Large Scale Structure
Advisor: J. Shen and J. Budiman
1.0 Objectives

The intent of the IPRO 315 is to design a large-scale structure. The focus of this IPRO is structural analysis. The advisors of this group thought it would be even more interested if IPRO 335 and IPRO 315 would mesh together to create a large green structure. The intent of IPRO 335 is to design a “green” and innovative building using the skills and input of students studying different majors at Illinois Institute of Technology. Our 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. 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. The 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 Methodology

A. Design an apartment building that optimize space on IIT Campus
B. Design I – 2 groups (approximately 15 hours)
   a. Architecture : This group designs the building and decides how many floors and rooms there are. (10 hours)
   b. Building Envelope : This group offers information on the site that we are building our structure. (5 hours)
C. Structural Analysis – 2 groups (approximately 20 hours)
a. Structure Design – This group decides how to construct the building. (10 hours)
b. Foundation Design – This group designs the foundation, basement and parking garage for the building. (10 hours)

D. Design II – 7 groups (approximately 49 hours)
a. Plumbing – This group decides and designs the plumbing structure. (7 hours)
b. Energy – This group chooses the type of energy and resources we will use after our building is built. This includes evaluating price and efficiency of many resources such as wind, fuel-cells, and solar. (7 hours)
c. AHU-HVAC – This group designs the heating and cooling system used in our structure. This includes the design of passive solar power. (7 hours)
d. Landscaping – This group designs the preservation of green outside the building. This includes building rooftop gardens and green lawns. (7 hours)
e. Fire Protection – This group design the fire protection of the building. (7 hours)
f. Electrical/Communication/Security – all electrical (7 hours)
g. Accessibility – for the handicapped (7 hours)

E. Each of these groups will submit a report on their group activities and choices. This will be apart of the final report for IPRO

F. Building a 3D model that will incorporate all of B-D.

G. Presenting our Structure in front of IPRO.

H. Total hours: 84 hours

4.0 Expected Results

A. The result of our effort will be blue prints and a scaled model of our structure. The blue prints will have all the information that a contractor would need to build the structure, including all information about the site.

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 Schedule of Tasks and Milestones

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration (days)</th>
<th>Start</th>
<th>Finish</th>
<th>Predecessors</th>
<th>Information</th>
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<tbody>
<tr>
<td></td>
<td>PROJECT ORGANIZATION</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>Define Project</td>
<td>1</td>
<td>8/21/2008</td>
<td>8/21/2008</td>
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<tr>
<td>2</td>
<td>Determine Requirements</td>
<td>1</td>
<td>8/21/2008</td>
<td>8/21/2008</td>
<td>1</td>
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<td>3</td>
<td>Division into Groups</td>
<td>5</td>
<td>8/21/2008</td>
<td>8/26/2008</td>
<td>2</td>
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<tr>
<td></td>
<td>DESIGN I</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Architectural Design</td>
<td>18</td>
<td>8/28/2008</td>
<td>9/15/2008</td>
<td>3,5</td>
<td>Came up with initial design</td>
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<tr>
<td>5</td>
<td>Building Envelope</td>
<td>1</td>
<td>8/28/2008</td>
<td>8/28/2008</td>
<td>3</td>
<td>Find information</td>
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<tr>
<td></td>
<td>STRUCTURAL DESIGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Structure Design</td>
<td>10</td>
<td>9/15/2008</td>
<td>9/25/2008</td>
<td>4</td>
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<tr>
<td>7</td>
<td>Foundation Design</td>
<td>10</td>
<td>9/15/2008</td>
<td>9/25/2008</td>
<td>4</td>
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<tr>
<td></td>
<td>DESIGN II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Plumbing</td>
<td>21</td>
<td>9/25/2008</td>
<td>10/16/2008</td>
<td>6</td>
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</table>
10 | HVAC | 21 | 9/25/2008 | 10/16/2008 | 6 |
12 | Fire protection | 21 | 9/25/2008 | 10/16/2008 | 6 |
14 | Accessibility | 21 | 9/25/2008 | 10/16/2008 | 6,4' |

