

**IPRO 335 Project Plan**

**Fall 2008**

# **Green Building Design Concepts and Integration**

**Advisor: Jeff Budiman and Jay Shen**

## 1.0 Abstract

The intent of this IPRO project is to design a “green” and innovative building using the skills and input of students studying different majors at Illinois Institute of Technology. The team has decided to design a replacement apartment building for Gunsaulus Hall on the Illinois Institute of Technology campus. Innovative technologies and practices will be researched and employed to design a “green” building. The decision to design a building for the IIT campus came about because it is an area that all of the team members could relate to and have a more realistic grasp on the project. Then it was suggested that the building this project group designed would then be studied structurally by the team of IPRO 315: Design of a Large-Scale Structure. For the remainder of the semester the two groups are planning on coordinating with each other on each step of the design process.

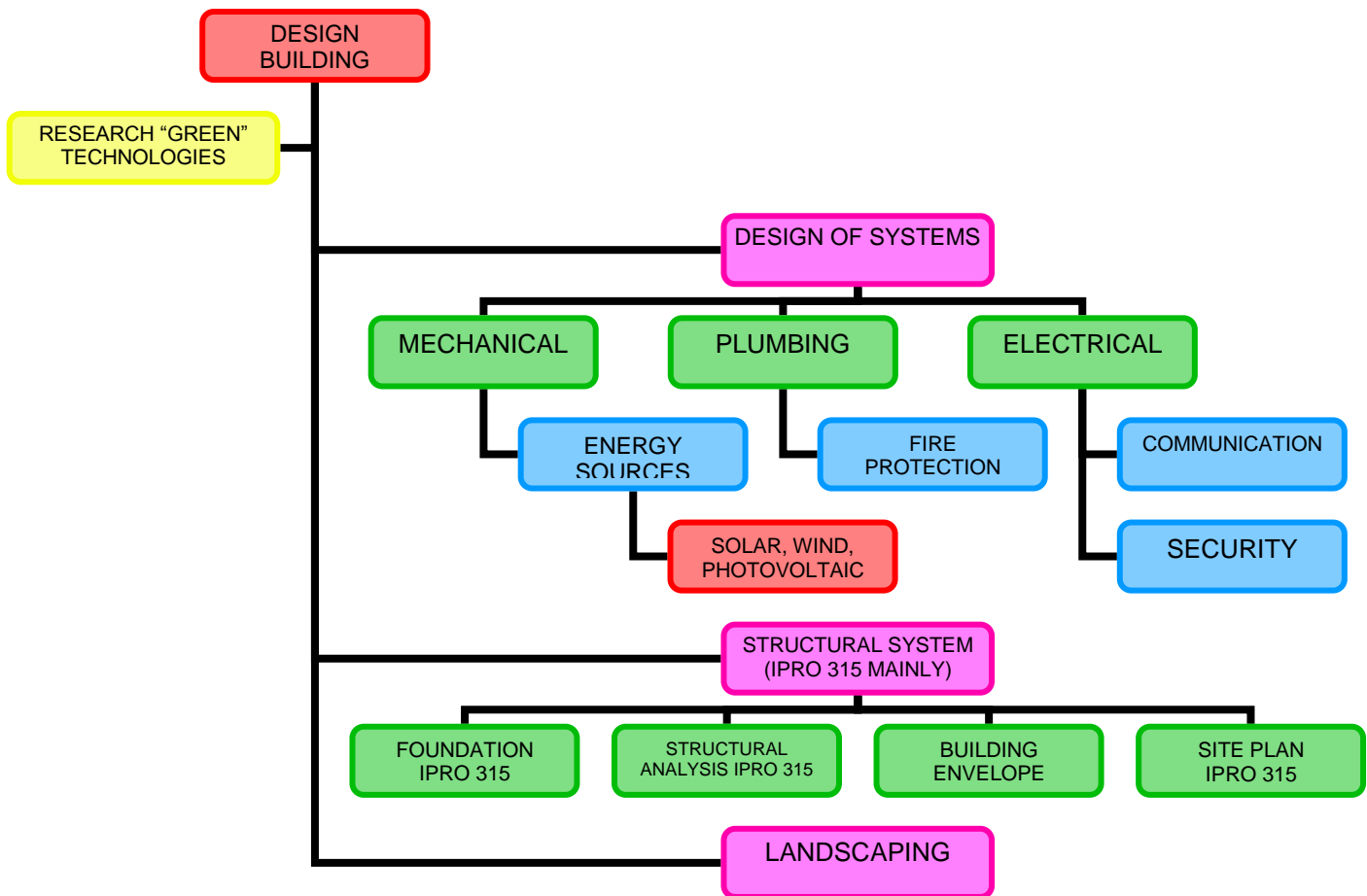
## 2.0 Background

- A. This project is seeking engineering design guidance from Environmental Systems Design, Inc. – an engineering company located in downtown Chicago. The team is also talking with key staff members of IIT that are involved with the design and decisions of new facilities on campus. The purpose of this communication with the school is so that the team has some idea of what the school is looking for and the kind of budget the project would have.
- B. There have been rumors floating around the IIT campus that Gunsaulus Hall will be in need of replacing in the near future. The team is trying to find the most feasible solution to designing a new living facility for the IIT campus that follows the LEED-NC guidelines. The team will be researching “green” technologies and providing information on why certain technologies are better than others for the site the team has chosen. With the building design the team is working on, the team wanted to keep about the same amount of units on each floor and total that is in the existing building. The team also wanted to add some amenities to the campus that would be housed in the new residence building.
- C. Currently, there is a big craze in the city of Chicago to get all new buildings LEED certified. This certification means that the building offers many “green” techniques and technologies. Some of these involve the type of materials chosen or the techniques for the indoor environment – decrease in use of water and better air quality. There team is also studying renewable energy sources, such as wind, geothermal, and solar power. There are many different projects within the city of Chicago that the team could look to for help in being as “green” as possible.
- D. There are some scientific and cost issues that are present in this design case. The scientific issues that can arise are dealing with the new technologies, such as solar and wind. There can be issues with the feasibility and cost effectiveness of these technologies because they haven’t been in existence for very long and the basic technology isn’t at its most efficient. The cost issue stems off of the fact that most of these technologies are not the most cost-efficient. The installation of these technologies have such a high initial cost that sometimes it is just not a viable solution because the pay-back will take too long.

