

## **Midterm Review Topics**

The exams will be open Engineering Notebook, and closed text and homework. You should have a mechanical pencil, eraser, and a well-charged calculator to complete the exam. The exams will be 1-1/2 hours in length.

### **EXAM I TOPICS**

#### **Strategic Planning for Facilities**

Strategic Planning vs. Tactical Planning  
Strategic impact of facilities

#### **Product and Process Design**

Indented Bills of Material and cost roll-ups  
Assembly Diagrams  
Routing Forms  
Operations Process Charts  
(including standard symbols)  
Precedence Diagrams

#### **Flow and Space Relationships**

Types of manufacturing systems  
Approximate volume characteristics  
Equipment characteristics  
Production characteristics  
Layout characteristics  
Skill characteristics  
Product characteristics  
Relationship between Volume, Variety and Automation  
Estimating Production Volumes with Scrap  
Single station  
Multiple, serial stations  
Estimating Equipment Fractions  
Adjusting for scrap and defectives – effective quota  
Adjusting for length of available time – effective shift length  
Adjusting for preventative maintenance – effective standard time  
Adjusting for process improvements – effective efficiency  
Replacing Reliability\* with Availability  
Adjusting for Failure (MTTF) and Repair (MTTR)  
Relating Machine Assignments, Cycle Times, and Total Costs  
Ideal Assignment  
Operator Idle  
Machine Idle  
Estimating Transient and Steady-State impacts

*(also, Group Technology – see below!)*

**EXAM II TOPICS****Activity Relationships**

- Typical Layout Patterns for Variety and Volume mixes
- Typical Flow Patterns (text)
  - Advantages
  - Disadvantages
- Group Technology\*\* (*on Exam I, not Exam II*)
  - Purpose
  - Matrix Construction
  - King Algorithm Steps
  - Direct Clustering Algorithm Steps
  - Matrix Partitioning
    - Non-Overlapping
    - Over-lapping & Strategies
- Quantitative Flow
  - Equivalent Load Units
    - Definition & examples
  - From / To Matrix
    - Forward / Backward Flows
  - Flow Path Length – Routing Effects
- Qualitative Flow
  - Relationship Charts
    - A, E, I, O, U, X classifications
- Estimating Department Space (Rough)
  - Considerations
  - Aisle Space Estimations
  - Aisle Width Minimums (Equipment)

**Personnel Requirements**

- Employee Parking
  - Parking Lot Design (steps & data)
- Rest Rooms
  - Rule of Thumb for Locating Restrooms
  - Fixture Requirements
- Food Services
  - Rule of Thumb Information for Dining Shifts ...
- Health Services
  - Rule of Thumb Data for First Aid Rooms...
- Barrier Free Compliance (ADA)
  - Web-sites for resources
- Office Facility Planning
  - Area Requirements (Rules of Thumb for office space)

**Material Handling**

- Material Handling Principles
  - 10 principles
- Unit Load Design
  - Unit Load Principle
- Efficiency of Returnable Containers
  - Container Space Utilization
  - Storage Space Efficiency
  - Container Nesting Ratio
  - Trailer Space Utilization
  - Trailer Return Ratio
  - Container Size Progression
- Material Handling Equipment (Cursory knowledge, similar to HW problems)

**Warehousing**

- 5 Missions of a Warehouse
- 11 Functions of a Warehouse
- 10 Receiving Principles – 10 Steps in Receiving Operation
- 6 Shipping Principles – 7 Steps in Shipping Operation
- Terms
  - ASN
  - Cross-Docking
  - SKU
  - Spotting
  - Value-Added
- Layout of Shipping Docks

**Layout Planning**

- Layout Alternatives: (Pros & Cons)
- SLP
  - Data Sources
  - Converting (Qualitative) Closeness to Affinity
  - Converting (Quantitative) Flow to Affinity
  - Combining Quantitative & Qualitative into Affinity
  - Diagramming Affinity

**Improvement of Layout (Mathematical Models)**

- Mathematical Objective Functions
  - Minimize Transportation Cost
  - Maximize Flow-Weighted Adjacency
  - Evaluate Flow-Weighted Layout Efficiency
- Implementation of Flow-Weighted Adjacency
- Criticisms

**Tables & Figures to Include in Engineering Notebook** (*cumulative from Exam I*):

Figure 2.8	Bill of Materials for an Air Flow Regulator (or better yet, lecture slide for indented BOM)
Figure 2.12	Assembly Chart for an Air Flow Regulator
Figure 2.13	Operations Process Chart for an Air Flow Regulator
Figure 2.14	Precedence Diagram for an Air Flow Regulator
Figure 3.1	Volume-Variety Layout Classification (or lecture slide)
Table 3.1	Procedural Guide for Combining Workstations...
Figure 3.18	Material Flow Systems for Various Types of Departments
Table 3.2	Closeness Relationship Values (or better yet, lecture slide)
Table 3.3	Aisle Allowance Estimates
Table 3.4	Recommended Aisle Widths for Various Types of Flow
Figure 4.1	Recommended Range of Stall Widths (or lecture slide for SW)
Table 4.1	Module Widths for Car Groups
Figure 4.2	Single & Double Loaded Module Options
Figure 4.4	Module Outline for Example (or lecture slide for PW)
Table 4.2	Plumbing Fixture Requirements
Figure 4.10	Wheelchair Dimensions & Turning Radius
Figure 4.11	Able-bodied Anthropomorphic Clearance & Reach
Table 4.4	Space Requirements for Cafeterias
Table 4.5	Space Required for Full Kitchens
Table 5.4	Recommended Aisle Widths for Facility Design
Figure 5.6	Container System with Progressive Dimensions
Figure 5.8	Common Designs for Wooden Pallets
Table 5.2	Comparison of Different Pallet Types
Text pp. 416-418	9 Recommendations for dock sizes
Figure 7.6	Recessed and "Y" Truck Approaches
Figure 7.7	Apron Definitions
Table 7.1	Space Requirements for 90° Docks
Table 7.2	Finger Dock Space Requirements for 65-ft Trailer
Table 7.3	Minimum Maneuvering Allowances for Receiving/Shipping