EDMM 4040: PLANT LAYOUT AND MATERIAL HANDLING

Catalog Description: This course is designed to give the students a comprehensive understanding of the issues involved in the design of an industrial production system. It will cover the problems in plant location, product analysis, process design, equipment selection, materials handling, and plant layout. NOT FOR ENGINEERING CREDIT. Prerequisites: EDMM 3050, EDMM 3260, and senior standing.

Textbook: Lab Manual and notes available on elearning.

References: A list of references and periodicals is given at the end of this syllabus.

Long Term Behaviors:
In the future, students completing this course can:
1. Coordinate the design of a complex new facility of any kind.
2. Find solutions to problems resulting from the movement of materials, people, and information in manufacturing and service-related facilities.
3. Improve the efficiency of manufacturing or service systems.

Prerequisites by Topics:
1. Work methods design and flow charts (EDMM 3050).
2. Forecasting and scheduling procedures (EDMM 3260).

Course Objectives:

Course Objectives	**Performance Criteria[1]**
1. Plan, analyze, and design to improve manufacturing and service facilities	F1 Defines technical problems, compares alternative options, and designs a solution
2. Learn and apply techniques to evaluate and design material handling and storage systems	C3 Uses decision making tools to analyze or improve a process or system
3. Conduct a financial analysis to justify a newly designed/modified facility	A2 Demonstrates the use of one or more tools (CAD, Word, Excel, PowerPoint, CAE) in presentation, analysis, research of a design
4. Work with a team to design a new facility	E5 Through group projects, learn valuable skills beyond learning course content

Lecture Schedule:

TOPIC	CHAPTER
Introduction to Course	Syllabus
Introduction to Facilities Design	1
Sources of Information for Facilities Design	2
MLK Day Convocation & Activities	
Instructions for Lab # 1	*Report 1 Manual*
Use of Time Study	3
Process Design	4
Flow Analysis Techniques	5
Lab #1 due.	
Instructions for Lab #2	*Report 2 Manual*
Flow Analysis Techniques	5
EXAMINATION # I	**1-5**
Workstation Design and Space Requirements	7
Auxiliary Services Requirement Space	8
Lab #2 due, Instructions for Lab # 3	*Report 3 Manual*
Auxiliary Services Requirement Space	8
Activity Relationship Analysis	6
Employee Services Space Requirements	9
Lab #3 due.	
Office Layout Techniques and Space Requirements	12
SPIRIT DAY	
Instructions for Lab # 4	*Report 4 Manual*
Financial Analysis	Notes
Area Allocation	13
Lab #4 due, Instructions for Lab #5	*Report 5 Manual*
Area Allocation	13

	E**XAMINATION # II**	**6-13**, **Fin. Anal.**
	Facilities Design—The Layout	14
	Material Handling	10
	Material Handling Equipment	11
	Material Handling Equipment	11
	Lab #5 due	
	Material Handling Equipment	11
	COMPREHENSIVE FINAL EXAMINATION #III	

Laboratory Schedule:

Report1: Product,Manufacturing,andFlowAnalysis

1. Parts list
2. Production routing sheets for each "make" part
3. Flow Process chart for each "make" part
4. Assembly chart for product
5. Operations chart
6. Package design
7. Unit load design
8. Material and parts requirement list

Report2: Machine&SpaceRequirements

1. Machine requirements:
   a) Computations of machine requirements
   b) Area and cost of production equipment
2. Receiving and shipping areas
3. Storage analysis
4. Organization chart
5. Plant services space requirements
6. Total space requirements

Report3: PreliminaryLayout

1. From-To chart
2. Activity Relationship chart
3. Worksheet for activity relationship chart
4. Nodal Diagram
5. Total space requirement work sheet
6. Initial departmental layout
7. Final departmental layout
8. Plot plan
9. Material handling system design
10. Material handling equipment list