### 3.0 Objectives

- A. The main objective of this IPRO is to design a building using sustainable and innovative technology.
  - a. The first and main objective was to develop a design for the building.
    - i. Once the team designed a basic design, the design will be given to the IPRO 315 so that they can do structural analysis.
    - ii. The design will be modified throughout the semester to accommodate the different mechanical systems that are needed throughout the building.
  - b. Design a mechanical system.
    - i. The team wants the system to be logical in its uses and also efficient for the building.
    - ii. The team is investigating different methods of solar heating and cooling to help take some of the load off of the total system.
  - c. Design a plumbing system.
    - i. The team wants to look into using a recycled water system, storm water capture and reuse systems, as well as using efficient fixtures throughout the building.
  - d. Design a fire protection system for the building.
  - e. Design an electrical system.
    - i. The team is investigating using photovoltaic cells to provide power to the building.
    - ii. Design a sensible communication system for the building.
  - f. Research of different energy sources that could be used in the design.
    - i. Solar, wind, fuel cell energy sources are the main ideas being investigated.
  - g. Design a building envelope that helps reduce the load on the heating and air conditioning system, and also that looks good and is energy efficient.
  - h. Design a landscaping scheme.
    - i. Allows for a majority if not all of the residents to have access to green-space.
    - ii. Follows the guidelines set forth by LEED.
  - i. Design a sensible security system.
    - i. Since there are plans for a restaurant and other amenities on the first floor, there needs to be a secure entrance for the residents of the building.
  - j. Assess and design the building with the appropriate accessibility.
  - k. Build a prototype of the building design for presentation on IPRO day.
  - l. Fill out the paperwork for the theoretical certification from LEED to show what the team is doing to make the building as “green” as it can be.
  - m. Do energy model/analysis, photometric study and an energy cost analysis of final design.

## 4.0 Methodology



- A. The main objective of this IPRO is to design a building using sustainable and innovative technology. The following is the tentative schedule for achieving this objective.
- a. Due Date: September 18, 2008
    - i. Develop a design for the building that is fairly final, but still open to changes to accommodate the different systems and structural changes that IPRO 315 deems necessary to make for a sound structure.
  - b. Due Date: September 25, 2008
    - i. Complete initial research of the different energy sources available to use in the design, such as solar, wind, fuel cell, geothermal, etc.
  - c. Due Date: October 16, 2008
    - i. Design a mechanical system.
      1. The team wants the system to be logical in its uses and also efficient for the building.

