



## COLLEGE OF ENGINEERING & TECHNOLOGY

Department: **Architectural Engineering & Environmental Design**  
Lecturer: **Dr. Yasser Moustafa and Dr. Sherif Ezzeldin**  
Course: **AR362: Environmental Studies 1**  
Semester: **Spring 2014**

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### **Term's Project:** **Ecological Design Development** **of AASTMT Building (B)**

Based on the course content and the attached photo/drawings, you are asked to improve the design of Building (B) in order to save more energy demand while providing better indoor environmental quality. Through your design you should attempt to achieve **better control of solar radiation, heat transfer, air movement, air humidity, light quality and energy generation** by relying on strategies related to:



- Building Form
- Building Orientation
- Roof and Walls' treatments
- Openings' treatments (including the design of shading devices)

#### **Part One: Ecological Assessment of the existing building design:** (W10)

You are asked to assess the existing building design in terms of building form, orientation, roof, façade and opening treatments. The analysis of the building performance could be determined by several walk-throughs across different spaces at different periods of the day in addition to visualizing the performance of a physical model of the building (Scale 1:200) at different periods/seasons on the Heliodon. The performance of the protruded window sides that shade partly the windows has also to be determined.

You are asked to capture some good values that we need to keep as well as to highlight on challenges and potential opportunities that will orient our design development process. Use annotated drawings, diagrams and photos to clarify your statements and present your assessment on A3-format sheets.

#### **Part Two: Research on environmental strategies applied in educational buildings:** (W10)

You are asked to analyze 2-3 precedents of sustainable architecture among various educational buildings (Libraries, schools, universities...). Use annotated drawings and diagrams to clarify the strategies used in each of these buildings to control of solar radiation, heat transfer between indoor and outdoor, air movement and natural ventilation, air humidity, light quality and daylight opportunities, and energy generation.

Present your research analysis on A3-format poster(s) (one sheet per building).

#### **Part Three: Ecological design development:** (W12)

##### **a) Overall Design Development (Half-Board 50x70 or 60x80)**

Based on the lessons learnt from your precedents and based on your assessment of the existing building design, you are to modify/develop the existing design of Building (B) in

order to save more energy demand while providing better indoor environmental quality. The design development will involve refinements to building form and orientation, roof and façade treatments, openings treatments in addition to some environmental features to achieve:

- Appropriate control of indoor air temperature and air humidity
- Appropriate natural ventilation of indoor spaces
- Appropriate natural lighting for the indoor environment

You might also consider in your design the generation and use of clean renewable energy.

### **b) Design of Shading Devices (A4-Format)**

Using the shading calculator and the solar path chart for 30°N latitude, optimize designs for the following shading devices:

1. A horizontal and a combined shading device for the office's south-facing windows.
2. A vertical and a combined shading device for the typical classrooms' east-facing or west-facing windows.

#### **For each window, your submission is to include:**

1. A plan and a section drawn to scale with dimensions for the optimized horizontal or vertical shading device.
2. The 100% and 50% shading lines on the solar path chart for the optimized horizontal or vertical shading device.
3. A plan and a section drawn to scale with dimensions for the optimized combined shading device.
4. The 100% and 50% shading lines on the solar path chart for the optimized combined shading device.
5. A discussion on the effectiveness of the two shading device designs determining which you find to be more effective.

### **c) Presentation of the Ecological Design Development (Half-Board 50x70 or 60x80)**

Your submission should include a statement of objectives, brief written explanations of the strategies used, and a clear presentation of your design and the strategies used through:

1. Plan of typical floor (1/200)
2. North elevation (1/200)
3. South elevation (1/200)
4. East or west elevation (1/200)
5. North-south section A-A (1/100)
6. Digital Model of the updated design
7. Details at appropriate scale to clarify strategies used
8. Annotations on all drawings to indicate and explain the strategies used
9. Supporting Photos.

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*Best Wishes,*