Credits: 2cr.

**Brief Description:**

This course presents the fundamental concepts, theory and procedures required for effective facilities design and planning. It includes models for determining plant size and time phasing. Design of manufacturing, warehouse and material handling facilities. Use of analytic and computer-aided methods in the facilities design process.

**Prerequisites knowledge:** The Work Environment - IE 3120, Production Control - IE 4310, and IE 4870 - Engineering Economy.

**Course text:**
- Heragu, S.; *Facilities Design* (3rd Edition), 2008 by Taylor & Francis Group, LLC. CRC Press (The students can access this site (https://louisville.edu/speed/faculty/heragu/Book) and get access to 1) data files used in the Numerical Examples for each chapter, 2) powerpoint slides of all 12 Chapters, 3) errata, and 4) software.

**Other References:**

**Journals:**
- IIE Transactions
- International Journal of Industrial Engineering
- IEEE Transactions in Engineering Management
- Computer and Industrial Engineering Journal
- Industrial Engineer
- International Journal of Production Research
- Material Handling Management

**Course Objectives:**
1. To gain an understanding and appreciation of the principles and methodologies relevant to the planning and design of "production oriented" facilities.
2. To develop skills and learn modern analytical techniques useful for solving facilities planning problems.
3. To gain an appreciation of the many qualitative considerations relevant to solving facilities design problems.
4. To use computer-aided methods for facilities design problems.
To apply the techniques of plant layout and material handling to practical real world problems.

Contribution of course to meeting the professional component
This course contributes primarily to the students' knowledge of engineering topics, and does provide design experience.
- Students learn to apply knowledge of math, economics, and engineering principles to solve facilities design problems.
- Students learn to use appropriate techniques, skills, and tools to identify, formulate, analyze, and solve engineering and facilities design problems using computer tools such as spreadsheets, simulation, and CAD.
- Students develop an understanding of economic principles necessary to propose and get approval of facility changes.
- Students get practice in writing clearly, using graphics effectively, and justifying solutions to production facility problems.

Course Instructor: Dr. Celestine Aguwa
2061 Manufacturing Engineering Building
Email: celestine.aguwa@wayne.edu
Telephone (313) 577-4007
Fax (313) 577-8833

Class Schedule: M: 5:30 – 7:30 pm  Classroom: Rm. 2062, Manufacturing Engineering Building

Course Grader: "Abhinav Vatchavai" <fd2542@wayne.edu>

Course Website: http://blackboard.wayne.edu

Grading:
Final grades will be based on the following:
1. Mid-term Exam  25%
2. Final Exam  25%
3. Homework / Journal Article Review  20%
4. Group Project  25%
5. Class Attendance and Participation  5%

- Late homework assignments will not be accepted unless the instructor is coordinated with in advance.
- Homework assignments can be done in groups of up to 2 students. If homework is done in a group, please submit individual results in each student’s writing.
- Individual projects, exams, and homework might be curved.
- Project reports and special assignment reports have to be typed.

Class Preparation and Participation:
Reading assignments are given for each class session. You are expected to come to class prepared to discuss the readings and the suggested questions. Your individual class participation grade will be based upon your in-class remarks during discussions.
**Tentative Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 6</td>
<td>Introduction &amp; Logistics</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 13</td>
<td>Chapter 1: Introduction to facility Design</td>
<td>Librarian-5:30-6:30)</td>
</tr>
<tr>
<td>3</td>
<td>Jan 20</td>
<td><strong>No Class</strong></td>
<td>Martin Luther King Day</td>
</tr>
<tr>
<td>4</td>
<td>Jan 27</td>
<td>Chapter 2: Product and Equipment Analysis</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Feb 3</td>
<td>Chapter 3: Process and Material Flow Analysis</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Feb 10</td>
<td>e-Factor (FactoryFlow) session 1&amp;2</td>
<td>By TA</td>
</tr>
<tr>
<td>7</td>
<td>Feb 17</td>
<td>e-Factor (FactoryOpt) session 1&amp;2</td>
<td>By TA</td>
</tr>
<tr>
<td>8</td>
<td>Feb 24</td>
<td>Chapter 4: Traditional Approaches To Facility Layout</td>
<td>Industry Tour(s)-2/19</td>
</tr>
<tr>
<td>9</td>
<td>Mar 3</td>
<td>Midterm Exams</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Mar 10-15</td>
<td>Spring Break - No Classes</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Mar 17</td>
<td>Chapter 5: Basic Algorithms &amp; Software for the Layout Problem</td>
<td>Project (CIC/MHE project) Start Date: 3/18/2014-Dr. Rickli</td>
</tr>
<tr>
<td>12</td>
<td>Mar 24</td>
<td>Chapter 6: Group Technology and Facility Layout</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Mar 31</td>
<td>Chapter 9: Materials handling</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>April 7</td>
<td>Chapter 10: Introduction to Storage and Warehousing</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>April 14</td>
<td>Study Day</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>April 21</td>
<td><strong>FINAL Exam</strong></td>
<td>End of Class-4/21;</td>
</tr>
<tr>
<td>17</td>
<td>April 28</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>