Report4: FinancialAnalysis

1. Plant cost: land, building, and production equipment
2. Material cost
3. Personnel cost
4. Office equipment cost

5. Material handling equipment cost
6. Profit and loss statement

Report5: FinalProjectReport

1. Letter of Transmittal.
2. Table of Contents
3. Contents of Appendices
4. Layout Methodology: A 12 to 15-page write-up on the procedure used in all the reports for the entire project.
5. Detailed layout drawings made to scale using VISIO for:
    a. Final plant layout
    b. Production departments showing all equipment
    c. Storage design: receiving, shipping, storage, and warehouse
    d. Office areas showing all work-stations
    e. Production and Personnel Service areas
6. All the material from the earlier reports properly sequenced into Appendices per instructions.

Laboratory Project Procedure:
The instructor will divide the class into several groups. Each group will be given detailed information on a product, and they are to plan, design, and layout the manufacturing facilities to produce this product. The final report will include layouts of the manufacturing areas, service areas, and office areas, and a financial analysis for the company. Each group will submit a total of five reports (the contents of each report are shown above) on the due dates indicated. Normally, each member of a group will receive the group grade for the lab. *However, if evidence of unequal participation in the lab (in quantity and/or quality) by any member of a group is brought to the attention of the instructor, the group grade will be divided up to reflect the individual levels of participation.*

Computer Usage:
All five reports in the laboratory project must be done using the computer. You will need a working knowledge of Word, Excel, and VISIO. All the forms that need to be completed and other computational software needed for each report can be downloaded from my elearning website. All written text material must be in WORD (or some other word processing software). In the initial reports, application of VISIO is limited. However, each group must start using VISIO from the beginning of the semester so that, by the time Report #5 is worked on, they are "experts" in its use. A majority of Report #5 uses VISIO.

Written Communication Requirements:
All the reports required for the laboratory project have sections that need to be written. These sections will be graded for good writing skills and mechanics. In addition, the final report will be judged for good report preparation skills.

Library Usage:
A list of references and periodicals useful in this course is attached at the end of this syllabus. As you work on the laboratory project, you will find it extremely useful to refer to the appropriate sections in the books listed to get different perspectives for designing the same thing. A review of the current issues of the listed periodicals will give you an insight into the latest developments in the areas of materials handling and warehousing.

Evaluation Distribution:

Laboratory Project:		Course:	
Report 1	200 points	Examination # I	20%
Report 2	200 points	Examination # II	25%
Report 3	200 points	Examination # III	25%
Report 4	100 points	Laboratory Project	30%
Report 5	300 points		
Total for Project	**1000 points**	**TOTAL**	**100%**

Grading Scale:
The following grading scale will be used in my class:

A (91–100), **BA** (86–91), **B** (81 – 86), **CB** (76 – 81), **C** (71 – 76), **DC** (66 – 71), **D** (60 – 66), **E** (below 60).

Attendance at all examinations is mandatory and nomake-upexamswillbegiven. All examinations will be graded on a numerical scale. At the end of the semester, the grades will be added up for all the examinations and the lab (with the appropriate weights), and then converted to a letter scale to determine the final course grade. In order to receive a course grade of 'C' or better, the student mustpass(agradeofDorhigher)inall 3examinations. Astudentwillreceivean'E'inthecourseifhefailsinall3exams.

Performance Criteria[2]:

Objective 1. Know how to correctly apply the various tools and techniques used in the designing of manufacturing and service facilities [I, II, III, 1, 2, 3, 5].

Objective 2. Become familiar with the various types of material handling and storage equipment and be able to evaluate and design material handling systems [III, 1, 3, 5].

Objective 3. Be able to conduct a detailed financial justification for newly designed/modified facilities [II, 4].

Objective 4. Be able to design a new facility and prepare a detailed project report [1, 2, 3, 4, 5].

[2]Numbers in brackets refer to the method of evaluation (Roman numerals refer to examination numbers and Arabic numerals refer to laboratory report numbers).

