Group Project (70 Points)

Sustainable Manufacturing Facilities Design & Management
You will, in a small group of 3 students, develop a project proposal involving a product and manufacturing technologies (facilities) required to plan and document it. Each team will design a different and approved product. The project is expected to include green product design, documentation, process planning, process routing, facilities layout, green and sustainability auditing, management, written and oral presentations. Students will obtain written approval for their topics, and the proposal must be completed for presentation on the due date (see course semester schedule).

Product Design (10 points): A product, consisting of at least six (6) parts and approved by the instructor, must be designed by each group. Each student should be assigned two of the six parts. Before coming to the instructor, each student should sketch his or her two parts on a sheet of paper. Each part must undergo at least five processes. After instructor’s approval, these parts must be designed on a CAD system. Product documentation should include the student’s name, 3-D drawings of all individual parts and assembled product, a bill of material, and dimensioned geometric drawings with title blocks of each part.

Process Design (10 points): Each student should do a process plan for the fabrication phase of all of his/her parts using regular process (routing) sheets. From your analysis and those of your teammates, determine all the resources (equipment, tools, time, money, and materials) needed to complete the project. This will help you to determine the types, number and length of operations or tasks needed to fabricate each part. A complete assembly chart (OPC) must also be designed. Both the process charts and assembly chart must be typed, and neatly completed for full credit. The assembly chart may be done jointly or by a volunteer from your team; however no extra credit will be given to whoever designed it.

Analysis (10 points): From your charts and with the help of the standard conversion table and appropriate formulae, determine the following information (assuming a daily production volume of 2000 of your product):

1) Summary of route sheets.
2) Machine requirements or total number of each type of machines needed.
3) The plant rate or takt time (R value) and conveyor speed of your assembled and boxed product if you have 50-minute downtime for breaks etc. and 80% anticipated plant performance.
4) Percentage of the group’s combined takt that is attributed to your assigned parts
5) The number of operators and assemblers needed in an eight-hour shift.
6) How much it will cost in operator and assembler wages if your budget allowed for $20 an hour per worker
7) The number of supervisors needed (assume you are the plant manager and there is one supervisor for every 10 workers)
8) Total amount of space anticipated for the proposed plant (the sum of all calculated spaces for machines, offices, storage, restrooms, shipping &
receiving, isles, tool room, cribs, cabinets, benches, assemblers, conference rooms, lunch rooms, stock room etc.). Show all your data and calculations in a work sheet.

9) Total cost of the proposed project for it to be fully constructed and implemented, assuming that the following costs would be incurred:
   a. Purchase and installation of machines and equipment = $900,000
   b. Materials for constructing the facility = $650,000
   c. Building contractor's charge for each square footage = $200

10) The green or sustainability rating of the project, to include clear analysis of the building itself, your manufacturing facilities, equipment, materials, company’s green policy etc.

System Layout (10 points): Your group should design an ideal layout of the equipment, workstations, transportation, MHS, storage, etc. necessary for complete production of your entire products. The layout must be drawn to scale, dimensioned, in 2- or 3-D, and enclosed in a dimensioned facility. Show the basic framework of the facilities and the process flow of only the parts assigned to you, with different line types or line colors indicating each student.

Assigned Tasks (10 points): In addition to the group tasks described above, each team member must assume one of the following roles:

- **Maintenance Manager**: Produces this manager’s detailed office layout and the group’s maintenance schedules for servicing all the machines and equipment identified in the facility. This schedule should include oiling and servicing schedules, equipment and instrument calibration schedule, building and office maintenance schedule, light bulb replacement schedule, janitorial services schedule, safety checkup schedule for items like fire extinguishers, employee safety and health maintenance schedules etc. Sample office layout attached.

- **Inventory Manager**: Produces this manager’s detailed office layout and a complete list of all the company’s inventory items for each category (tools, instruments, machines, equipment, materials, parts, etc.) Produces an ideal inventory control system for managing the facility’s resources, including materials, tools, instruments, hardware, parts, equipment, personnel, and machines. Sample office layout attached.

- **Plant Manager**: Produces this manager’s detailed office layout and a complete organizational chart showing all personnel. Produces ideal schedules for efficient and smooth operation of the plant, to include daily operation schedules for personnel and workstations, shipping schedules for finished goods, meeting and downtime (break etc.) schedules. Sample office layout attached.

- The fourth member in a four-member team will be assigned tasks by the instructor as needed.

Report (10 points): A 1 ½ -2-page, double-spaced report is required from each student. The report should include a full description of your individual activities and personal contributions to the whole project: Product design, process planning, facilities layout, analysis, and documentation including your assigned tasks. It should also
include detailed and specific manufacturing processes for your assigned parts. The report should have only two headings that read: “My Contributions To My Group” and “Specific Manufacturing Processes For My Two Parts”. Each report should have the student’s name and parts name on the top right hand corner. All individual reports should be collected and bound into one report with the students’ names and product name in the front cover.

The following are to be attached to each student’s report before binding the team’s collective report:

1. Design of your two parts and one assembly drawing
2. Process planning and documentation for your two parts
3. Answers to analysis questions
4. Facility layout showing resources, equipment etc and process flow paths for only your two parts
5. Hardcopy evidence of your assigned tasks including at least three (3) different copies of your schedules, inventory systems, and charts.

**Oral Presentation (10 points):** Your group will be required to make a 12-15 minute oral presentation of your project. This presentation may also include a demonstration of your systems output using simulation and/or animation to illustrate. This presentation should also include sufficient explanation of your project design and analysis, using effective visual aid to explain. Plan your presentation as if you will be presenting it to your company’s review board on the potential benefits you envision, seeking their approval of the project’s implementation. Coming to class late on that day may result in lost points, so try and be in class at least 10 minutes before class begins.

**Suggested Steps:**

1. Identify and sketch product and get instructor’s approval
2. Design product and BOM, and perform associated analysis
3. Do process planning and associated analysis
4. Design system layout(s) and associated analysis
5. Write report and attach other materials
6. Do oral presentation and simulate process as needed
### Grading Criteria for Team Project (70 Points)

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<thead>
<tr>
<th>Criteria</th>
<th>Points Possible</th>
<th>Points Received</th>
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<tbody>
<tr>
<td>Students’ Names</td>
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<tr>
<td>1. Written report (1.5-2 pages):</td>
<td>(10)</td>
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<tr>
<td>Completeness, format, grammar, spelling, content, clarity, prep, etc.</td>
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<td>2. Product Design and BOM:</td>
<td>(10)</td>
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<td>Completeness, format, preparation, dimensioning, title, analysis, clarity etc.</td>
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<td>4. Analysis: Completeness, correctness, format, clarity, analysis, preparation, etc.</td>
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<td>5. Systems Layout and Design:</td>
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<td>Completeness, correctness, clarity, analysis, dimensioning, preparation, etc.</td>
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<td>6. Assigned Tasks: Completeness, correctness, clarity, analysis, format, utility, preparation, etc.</td>
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<td>7. Oral presentation and simulation:</td>
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<td>Time, completeness, content, visual aids, clarity, outline, audibility, appearance, prep, etc.</td>
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**Total Points Received out of 70**

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**Comments:**

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