**Term Project Guideline**

The course project consists of teams of students applying FMS techniques to solve a real world problem or completing a special case study. Choose a manufacturing that need re-design (preferably one that you are familiar with). The instructor will support this effort. Carry an analysis of the existing facility and then use the tools that were covered in this class to suggest layout changes to the facility. Evaluation of the project will be based on the final report, which is due the last week of class, the interim reports described below, and the project presentation. **There will be a regular project updates in class.**

**Presentation Slides and Written Project Requirements:**

The written project reports must be typed or computer printed (laser quality only). The length of the written report is strictly limited to 10 pages, but exhibits up to 5 additional pages may be appended. Each report must include the following information, but not necessarily in this order:

- Abstract (for report only)
- Project Timeline (Microsoft Project is preferred tool)
- Introduction and project definition/description
- Literature reviews
- Proposed work with contribution to subject matter
- Validation and/or evaluation of proposal
- Conclusion and recommendation
- Bibliography/References

**Oral Presentation Requirement:**
Each project team is expected to make a presentation of 15 minutes. Reports will be collected after the last presentation is completed. Each group member must be actively involved in the oral presentation. The presentations will be graded for clarity, content, and smoothness.

Each presentation will be 15 minutes with an additional 5 minutes for Q&A. The order of the presentation groups and individuals will be announced in the presentation date. Each project team needs to plan presentations to be around 15 slides. There will be a weekly update in class.

**Project Teams:**
In the first or second week of the course, we will form project teams based on students' preferences. Teams' size will be determined in class. Once you are assigned to a project team, we expect you to stay in the course for the entire term.

**Journal Article Review**
The objective of the article review presentations is to allow students to study a wide range of real world applications that rely on lean. You will work in teams of three or four. Each team is required to select and analyze one article from recent related journals that describe a practical application of lean process. Each team will make a weekly update and fifteen-minute presentation at the end of semester and submit overheads of presentation & names of team members.

**Presentation 5-8 Overheads:**
1. Problem Context
2-3 Model Structure
   - Decision Variables, Objectives, Constraints, and System Scope
4-5 Model Usage -
   - What issues did it address?
   - What was its impact?
   - Who were the model users?
6. Implementation Issues & Concerns if discussed in paper
7-8. Your lessons learned
   The analogies could relate to potential use of model or to implementation issues

**General Policy:**

**Student Conduct**
It is the responsibility of each student to adhere to the principles of academic integrity. Academic integrity means that a student is honest with him/herself, fellow students, instructors, and the University in matters concerning his or her educational endeavors. Thus, a student should not falsely claim the work of another as his/her own, or misrepresent him/herself so that the measures of his/her academic performance do not reflect his/her own work or personal
knowledge. In this regard, cheating will not be tolerated. Cheating includes (but is not limited to) any communication (written or oral) during examinations and sharing of work, such as using the same models or computer programs or copying work. All homework and projects must be an individual effort unless specifically noted. **STUDENTS WHO CHEAT ON ANY ASSIGNMENT OR DURING ANY EXAMINATION WILL BE ASSIGNED A FAILING GRADE FOR THE COURSE.** Therefore, avoid all appearance of improper behavior! Students who witness cheating should report the incident to the instructor as soon as possible. Students are also welcome to discuss any concerns related to cheating with the Chair of Industrial & Manufacturing Engineering.

**Student Accessibility 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. SDS telephone number is 313-577-1851 or 313-577-3365 (TTY: telecommunication device for the deaf; phone for hearing impaired students only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. 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.

**Policy on Classroom Attendance:**

All students are expected to attend all lectures, quizzes, and examinations with enthusiasm. Although classroom attendance does not mathematically contribute to the final course grade, active class participation is expected of all students and may help to boost up the course grade in those “borderline” cases between failing and passing.