**PRESENTATION**
17 | Poster | 11 | 11/6/2008 | 11/17/2008 | all |
18 | Presentation | 1 | 12/3/2008 | 12/3/2008 | all |

### 7.0 Individual Team Member Assignments

#### A. Individual Team members

<table>
<thead>
<tr>
<th>NAME</th>
<th>MAJOR, YEAR</th>
<th>SKILLS &amp; STRENGTHS</th>
<th>EXPERIENCE &amp; ACADEMIC INTERESTS</th>
<th>TEAM(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(IPRO 335)</strong></td>
<td></td>
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<tr>
<td>Aduroja, Oluwasesan</td>
<td>Architecture, Senior</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>Experience comes from IIT studio projects</td>
<td>Architecture Design, Building Envelope, Landscaping</td>
</tr>
<tr>
<td>Aguilar, Fabian</td>
<td>Civil &amp; Architectural Engineering, Senior</td>
<td>computer drafting and design, 3D modeling, HVAC, plumbing, Fire Protection, Structure Analysis, energy efficiency analysis, electrical design and installation</td>
<td>7+ years of electrical and electronics work, computer drafting and design of architecture, interested in electrical engineering, energy efficiency analysis, and plumbing design</td>
<td>Electrical &amp; Communication Systems, Energy, Landscaping</td>
</tr>
<tr>
<td>Althoff, Sarah</td>
<td>Architectural Engineering, Senior</td>
<td>AutoCAD, Trane Trace 700 (heating and cooling loads software)</td>
<td>Experience as an intern at Teng &amp; Associates working with the mechanical engineering group. Plans to do HVAC design after graduation.</td>
<td>Energy, HVAC System</td>
</tr>
<tr>
<td>Aubry, Curtis</td>
<td>Architectural Engineering, Senior</td>
<td>Electrical Engineering for buildings</td>
<td>Internship with ESD doing electrical engineering projects</td>
<td>Electrical &amp; Communication Systems, Fire Protection</td>
</tr>
<tr>
<td>Chock, Chris</td>
<td>Chemical Engineering, Junior</td>
<td>photography, design, MATLAB</td>
<td>TechNews photo and assistant editors, student assistant to ChemE dept.</td>
<td>Plumbing System, Energy</td>
</tr>
<tr>
<td>Dewi, Fransisca</td>
<td>Architecture, Senior</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>Experience comes from IIT studio projects</td>
<td>Architecture Design, Landscaping</td>
</tr>
<tr>
<td>Dlugosz, Anna</td>
<td>Civil &amp; Architectural Engineering, Senior</td>
<td>AutoCAD, Illustrator</td>
<td>landscaping</td>
<td>Building Envelope, Landscaping</td>
</tr>
<tr>
<td>Name</td>
<td>Year/Course</td>
<td>Major</td>
<td>Skills</td>
<td>Experience/Goals</td>
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<tr>
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<tr>
<td>Douglas, Carlie</td>
<td>Senior</td>
<td>Architecture</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max, Microsoft Office Suite programs</td>
<td>interested in innovative mid to high rise housing, experience comes from IIT studio projects</td>
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<tr>
<td>Olson, Sarah</td>
<td>Senior</td>
<td>Architecture</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max, Excel, organized</td>
<td>integrating ideas for stronger product</td>
</tr>
<tr>
<td>Rodgers, Lucas</td>
<td>Senior</td>
<td>Architecture</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>IIT studio projects</td>
</tr>
<tr>
<td>Stroot, Jaimi</td>
<td>Senior</td>
<td>Architectural Engineering</td>
<td>AutoCAD, HVAC and plumbing design</td>
<td>Summer internships with ESD doing HVAC design and plumbing design, want to learn more about plumbing design for after graduation</td>
</tr>
<tr>
<td>(IPRO 315)</td>
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<tr>
<td>Aguirre, Arturo</td>
<td>Junior</td>
<td>Civil Engineering</td>
<td>AutoCAD</td>
<td>architecture and foundation design</td>
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<tr>
<td>Cantone, Kyle</td>
<td>Super Senior</td>
<td>Architectural Engineering</td>
<td>AutoCAD</td>
<td>8 years-structural steel detailer, interested in structures</td>
</tr>
<tr>
<td>Forneris, Craig</td>
<td>Senior</td>
<td>Architecture</td>
<td>AutoCAD, 3D Max, Rhino, Flash, Revit, Photoshop, Illustrator SAP2000, HTML coding, CNC physical model ability, secretarial and presentation skills, group leadership, and music</td>
<td>Played music semi-pro, owns a freelance website development corp., TA for Professor Land, works at VRA architects designing banks, interested in architecture and computer aided form generation</td>
</tr>
<tr>
<td>Freund, Ryan</td>
<td>Junior</td>
<td>Civil Engineering</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>Structural analysis</td>
</tr>
<tr>
<td>Name</td>
<td>Major</td>
<td>Skills/Programs</td>
<td>Interests</td>
<td>Courses</td>
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<tr>
<td>Khan, Qudsia</td>
<td>Civil Engineering, Senior</td>
<td>structures, foundations, Autocad, SAP2000 structural analysis program</td>
<td>Interested in learning more about foundation design</td>
<td>Structural Analysis &amp; Design, Foundation Analysis &amp; Design, Structural Analysis &amp; Design, Foundation Analysis &amp; Design,</td>
</tr>
<tr>
<td>Laschiazza, Elizabeth</td>
<td>Civil Engineering, Senior</td>
<td>structures, foundations, Autocad</td>
<td>Interested in plumbing and electrical</td>
<td>Plumbing System</td>
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<tr>
<td>Muresan, Lucian</td>
<td>Architectural Engineering, Junior</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>architecture and foundation design</td>
<td>Structural Analysis &amp; Design,</td>
</tr>
<tr>
<td>Rus, Bogdan</td>
<td>Civil Engineering, Senior</td>
<td>Structures, AutoCad</td>
<td>Internship with civil engineering firm last summer, worked on analysis of foundation</td>
<td>Architecture Design, Building Envelope, Landscaping</td>
</tr>
<tr>
<td>Scully, Dawveed</td>
<td>Architectural Engineering, Junior</td>
<td>AutoCAD, Illustrator, Photoshop, 3D max</td>
<td>Interested in Architecture, worked at architecture firm last summer</td>
<td>Structural Analysis &amp; Design, Foundation Analysis &amp; Design, Plumbing System</td>
</tr>
<tr>
<td>Steffen, Trent</td>
<td>Civil Engineering, Senior</td>
<td>structures, foundations, geotechnical, Autocad, SAP2000 structural analysis program</td>
<td>Internships with civil engineering firms for 2 summers, site development, structures, geotechnical, green building, sustainable site development</td>
<td>Foundation Analysis &amp; Design, Plumbing System</td>
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<tr>
<td>Stenson, Amanda</td>
<td>Mechanical Engineer, Junior</td>
<td>mechanics analysis</td>
<td>interested in structure and foundation analysis</td>
<td>Structural Analysis &amp; Design, Energy, HVAC System</td>
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<tr>
<td>Urdiales, Miguel</td>
<td>Civil Engineering, Junior</td>
<td>Foundation and structural analysis</td>
<td>interested in learning more about foundation design</td>
<td>Structural Analysis &amp; Design, Foundation Analysis &amp; Design,</td>
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<tr>
<td>Yeung, Helen</td>
<td>Civil Engineering, Senior</td>
<td>Foundation analysis and structural analysis</td>
<td>internships with civil engineering firms</td>
<td>Structural Analysis &amp; Design, Foundation Analysis &amp; Design,</td>
</tr>
</tbody>
</table>

