Services: The Academic Success Center (1600 Undergraduate Library) assists students with content in select courses and in strengthening study skills. Visit www.success.wayne.edu for schedules and information on study skills workshops, tutoring and supplemental instruction (primarily in 1000 and 2000 level courses). The Writing Center is located on the 2nd floor of the Undergraduate Library and provides individual tutoring consultations free of charge. Visit http://clasweb.clas.wayne.edu/writing to obtain information on tutors, appointments, and the type of help they can provide.

Class recordings: Students need prior written permission from the instructor before recording any portion of this class. If permission is granted, the audio and/or video recording is to be used only for the student’s personal instructional use. Such recordings are not intended for a wider public audience, such as postings to the internet or sharing with others. Students registered with Student Disabilities Services (SDS) who wish to record class materials must present their specific accommodation to the instructor, who will subsequently comply with the request unless there is some specific reason why s/he cannot, such as discussion of confidential or protected information

Canvas Access: Every student is expected to enroll at: http://canvas.wayne.edu. Class documents, handouts, homework and solutions and also class grades will all be posted on Canvas. Class documents, handouts, homework, homework solution and class grades will all be posted on Canvas.

Homework: Homework assignments are individually assigned unless specifically stated otherwise. If homework is done in a group, please submit only one copy of the assignment with both students’ names on it. Students are allowed to discuss assignments; however, each student must submit his/her/teams own work. Homework assignments must be submitted on canvas, by the start of class, unless prior arrangements have been made with course instructor. Late homework will be docked 10% for day it is late for three days. After the third day the report will not be accepted.

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Presentations and Report: Students will be responsible for three presentations (either by team or individually depending on the class size). Two presentations will cover the course project, assignment #1, and a specific material handling equipment. Two reports will be required during the course; one for assignment #1 and the MHI project which must adhere to the MHI report format.

Project: The course will be highly focused on the MHI student design competition project. The project is provided by MHI and is a design problem taken from a real world situation with real world data provided. The project is challenging because it does not conform to traditional course work. It is open-ended and has many “correct” approaches and solutions. More information can be found at the following link; http://www.mhi.org/cicmhe/competition.

Exams: No makeup exam will be offered except for students who have medical emergencies that can be supported by a letter from a doctor or an approved re-scheduling with the instructor.

In-Class Work and Attendance: It is the student’s responsibility to attend every class session. Attendance will not be taken nor will a numerical grade be assigned to it. However, there will be in-class assignments (both announced and unannounced) and other activities of learning and evaluation. Only students who are present in the classroom can take part in these activities and earn the corresponding grade. Students who are not present for these evaluations will receive a zero. There will be no makeup sessions to any student who misses a class. There will be no relief on homework due date for any student who misses a class. A late arrival disrupts the class and the attention of everyone. It is highly encouraged that you arrive on time for the class. However, if there are circumstances that prevented you from arriving on time, please enter in the least disruptive way possible. Doors will not be locked.

Student Disability Services: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-202-4216 for videophone use. Once you have met with your disability specialist, I will be glad to meet with you privately during my office hours to discuss your accommodations. Student Disability Services’ mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. You can learn more about the disability office at www.studentdisability.wayne.edu.
Tentative Course Outline:

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<tr>
<th>Wk.</th>
<th>Day(s)</th>
<th>Topic</th>
<th>Reading</th>
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| 1   | T,R    | Syllabus Review  
Introduction to Facilities  
Team assignments  
MHI Overview | 1.1, 1.2, 1.3  
MHI Project |
| 2   | T,R    | Facilities Planning Introduction & Overview  
Facilities Planning Introduction & Overview | 2.1-2.4, 6.2 |
| 3   | T,R    | Facilities Planning Introduction & Overview  
Material Handling & Unit Load | 3.1-3.5 |
| 4   | T,R    | Material Handling & Unit Load (Project #1 due)  
Equipment Selection/Number Determination  
Queuing Theory Group Activity | 3.1-3.5  
5.1-5.5  
5.6/Appendix 5 |
| 5   | T,R    | Equipment Selection/Number Determination  
Queuing Theory Group Activity | 10.5.3  
7.1-7.4.1 |
| 6   | T,R    | Warehouse & Storage  
Presentation #1 – Material Handling Systems/Queuing | |
| 7   | T,R    | Warehousing & Storage  
Warehousing & Storage | 10.5.3  
7.1-7.4.1 |
| 8   | T,R    | Order Picking & Docking  
Facility Layout Introduction | 10.9.1  
7.5-7.7 |
| 9   | T,R    | Facility Layout Introduction  
Mid-term Exam | 6.1-6.4.4,  
6.4.8 |
| 10  | T,R    | SPRING BREAK (no classes) | |
| 11  | T,R    | Facility Layout Introduction – Method Classification  
Facility Layout Construction  
(pre-evaluation of relationship) | 6.1-6.4.4,  
6.4.8 |
| 12  | T,R    | Facility Layout Improvement Methods  
Facility Layout (Software)  
(peer grading and evaluation)  
MHI Project Work Day | 6.1-6.4.4,  
6.4.8 |
| 13  | T,R    | Facility Layout Completion  
Facility Location Introduction  
MHI Project ½ Work Day | 10.2 |
| 14  | T,R    | Facility Location Methods  
MHI Project Work Day | 10.2 |
| 15  | T,R    | MHI Project ½ Work Day | |
| 16  | T,R    | Group Presentations (MHI Presentation)  
Group Presentations & Review | |
| 17  | -      | Final – to be listed | |

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