



Southern
Illinois University
Carbondale

IT 395 TECHNOLOGY DESIGN

Fall 2009

(Individual Project)

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DESCRIPTION: A creative project on a technical subject selected by the student with faculty approval.

OBJECTIVE: To provide the student with the opportunity to use knowledge and experience gained in the Industrial Technology program to improve an actual work situation.

INSTRUCTIONS TO THE STUDENT:

1. It is the responsibility of each student to identify the nature of their project rather than have the instructor assign one. The student should evaluate a work environment (either in his/her own place of employment or in a business concern that would welcome professional work) to identify a problem that could be improved by the application of scientific principles. Dependent upon the scope of the problem, it is possible to have a group work on the project as a team. The team project and the number of students on the team must be approved by the faculty. Usually, team size will be limited to two or possibly three students. This is a self-study course; therefore, there is no in-class lecture time. However, if you need help of clarification on any aspect of the project, let me know.

2. Once you have identified a specific problem, write a plan of action detailing the problem solving process as it applies to your project/problem and submit it for approval. See the attached form. You should start this soon so that you will have Project approval Not Later Than (NLT) **Sept. 11, 2009.** Late work will be subject to a DISCOUNT.

Important Note: There are usually some correction or changes required before I can approve submitted projects. Therefore, you should start on this project early so that any changes can be completed and final project approval received NLT **Sept. 25, 2009.** This date is the date

that this evaluation and approval process should be completed, not the date for your initial submission of the project.

A. PROBLEM DEFINITION - Clearly identify the problem(s).

B. ANALYSIS OF PROBLEM - What information or data will you need to properly analyze the problem(s).

C. SEARCH FOR POSSIBLE SOLUTIONS - Identify possible alternative solutions to the problem(s).

D. EVALUATION OF ALTERNATIVES - What will your criteria be for evaluating the alternatives so that the best will be selected.

E. RECOMMENDATION AND IMPLEMENTATION - What implementation process you think would be best for the solution.

F. FOLLOW-UP - What follow-up methodology would you consider appropriate for the solution selected.

For the above steps you should detail the problem, how you plan to analyze the problem, the criteria involved, the possible implementation plan, and the follow-up plan.

3. Have the organization or business complete the attached form detailing the project that you will be doing. This form must be completed and returned to the faculty along with the student's outline of the Problem Solving Process NLT **Oct. 2, 2009.**
4. **REPORTS:** A comprehensive written report and analysis is required. In addition, an oral presentation of the project will be made by the student(s). Your work should include a minimum of 20 double spaced, typewritten pages in addition to appropriated forms, graphs, or diagrams that may be necessary. The basis for instructor evaluation will be the importance or merit of the project, the method of problem solving, the written report (organization, composition, completeness), and the oral presentation. Visual aids should be used in the oral presentation and you should plan on a maximum of 30 minutes and then additional time for questions. The computers in the IT Office are available for your use.

PROJECT APPROVAL RECEIVED NLT

(covered in Part #2 above)

Sept. 11, 2009

PROJECT FOLLOW-UP DUE NLT

(Progress Update Report)

Nov. 6, 2009

COMPLETED WRITTEN REPORT DUE NLT

Dec. 4, 2009

ORAL PRESENTATION

TBA

Your written report should be in the following format:

- A. Title Fly - the title only, centered on the page
- B. Title Page - the title at the top, to whom written in the center of the page, and from whom and date at the bottom
- C. A Letter of Transmittal - keep it short
- D. A Table of Contents
- E. A Table of Illustrations
- F. Summary/Synopsis
- G. The Body of the Report - Introduction, Discussion, Conclusion
- H. Addenda

5. SOME SUGGESTED TYPES OF PROJECTS:

- A. Plant or Office Layout Improvement
- B. Methods Improvement
- C. Control of Cost
- D. Material Handling Equipment Study
- E. Analysis of an Inventory Control System
- F. Quality Control Problem
- G. Analysis of a Major Safety Problem

Note: Other projects are possible with approval of the Instructor.

6. WHAT TO LOOK FOR IN THE WORK SITUATION

- A. Poor Utilization of Facilities
- B. Poor Utilization of Manpower
- C. Inefficient Office Layout
- D. High Accident Frequency
- E. Poor Product or Service Quality

7. THIS ANALYSIS REQUIRES THAT THE STUDENT USE SEVERAL QUANTIFYING TECHNIQUES:
 - A. Flow Charting
 - B. Process Charting
 - C. Analytical Quality Control Charting
 - D. Time & Motion Study
 - E. Return-On-Investment Analysis
 - F. Results of Environmental Testing
 - G. Computer Programs
 - H. Inventory and Production Control Methods
 - I. Other Scientific Problem Solving Methods

8. REFERENCES: The following handbooks are suggested reference materials.
 - A. Industrial Engineering
 - B. Maintenance Engineering
 - C. Tool and Manufacturing Engineering
 - D. Materials Handling
 - E. Accident Prevention Manual
 - F. Production and Inventory Control
 - G. Quality Control
 - H. Industrial Pollution Control
 - I. Manufacturing Planning and Control

In addition, the textbooks used in the Industrial Technology Program would be good reference sources.