**B. Team Leaders**

a. IPRO-315: Trent Steffen
b. IPRO-335: Lucas Rogers
C. Sub Teams

a. **Architecture Design**
   Lucas Rogers,
   Joe Parker,
   Craig Forneris
   Sarah Olson,
   Fransisca Dewi,
   Aduroja Feyi,
   Dawveed Schully,

b. **Structural Analysis and Design**
   Qudsia Khan,
   Bogdan Rus,
   Helen Yeung,
   Ryan Freund,
   Miguel Urdiales,
   Kyle Cantone,
   Lucian Muresan,

c. **Foundation Analysis and Design**
   Bogdan Rus,
   Trent Steefen,
   Ryan Freund,
   Miguel Urdiales,
   Qudsia Khan,
   Amanda Stenson,
   Helen Yeung,

d. **Plumbing System**
   Jaimi Stroot
   Chris Chock
   Trent Steffen
   Elizabeth Laschiazza

e. **Electrical and Communication Systems**
   Curtis Aubry
   Carlie Douglas
   Hon-Kyu
   Fabian Aguilar
   Chris Antonio

f. **Building Energy Sources**
   Chris Chock
   Chris Antonio
   Craig Forneris
Sarah Althoff  
Fabian Aguilar  
Amanda Stenson,

g. Building Envelope  
Anna Dlugosz  
Carlie Douglas  
Lucas Rogers  
Aduroja Feyi,  
Dawveed Schully

h. HVAC System  
Sarah Althoff  
Jaimi Stroot  
Amanda Stenson,

i. Landscaping  
Dawveed Schully,  
Aduroja Feyi,  
Joe Parker,  
Fransisca Dewi,  
Anna Dlugosz  
Fabian Aguilar

j. Fire Protection System  
Jaimi Stroot  
Sarah Olson  
Curtis Aubry

k. Security System  
Craig Forneris  
Joe Parker,  
Chris Antonio

D. Sub Team Leaders  
a. Architecture – Lucas  
b. Structural Analysis and Design – Helen  
c. Foundation Design – Trent  
d. Plumbing – Jaimi  
e. Electrical and Communication Systems – Curtis  
f. Building Energy Sources – Craig  
g. Building Envelope – Anna  
h. HVAC – Sarah A.  
i. Landscaping – Dawveed  
j. Fire Protection – Sarah O.  
k. Security Systems – Joe
8.0 **Designation of Roles**

A. Minute taker – Amanda Stenson and Sarah Altoff  
B. Agenda Maker – Helen Yeung and Curtis Aubrey  
C. Time Keeper – Craig Forneris and Hon-Kyu Chong  
D. Weekly Timesheet Collector – Fabian Augilar and Kyle Cantone  
E. Master Schedule Maker – Amanda Stenson and Anna Dlugosz  
F. iGroups – Ryan Freund and Chris Chock