**ICC Process Operations**

**ENGT 1330 – Prof. II**

**House of Cards Project: Design, Optimization, Management, and Teamwork Activity**

The following activity requires participants to use good planning, team work, and problem-solving techniques while formulating a working design process. The overall objective is to design and build a structure that meets or exceeds minimum specifications while maximizing overall profit.

\_\_\_\_\_& \_\_\_\_\_\_: Kick off House of Cards Project. Create teams of 3. Begin Design Plan using an engineering design process.

\_\_\_\_\_\_\_: Turn in deliverable A. “Purchase” materials for tower and complete the competition. Follow your disposal plan to finish out the project. Work on deliverable B.

\_\_\_\_\_\_\_: Turn in deliverable B at the start of class.

**Design Constraints:**

* Height: Earn $100,000 for building a structure that is 36 inches tall. *Bonus* $2000 per inch above 36 inches.
* Strength: The structure must support 10 pennies a height of at least 36 inches for at least 30 seconds without falling. After this, teams can load additional pennies onto their structure – *Bonus*: $500 for each additional penny loaded. Teams must tell their instructors how many additional pennies they will attempt prior to additional loading.
* Speed: The structure should be built within 25 minutes. Structures built in more than 25 minutes will be charged $2000 for each additional minute. *Bonus*: $1000 for each minute under 25.
* Material costs: 3”x5” index cards are $1000 each, 100 card limit. Tape is $5000 per roll, scissors are $5000 per pair.

**Rules:**

* Teams will NOT be allowed to purchase additional cards or return cards once construction begins.
* Teams will be charged for the number of cards bought, not the number actually used. (No returns).
* Teams may only buy cards from the ICC Engineering Store (your instructor).
* If tape is used, it cannot be affixed to any other structure (i.e., tables, chairs, floor, ceiling, etc.).
* The structure height will be determined by measuring bottom of the lowest card to top of the highest card.
* If failure occurs during loading of additional pennies, teams forfeit the opportunity to earn any strength bonus. In other words, teams should know the capacity of their design prior to attempting additional loading.

**Brainstorming and Planning Sessions:**

* Use brainstorming and planning sessions to develop the design process graphic, a design plan, and list of construction materials.
* During the planning session, each team must decide how many cards they want to “buy” and whether or not they will use tape and/or scissors.

**Deliverables:**

All deliverables must be submitted as paper copies (one per team):

1. Design Plan: A typed Design Plan must be submitted at the beginning of the competition. The design plan is evidence that you actually did “design” and “planning” for this activity, instead of just improvising on the day of the contest. The Design Plan will be graded for completeness, neatness, and accuracy to actual competition results, and should include:

1) student names and team name

2) list of materials to be purchased

3) expected structure height

4) anticipated strength

5) time required for construction (time management)

6) calculations showing anticipated profit (last page) (budget management)

7) a basic construction plan (describe how the structure will be built; who will do what) (people/resource management)

8) a dimensioned drawing of the structure that will be built

9) a disposal plan for once the tower has exceeded its useful life

1. Team Reflection Memo: The team reflection memo should cover the following.
   * Summarize the important results of construction day.
   * Explain how your team used a Design Process to complete the project.
   * Discuss the effectiveness of your Design Plan. Did your team carry out the plan and to what degree? What reasoning do you have for any changes to the plan?
   * If you were to do this again, what budget, resource, and time management techniques worked/you would keep the same and what would you do differently?

**House of Cards**

**Profit Calculation**

**Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Team Members \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

*Costs*

Cards purchased \_\_\_\_\_\_\_ x $1000 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rolls of tape used \_\_\_\_\_\_\_\_ x $5000 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Pairs of scissors used \_\_\_\_\_\_\_\_\_\_ x $5000 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time used beyond 25 minutes \_\_\_\_\_\_\_\_\_\_ x $2000 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Costs: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Revenue*

Successfully built structure (Yes = $100,000 No = $0) \_\_\_\_\_\_\_\_\_\_\_\_\_

Height. Additional height (inches above 36) \_\_\_\_\_\_\_\_\_\_ x $2000 each = \_\_\_\_\_\_\_\_\_\_\_\_

Strength. Additional pennies (beyond 10) \_\_\_\_\_\_\_\_\_\_\_ x $500 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Speed. Available time not utilized (minutes under 25) \_\_\_\_\_\_\_\_\_\_\_\_ x $1000 each = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Revenue: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Profit = Total Revenue – Total Costs = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_