Industrial Engineering 583: Plant Layout and Material Handling

Course Description: 3 CR. U. Basics in facility planning; design and integration of plant layout, material handling, and warehousing; quantitative models for facility location problems. Prereq: Ind Eng 370 (P) or Sr. St.


Prerequisites by Topics:
- Operations research modeling
- Industrial Ergonomics
- Engineering economic analysis

Course Objectives:
- Students learn the methodologies of developing efficient layouts for various production/service systems, focus on modern plant layout and material handling practices.
- Students understand the importance of interrelationship with management planning, product and process engineering, methods engineering and production control.
- Students understand how to integrate current topics such as supply chain management, JIT, agile manufacturing, automated systems, industrial ergonomics and quality into facilities planning.
- Students understand quantitative approaches in developing alternatives of facilities planning and material handling problems.
- Students become skilled in using computer software in computer aided layout.

Topics Covered:
- Facilities design procedure and planning strategies
- Production, activity and materials flow analysis
- Space requirements and personnel services design considerations
- Material Handling: Material handling principles; material handling equipment and material handling systems
- Layout construction techniques: systematic layout planning; activity relationship analysis, pairwise exchange, graph-based construction algorithmic.
- Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc.
- Warehouse operations: function, storage operations
- Manufacturing operation: JIT, TQM, AM, CIM, SCM
- Facility systems
- Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.
- Assessment and evaluation of layout alternatives

Projects
- Use Spiral software to practice plant layout design
- Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

Written Communications
• Students prepare a written report for their group projects. The project grade depends on how well the objectives are defined, clear description of the methods and why they are used, analysis and evaluation of results, and conclusions.

Class/Laboratory Schedule: Two 75-minute lectures per week. One of the class meetings is held in a computer lab getting students familiar with the Spiral software.

Contribution of Course to meeting the Professional Component:

• Basic knowledge, concepts, and systematic analysis techniques of facilities planning and materials handling are given. The students learn how to design plant layout considering the material handling systems.
• Use of quantitative models and computer-aided techniques is discussed with engineering applications.

Relationship to Program Objectives:

i) Students learn practical technique to solve facilities planning problems.
ii) Students can use modern engineering tools such as plant layout computer tool to deal with the plant layout problems.
iii) Students learn quantitative methods to solve practical facilities planning problems.
iv) Students learn how to use Spiral software to solve applied engineering problems.
v) Students learn variety of systematic analysis methods to solve facilities planning problems.
vii) Students use a system's approach to model and solve facilities planning problems.
viii) Students work in teams for a class project.
ix) Students write report to communicate problem statement, identification of appropriate methodology, systematic analysis of results, and evaluation of the facilities design alternatives for a project.
x) Students learn how to coordinate the safety and comforts consideration for labor in the facilities design.
xii) Students are made aware that one needs to continuously remain informed about the new mathematics methodology, software and better techniques of plant layout.
xiv) This course provides foundation to pursue graduate studies in engineering.

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Methods of Assessment:
• Prerequisite Exam
• Course Evaluations by Students
• Graded Homework
• Graded Projects
• Graded Tests
• Evaluation by IAC
• Instructor Judgment

Resources Commonly Available:
• Instructor
• Use of CAE Lab Computers
• Use of Spiral software

Desirable Student Competencies:
• Ability to operate computer programs in the Windows environment
• Ability to make ethical choices and exercise common courtesies