TO BE COMPLETED BY THE STUDENT

STUDENT NAME: _____

For your proposed problem, complete the following questions and return this form to the instructor. The questions will assist you and me in determining the significance, scope, and work required to solve or complete this proposed project.

1. **Problem Recognition:** What symptoms or facts do you recognize in this case that lead you to believe a problem exists? (Please use short descriptive statements)

2. **CLEARLY DEFINE THE CENTRAL PROBLEM.** Write a clear statement of the central problem or issue in this case.

3. Write a statement of your objective or goal in solving this problem.

4. Write a statement of the criteria you believe appropriate for evaluating alternative solutions to the problem and how well the selected solution solves the problem and achieves the stated objective.

5. **ANALYSIS OF THE CENTRAL PROBLEM:** What factors, facts, or data would need to be analyzed or developed before solutions could be generated? This is the information that you will develop or research.

6. **GENERATE SEVERAL POSSIBLE SOLUTIONS TO THE PROBLEM:** Do some brainstorming to generate possible solutions to the problem. List as many plausible and implementable solutions as you can generate.

7. **EVALUATE THE PROPOSED SOLUTIONS TO THE PROBLEM:** **What** criteria would you use to evaluate the proposals?

8. **CHOOSE & RECOMMEND A SOLUTION TO THE PROBLEM:** At this time, which of the solutions do you believe will be the solution selected?

9. **DESIGN & RECOMMEND AN IMPLEMENTATION PLAN:** Write a statement that describes your plan for the implementation of the proposed solution.

10. **DESIGN & RECOMMEND A FOLLOW-UP PLAN:** Write a statement of the follow-up methodology that would be appropriate of the proposed solution to the problem.

OR

IT 395 TECHNOLOGY DESIGN (GROUP PROJECT)

A MANAGEMENT PROPOSAL FOR AN ORGANIZATION WITH TWO PRODUCT LINES.

OBJECTIVE: A complete plant layout, costing proposal, break-even and profitability analysis for presentation to top management for 8% financing at 9% interest for 10 years.

PRODUCT

CRITERIA: The products you select to manufacture should have similar manufacturing requirements so that you can better utilize your capital expenditures in machines and equipment. Do not select products which require only one or two operations to produce as these will not be approved for the project. Each product should require several primary, secondary, and assembly operations.

PRODUCT

DEMAND: Your business plan should provide for a 10% increase in sales each year for ten (10) years.

I. The Proposal Should Include, But Is Not Limited To:

(NOTE: Your proposal should cover ten (10) years of operation based on forecasted sales, therefore, you should have plans for each of these years. All computations should be included in your work-up.)

Facilities Planning

A. Equipment Required

1. Number of machines at the various levels of production
 - a. Most operations should have a scrap rate
 - b. All operations should have a utilization rate other than 100%.

B. Detailed Plant Layout

1. Work-in-process areas
2. Raw materials storage
3. Finished goods storage
4. Miscellaneous factory supplies
5. Office spaces
6. Auto parking

Operational Planning

C. Manpower Plan

1. Direct, Indirect, Staff and Clerical
 - a. Methods analysis on direct labor operation required
(use MTM I, II, or III)
2. Organizational Chart

D. Process/Product Description

1. Operation process chart for each product
2. Exploded view of product(s)
3. Parts list
4. Indented Bill-of-materials listing

E. Sales, Production & Inventory Schedules

1. Capacity Plan
 - a. Machine load/utilization plan
 - b. Quantitative Labor requirement plan. For direct labor requirements under various product mix situations you should use the equivalent unit method of computation.
2. Quantitative Inventory Plan. (You should try to hold inventory levels to some reasonably low level)
3. Quantitative Production schedule for each of the first five years (i.e., Level, Chase or Combination).

II. Organization of Groups

1. International organization is up to the specific group with the group size limited to three (3) students.
2. Each group is required to submit two (2) written reports during the term as follows:

1st: Project Submitted and Approval Received: Due Not Later Than (NLT) Sept. 11, 2009. To include: an exploded view of the two products you have selected, a bill of material listing denoting purchased and manufactured parts, an assembly process chart (operation process chart), and an outline that your group plans to follow (with dates) for timely completion of the project.

Important Note: There are usually some corrections or changes required before I can approve submitted projects. Therefore, you should start on this project early so that any operation changes or product changes can be completed and final project approval received **NLT Sept. 25, 2009.** This is the date that this evaluation and approval process should be completed, not the date for you initial submission of the project.

