IPRO 335

GREEN BUILDING DESIGN CONCEPT & INTEGRATION

PROJECT PLAN

SEPTEMBER 11TH, 2009

Team Information: UAE – United Architects and Engineers

Team Member	Major	Contact Information
Aris Avanessian	Architectural Engineering	aavaness@iit.edu
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Ali Razeq	Civil Engineering	arazeq@iit.edu
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Instructors: Jeff Budiman, Jiehua Shen, Jamshid Mohammadi

- **Aris Avanessian:** As an architectural engineering major, Aris brings to the table much knowledge of design of buildings with regards to heating and cooling. His skills in CAD, REVIT, and architectural engineering design will be a big part of his contribution. He expects to design an adequate green building in this IPRO with effective communication being his main concern and need.
- **Justine Banda:** Part of a large group of architects in this IPRO, Justine has a skill set including CAD, MAX, INDESIGN, Illustrator, Photoshop, and animation. All of these will help her in her contribution to the design of the building. She hopes to learn of "Green" concepts, Solar Heat Collection in particular, during this project. Consistent communication will be important to her as there are many architects working together.
- **Joshua Bergerson:** Our other architectural engineering major, Joshua, is a good communicator with IPRO experience that enjoys working in a team setting. He has much knowledge and interest of the design and analysis of "Green" concepts, as related to his major. Joshua expects to develop inter-departmental corporation on a full scale design project, ranging from conception to final design.
- **Jeffrey Burke:** An architect major intent on being part of a successful "Green" project this semester, Jeffrey has skills in CAD and REVIT which will help the project completion. Jeffrey will be working with the other architects in the main design and needs to stay focused on working intently with the group. He expects this project to be a success in many terms, particularly the architectural design.

- **Robert Christo:** Another architect, Robert also possesses skills in CAD, MAX, REVIT, Photoshop, as well as Sketch-up. Robert hopes to get a good experience in working with engineers in order to achieve a particular goal, in this case a "Green" building. Communication and collaboration are his main concerns, and he expects a realistic completed design.
- **Eric Dexter:** Eric is another architect with skills in CAD, REVIT, MAX, and Photoshop. His experience in building design, layout, and presentation of building material will prove to be a major part of this project's design aspects. Eric hopes to work well with the team in order to broaden his experience in group projects, as he expects to overcome obstacles set forth by a large scale semester long project.
- **Kibum Kim:** Another member of the architecture team is Kibum. He possesses skills in modeling, CAD, MAX, and Photoshop. These skills will be helpful in the design process. Kibum hopes to gain knowledge of reusable water and brown water in this IPRO. He expects to have a good experience working as a team to accomplish a main goal.
- **Andrew Mey:** One of three civil engineers on the project, Andrew has a more broad range of skills. Among those are many civil, structural, construction, transportation, and design aspects which will contribute to different sectors of the project at different times. Andrew would like to be challenged in different aspects during the project, and expects to gain valuable knowledge and skills in project managing and team work.
- **Jonathon Okunaga:** Another civil engineer, Jonathon possesses exceptional skills mainly in design, analysis, and working in an IPRO setting. One of Jonathon's main needs during this project is to develop interdepartmental communication skills. He expects the semester long project to provide those skills and experience in "Green" concepts.
- **Ali Razeq:** A civil engineering major, Ali possess a variety of skills including structural design and analysis concepts, project management knowledge and experience, construction management and construction processes. These skills will contribute to a particular aspect of the project. Ali needs to be challenged in order to put all of his skills to work consistently, and expects a successful and implementable design to be completed at project's end.
- **Jacqueline Schaefer:** An architect, Jacqueline has skills in CAD, MAX, Photoshop, Illustrator, Sketch-up, and PowerPoint. She hopes these skills will contribute to the thorough design of the project, as her main need is to create a professional level project. She expects to learn many "Green" concepts and the project to be feasible.
- **Adrain Thover Leon:** Adrian is an architect with skills in CAD, Photoshop, and is a good communicator. He hopes his Spanish culture brings a different perspective to the design team. Adrian expects to develop interdepartmental cooperation and look into new materials.
- **Hye Um:** As an architect, Hye possesses CAD, MAX, and Photoshop skills. One of Hye's needs is to communicate efficiently and stay involved in many aspects of the development in order to gain valuable experience in larger scale projects. Hye expects successful completion of a feasible "Green" building.

Team Purpose:

Green Building design is becoming a vast topic in today's world. As times change, and energy sources become limited and more expensive, we need to find more ways to conserve energy. This IPRO's main goal is to research these alternative energy sources, methods, and uses; then implement them into a feasible design of our own.

Team Objective:

The objective of this semester's project is to design a five story commercial mixed-use building. The building will contain retail stores on the first level, and office spaces on the remaining upper levels. The total foot print area is about 60000 square feet. The building will be constructed with prefabricated columns, beams, floors, and wall panels. The design will apply concepts related to green design, energy sustainability, smart building concepts, health issues, and safety considerations. It is our intention to develop an architecturally feasible building schematic which incorporates energy saving features. Using this schematic, we will implement our research and design the building using as many of the green concepts that are available and functional with respect to our site, schematic, and concept knowledge. It is our goal to have a LEED certified building with a Platinum rating when the project is completed. Finally, we will provide a building cost estimate and an estimate of the energy saved, as well as potential money saved through our design.