2. The team is investigating different methods of solar heating and cooling to help take some of the load off of the total system.
- ii. Design plumbing and fire protection systems.
  1. The team wants to look into using a recycled water system, storm water capture and reuse systems, as well as using efficient fixtures throughout the building.
- iii. Design an electrical system.
  1. The team is investigating using photovoltaic cells to provide power to the building.
  2. Design a sensible communication system for the building.
- iv. Design a building envelope that helps reduce the load on the heating and air conditioning system, and also that looks good and is energy efficient.
- v. Design a landscaping scheme.
  1. Allows for a majority if not all of the residents to have access to green-space.
  2. Follows the guidelines set forth by LEED.
- vi. Design a sensible security system.
  1. Since there are plans for a restaurant and other amenities on the first floor, there needs to be a secure entrance for the residents of the building.
- vii. Assess and design the building with the appropriate accessibility.
- d. Due Date: November 15, 2008
  - i. Build a prototype of the building design.
  - ii. Fill out the paperwork for the theoretical certification from LEED to show what the team is doing to make the building as “green” as it can be.
  - iii. Do energy model/analysis, photometric study and an energy cost analysis of final design.
  - iv. Write a specification booklet for the new residence hall.
    1. Each group will produce their own list of specifications for construction for the new building.
- e. Due Date: November 26, 2008
  - i. Posters, brochures, sections, presentation, and other materials needed to show the project for IPRO day.

## 5.0 Project Budget

- a. TOTAL BUDGET = \$650.00
  - a. Supplies - \$200
    - i. This will include all printing for class handouts and other printing or supplies that we need to buy in order to facilitate the progress of the project.
  - b. Model Supplies - \$300
    - i. This part of the budget encompasses all of the supplies that the team members will need to buy in order to build the prototype for IPRO Day at the end of the semester.

1. These supplies will most likely include chip board, bass wood, mdf wood, foam core, museum board, insulation foam, acrylic, adhesives, etc.
- c. Travel - \$150
  - i. The combined teams of IPRO 315 and 335 plan on taking field trips to pre-cast concrete plants and other companies that are relevant to gathering information in order to better understand how the building would be built in reality.

## 6.0 Team Information and Assignments

### A. Architecture Design

- a. Lucas Rogers,
- b. Joe Parker,
- c. Craig Forneris
- d. Sarah Olson,
- e. Fransisca Dewi,
- f. Aduroja Feyi,
- g. Dawveed Schully,

### B. Structural Analysis and Design

- a. Qudsia Khan,
- b. Bogdan Rus,
- c. Helen Yeung,
- d. Ryan Freund,
- e. Miguel Urdiales,
- f. Kyle Cantone,
- g. Lucian Muresan,

### C. Foundation Analysis and Design

- a. Bogdan Rus,
- b. Trent Steefen,
- c. Ryan Freund,
- d. Miguel Urdiales,
- e. Qudsia Khan,
- f. Amanda Stenson,
- g. Helen Yeung,

### D. Water Use, Plumbing System and Drainage

- a. Jaimi Stroot
- b. Chris Chock
- c. Trent Steffen
- d. Elizabeth Laschiazza

### E. Electrical and Communication Systems

- a. Curtis Aubry

- b. Carlie Douglas
- c. Hon-Kyu
- d. Fabian Aguilar
- e. Chris Antonio

F. Building Energy Sources, Solar Panels and Wind Turbines

- a. Chris Chock
- b. Chris Antonio
- c. Craig Forneris
- d. Sarah Althoff
- e. Fabian Aguilar
- f. Amanda Stenson,

G. Building Envelope

- a. Anna Dlugosz
- b. Carlie Douglas
- c. Lucas Rogers
- d. Aduroja Feyi,
- e. Dawveed Schully

H. HVAC System

- a. Sarah Althoff
- b. Jaimi Stroot
- c. Amanda Stenson,

I. Landscaping

- a. Dawveed Schully,
- b. Aduroja Feyi,
- c. Joe Parker,
- d. Fransisca Dewi,
- e. Anna Dlugosz
- f. Fabian Aguilar

J. Fire Protection System

- a. Jaimi Stroot
- b. Sarah Olson
- c. Curtis Aubry

K. Security System

- a. Craig Forneris
- b. Joe Parker,
- c. Chris Antonio