Attendance Policy:
An attendance sign-up sheet will be passed around on random days at the start of the class meeting. If, during the semester there are more than three absences, the course grade will be dropped by ONE full letter grade.

Academic Honesty:

Students are responsible for making themselves aware of and understanding the University policies and procedures that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. The academic policies addressing Student Rights and Responsibilities can be found in the Undergraduate Catalog at

http://catalog.wmich.edu/content.php?catoid=24&navoid=974.

If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s) and if you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test. In addition, students are encouraged to access the Code of Honor, as well as resources and general academic policies on such issues as diversity, religious observance, and student disabilities:

EDMM 4040: PLANT LAYOUT AND MATERIAL HANDLING

List of References and Periodicals

REFERENCES

1. Allegri, Theodore. MaterialsHandling. Van Nostrand Reinhold, 1984.
*2. Apple, James. MaterialsHandlingSystemsDesign. Ronald Press, 1972. [TS180.A66]
*3. Apple, James. PlantLayout&MaterialHandling. Krieger, 1991. [TS178. A63 1991]
*4. Black, J. Temple TheDesignoftheFactorywithaFuture. McGraw-Hill, 1991. [TS157.B57 1991]
5. Francis, McGinnis, and White. FacilitiesLayoutandLocation. Prentice Hall, 1992.
6. Hales, Lee. ComputerizedFacilitiesPlanning. IIE, 1985.
*7. Heragu, Sunderesh, FacilitiesDesign. PWS Publishing, 1997. [TS177.H47 1997]
*8. James and Alcorn. AGuidetoFacilitiesPlanning. Prentice Hall, 1991. [TS177.J36 1991]
*9. Konz, Stephan. FacilityDesign. Publishing Horizons, Inc., 1985. [TS177.K66 1985]
*10. Kulweic, Raymond. MaterialsHandlingHandbook. American Society of Mechanical Engineers and the International Material Management Society. 1985. [TS180.M315 1985]
*11. Meyers, Fred. PlantLayout&MaterialHandling. Prentice Hall, 1993. [TS178.M48 1993]
*12. Moore, James M. PlantLayout&Design. McMillan, 1962. [TS155.M692]
*13. Muther, Richard. PracticalPlantLayout. McGraw-Hill, 1955. [TS155.M7995]
*14. Muther, Richard and Haganas, Knut. SystematicHandlingAnalysis. Management and Industrial Research Publications, 1969. [TS180.M8]
15. Muther, Richard. SystematicLayoutPlanning. Cahners Books, 1974.
*16. Reed, Ruddell Jr. PlantLayout: factors, principles, and techniques. Richard Irwin, Inc., 1961. [TS155.R36]
*17. Sule, D.R., ManufacturingFacilities:Location,Planning,andDesign, PWS Publishing Co., 1988. [TS177.S84 1988]
*18. Sule, D. R., LogisticsofFacilityLocation&Allocation, Marcel Dekker, 2001. [HD58.S85 2001]
*19. Tompkins and Smith. TheWarehouseManagementHandbook. McGraw-Hill, 1988. [HF5485.W351988]
*20. Tompkins, White, et. al. FacilitiesPlanning. Wiley, 2003. [TS177.F324 2003]
*21. Tompkins and Harmelink. TheDistributionManagementHandbook. McGraw-Hill, 1994 [HF5415.7. D572 1994]
*22. Tompkins, James A. WinningManufacturing:TheHow-toBookofSuccessfulManufacturing. McGraw Hill, 1990. [TS155.T57 1990]
*23. Materials handling and storing. U.S. Dept. of Labor (Occupational Safety and Health Administration), 1998. [L35.2:M 41/2/998]

PERIODICALS (Housed in Waldo Library)

*1. Modern Materials Handling [TS149.M63]
*2. Material Handling Engineering [TS149.F45]
*3. Plant Engineering [TS155.A1 P53]

* Available in Waldo Library [call number is shown in parenthesis]