2nd. Project Follow-up: Due Not Later Than (NLT) Nov. 6, 2009.
Progress update report.

3. This is a self-study project, therefore, there is no in-class lecture time; however, any group or student needing clarification or special direction or assistance on any aspect of the project should contact me at the IT office for assistance as needed.

III. Presentation and Report

- A. Each group will make their presentation on **Dec. 4, 2009.** I will notify you if this date changes for any reason. The Project will be written and you will need to use visual aids for the presentation. You should plan on a maximum 30 minute presentation and then additional time for questions. Please copy and make overheads of any documents that you will need for the oral presentation before you submit the written work-up. The written work-up will not be returned to you. A formal technical written report format should be used for the written document. Be complete in your written analysis and explanations.
- B. The completed written project is **Due In The Office NLT Dec. 4, 2009.**
- C. Late projects will be subject to **DISCOUNT.**
- D. Questions may cover any subject or aspect of the project in detail.
- E. All decisions made should include assumptions, calculations, all pertinent information and logic.
- F. The more complete, detailed, accurate, and professional your work the better your project will be.
- G. Each group member should be present for the group project presentation. A grade will be given to the group.

IV. Grading

A. A final grade will be given for the group.

B. Accurate and Complete Quantitative Data and Analysis

<u>Breakdown</u>	<u>Points</u>	
1. Facilities Planning	200	
-Plant & Equipment layout		
2. Operational Planning	200	
-Manpower Plan		
-Process/Product Description		
-Sales, Production, Inv. Schedules		
3. Costing and Profitability Analysis	200	
-Relevant Data		
-Detail & Correctness		
4. Financial/Management Analysis	<u>200</u>	800
Accurate, Complete Exposition and Understanding of Data and Proposal		
5. Written work	400	
-Elaboration, Clarification and Summary		
6. Team Presentation and Explanation	<u>400</u>	<u>800</u>
		1600

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GRADE AND COMMENT SHEET

Student: _____
 Base: _____
 Subject: _____
 Date: _____

	<u>Potential</u>		<u>Actual</u>
A. Project Proposal	10%		_____
B. Subject Content & Development			
Letter of Transmittal	5%	_____	
Abstract	5%	_____	
Table of Contents	5%	_____	
W Identification of Problem	15%	_____	
R			
I			
T Validate Analysis Techniques	15%	_____	
E			
U			
P Selling Results	20%	_____	
Appendix	<u>5%</u>	_____	
Subtotal	70%		_____
C. Grammar, Punctuation & Physical Appearance			
No. _____			
Misspelled: pp. _____			
No. _____			
Punctuation: pp. _____			
Grammar:			
Subtotal	10%		_____
D. Presentations:			
1. Progress Report			
2. Final Review			
Subtotal	10%		_____
Numerical Grade	100%		_____

IT 395 TECHNOLOGY DESIGN- Minimum Student Competencies

The student will demonstrate, by project report submission, the following competencies:

1. Develop an understanding of the relationship between production system design, production system operation, and production system cost.
2. Design a production system and its operational and support components.
3. Calculate appropriate production cost estimates, break-even point.
4. Select two different products that meet the following criteria:
 - a. Product material must primarily be metal.
 - b. Products selected should have similar, but not identical, manufacturing requirements so that capital equipment may be best utilized.
 - c. Products selected must have at least four distinct manufacturing operations (i.e. cut, bend, mill, drill, etc.) and have at least a three-step subassembly/assembly operation not including packaging.
 - d. Products should be a consumer item so that some reality of retail price can be attained at places such as Sears, Home Depot, etc.
5. Select the material for each project and justify the reason for selection based on cost of material, material characteristics, and material availability. Do not give as a reason that similar products are made out of that material.
6. Using a CAD software program, draw an exploded view of the two products.
7. Produce a bill of material denoting purchased and manufactured parts.
8. Produce an operation process chart for each product.
9. Produce an assembly chart for each product.
10. Given appropriate information such as scrap rate, machine efficiency, number of shifts and workdays, and machine production rates, calculate the number of machines at each level of production.
11. Develop a complete plant layout showing:
 - a. How production equipment can be most efficiently arranged for the manufacture and assembly of the two different products.
 - b. Support functions such as:
 - (1) Raw material storage.
 - (2) Finished goods storage.
 - (3) Office/administrative space.
 - (4) Personnel services.
 - (5) Auto parking space.
 - (6) Maintenance area.
 - (7) Material handling equipment.
12. Determine staffing requirements for direct and indirect manpower.
13. Create an organizational chart showing lines of authority and departments.
14. Determine cost estimates for the following items:
 - a. Production and material handling equipment.
 - b. Facility construction and equipment installation.
 - c. Hourly and salaried pay scales for each type of employee.
 - d. Utilities based on local rates.
15. Produce a report using a Technical Report Format.