Background:

Green building applies many aspects of sustainable development into construction. By doing so, efficiency of energy and resources are increased; this decreases the overall impact the project has on humans, health, and the environment. There are a few main aspects that can be managed with the use of green building concepts in mind. A few of these are design, construction, operation, maintenance, and waste removal/disposal. Green building can reduce operating costs by increasing productivity and using less water or energy, improve health by improving indoor air quality, as well as reduce environmental impacts. Briefly, these concepts will be discussed in order to establish a better understanding.

The design of a building can be incorporate green concepts in a few ways. One way is to incorporate sunlight into different lighting features of the building. By utilizing the sunlight, the building can reduce the amount of energy used in lighting sources. Another design aspect that is commonly used is the implementation of high-efficiency windows, and insulation in walls, ceilings, and floors. On a larger scale, the implementation of natural sources of energy into functions of a building plays a major role in the design of a green building. Sources such as geothermal heat, wind, and solar power can all be included in the design in order to achieve efficient energy usage.

Following the design, construction can be performed in a manner so that energy is conserved. Environmentally friendly materials can be used, as well as use of materials from local sources so as to minimize energy used in transportation.

The main use of green building application is likely to be in the operation of a building. These applications are more geared to long term energy contribution, benefits, and sustainability. Some examples of these include passive solar building design, capitalized natural ventilation, heat recovery ventilation systems, fluorescent lighting, and highly efficient appliances. All of these methods of saving energy will benefit the building in a long term sense.

Maintenance of a building is important to ensure sustainability and profitability of the building. Maintenance of a green building, however, is much less expensive than that of other buildings. Even though the initial costs of a green building are more, the overall savings in maintenance exceeds that of other buildings. For example, maintenance of furnaces, air conditioners, and lighting systems will not be of a high magnitude in comparison to other buildings; this is a major benefit.

Today, green building is being used constantly in new structures. It essentially has only positive impacts on energy saving, health, and environmental impact. In this particular green building, many methods and sources of energy will be utilized to achieve a desired green building status. Some of these sources will include geothermal energy for heating and cooling, solar energy and wind energy for power and lighting, and water re-usage. As more research is performed, the design and usage of each aspect will be more detailed and specific towards certain applications of the building itself. Each of the intended energy sources have been used successfully in past applications. Most of the design will implement already proven and used methods.

Note: There is no provided sponsor for IPRO 335.

Team Values Statement

All team members are expected to:

- ✓ Treat all team members and instructors with respect.
- ✓ Be on time for meetings.
- ✓ Be prepared for meetings.
- ✓ Actively participate in meetings.
- ✓ Complete tasks in a timely manner and by due dates.

All team members will perform tasks in the following manner:

- ✓ Use iGroups to communicate and update resources and completed tasks.
- ✓ Incorporate the entire team in decision making.
- ✓ Effectively present progress or completed work during meetings.

Those who fail to follow the outlined expectations will be addressed as stated:

- ✓ Team/individual discussion with faculty advisor regarding departure from expected actions.
- ✓ Large group discussion regarding reasons for indiscretion.
- ✓ Reassignment of tasks for individual or team.

Project Methodology

A. How will the team complete the project?

To begin, the team is divided into groups of two members. Each team will research and develop designs and schematics for different green building energy sources or methods; these include but are not limited to: geothermal, solar, wind, and water. Following this, the team will begin to implement these developments into the designs of the building. The architects will create a design that is both suitable and feasible for our green methods. Within this design, the engineers will incorporate their findings and calculations in order to maximize the potential green building features. Each source of energy or method of green building used will be tested through calculation and research. Other small features of the project will be distributed evenly amongst team members in order to collaborate between architects and engineers fairly. The project will require great concentration on team work and communication, particularly between the engineer/architect segregation in order to achieve the required result. It is reasonable to believe that all of these major tasks and requirements will be met in the allotted time frame.

B. Team Structure:

1. Groups: Two main sub-groups are formed within the team.

Architects	Engineers
Eric Dexter	Aris Avanessian
Adrian Thovar Leon	Andrew Mey
Jacqueline Schaefer	Jonathon Okunaga
Justine Banda	Ali Razeq
Kibum Kim	Joshua Bergerson
Hye Um	
Jeffrey Burke	
Robert Christo	

Note: We have not assigned any traditional group leaders, as each task is in the preliminary stage at best. However, it should also be noted that this project will not have well defined leaders for some tasks, as these tasks require great amounts of collaboration and team work between not only the engineers and architects, but between the each architect and each engineer.

2. Preliminary Research Groups: Pairs of team members formed to do research on energy sources.

Team Members	Topic of Research
Ali Razeq & Eric Dexter	Geothermal Systems (Application and Design)
Aris Avanessian, Andrew Mey, & Adrian Leon	Wind Turbines
Jacqueline Schaefer & Justine Banda	Solar Heat Collection
Kibum Kim & Hye Um	Reusing Rain and Brown Water
Jon Okunaga & Joshua Bergerson	Energy Storage
Jeffrey Burke and Robert Christo	Passive Energy Systems

3. Major Tasks: As required by the IPRO Course Description

Project Task	Assigned Sub-Group
Site Selection and Layout	Architects
Building Architecture/Designs	Architects
Detail Drawings	Architects
Selection of Type of Structure (steel or concrete)	Both
Green Building concepts	Both
Structural Analysis & Structural Design	Both
Building Comfort (Heating/Cooling)	Engineers
Electrical System	Engineers
Lighting System	Engineers
Acoustics	Engineers
Estimate of Building Cost	Engineers

Note: Leaders and sub-group team members will be assigned in the upcoming weeks if necessary.

Most tasks have yet to be specifically assigned. As a brief overview; Architects will handle main drawings, architectural schematics, and models. The civil engineers will mainly handle the structural aspects of the building, while the architectural engineers provide the electrical, heating/cooling, lighting and acoustics aspects. The green concepts will be handled by everyone on the team as it is the main requirement of this IPRO. It is likely that the civil engineers will provide the building cost estimate, while the architects and architectural engineers estimate the energy saved and money saved through the building design.

C. Work Breakdown Structure

Task	Start Date	End Date	Team Members Needed	Hours Needed
Research of Alternative Energy Sources	9/1	9/10	13	10
Site Selection & Layout	9/8	9/15	8	10
Detail Drawings	9/8	10/4	8	150
PROJECT PLAN	9/8	9/10	1	10
Selection of Structure Type	9/10	9/17	13	10
Green Building Concept Implementation	9/10	10/4	13	100
Building Comfort	9/21	10/4	3	20
Midterm Review Presentation	9/22	10/5	3	10
Electrical System	10/10	11/10	3	20
Lighting System	10/10	11/10	3	20
Ethics Reflective Report	10/10	11/11	2	5
Acoustics	10/10	11/12	3	20
Estimate of Building Cost	10/15	11/12	5	50
Final Project Report [Draft]	11/10	11/20	2	10
IPRO Day Abstract/Brochure	11/17	11/30	2	5
IPRO Day Poster	11/17	11/30	2	5
IPRO Day Final Presentation	11/17	12/2	2	10
Final Project Report [Final]	11/19	12/4	2	10
TOTAL				475

Note: All dates and members/hours needed are tentative and subject to change; Items in **BOLD** are IPRO deliverables.

Expected Results

By the end of the semester, IPRO 335 hopes to have completed a feasible design of a five story commercial mixed-use building. Through intense research, detailed and articulate design, and ideological thinking, it is our intention to have a Platinum rating LEED certified building. The architects are expected to design a building capable of utilizing natural resources, such as sunlight, while creating an elegant original appearance. The engineers are expected to work with the architects in order to properly incorporate design specifications, whether they are structural, energy-related, or environmentally permitted. The architects will provide detailed drawings that comply with LEED building codes, while the engineers will design the systems, mathematically and functionally, to be constructed, which are LEED certified as well. Each of these design details and calculations will help demonstrate the buildings function-ability as a green building. It is expected that our presentation will demonstrate the effect that designing a green building can have on energy saving, sustainability, and the environmental aspects. We hope to provide an example for green building projects in the future.

Project Budget

Item	Amount (Dollars)
Printing (Drawings, Posters, etc.)	250.00
Project Field Trips	200.00
Team Building Pizza Party	200.00
Total	650.00

Note: Each amount is tentative may be an overestimation.

As this is a design IPRO, there will a significant amount of drawings, design sketches, analysis, and models which will need to be printed on a large scale. This is all included in the budget amount for printing. Also, as part of the research being done, a field trip has been planned by the instructors to visit a manufacturer of some of the structural members being used; this is to help us understand the type of design we can use and implement throughout the semester. At this time, the method of transportation, food, and other expenses for the trip are unknown, so the amount budgeted may also be skewed. The team building session will be, as suggested by the IPRO office, a Pizza Party. This IPRO is rather large with thirteen members and three instructors, justifying the amount of money budgeted.

Role Designation

Teamwork is an important part of the process required to achieve our final goal. The necessary skills needed to become a leader for a project in the future will be learned during the various tasks assigned in this IPRO.

- The minute taker will record decisions and assignments on a meeting to meeting basis. Since there are not several small tasks, rather a few large ones, this role is not very demanding. In the early stages of the project, we have chosen Aris Avanessian to fulfill this role. However, this role may change throughout the semester in order to distribute work load and responsibility.
- The time keeper role will be assumed by the agenda maker. The agenda maker, at this point, has been the instructor. However, there will most likely be two agenda makers; one for the architects and one for the engineers. Early on, Aris Avanessian and Ali Razeq have assumed roles in making the agendas and keeping track of the meetings. As the project progresses, different people will fulfill these roles in order to maintain balance and stability between what is necessary of the project requirements, and what is due.
- Ali Razeq will be the iGroups moderator. In this role, the team's files and deliverables will be organized.