PROJECT 7: INTERLINKED

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STRUCTURE

• ’fundamental, tangible or intangible notion referring to the recognition, observation, nature, and permanence of patterns and relationships of entities’

-wikipedia..
In engineering and architecture, a structure is a body or assemblage of bodies in space to form a system capable of supporting loads.

Example: buildings, aircraft, soap films, skeletons, anthills, beaver dams and salt domes are all examples of physical structures.
STRUCTURE

• The effects of loads on physical structures are determined through structural analysis. Structural engineering refers to engineering of physical structures.

• Built structures are a subset of physical structures resulting from construction. These are divided into buildings and non-building structures, and make up the infrastructure of a human society.
TYPES OF STRUCTURE

• Structures include:
  - buildings
    (occupied—habitable)
  - nonbuilding structures
    (non-occupied—non-habitable).

• Examples of building structures include: houses, town halls, libraries, and skyscrapers.

• Examples of nonbuilding structures include: bridges, monuments and memorials, dams, windmills, lookout towers etc.
EXAMPLES

(some remarkable recent building structures inspired by nature)
DYNAMIC TOWER, Dubai

The world’s first moving building, a skyscraper with 80 independently rotating floors for the residents to enjoy different view as well as in-house parking, indoor swimming pools and voice controlled systems.
BUILDING STRUCTURES

WIN AND WATER BAR, VIETNAM
Architectural model planned for the flood prone areas in Vietnam. This will help the people to build temporary shelters, houses and classrooms with low cost materials with speedy construction and ease of transport. The structure utilizes bamboo whereas the covering is made from leaves that are highly resistant to fire.
BUILDING STRUCTURES

WNW bar is a structural bamboo arch system. Materials using for the roof covering are the sheets that made from the leaves having the high resistance in fire. Bamboo trees are popularly grown in many places in Vietnam.
The design of this massive structure also incorporates solar energy utilization, wind turbines, water recycling system along with the inclusion of natural vegetation to deal with the various energy requirements.
BUILDING STRUCTURES

BASQUE HEALTH DEPARTMENT HEADQUARTERS IN BILBAO, SPAIN.
It includes seven open plan floors for offices and two levels for institutional and representative uses. It also has meeting rooms, auditory and services room and even three floors for parking. The different faces of the building provide different views of the surrounding city.
It has been planned such to let the students enjoy nature along with their studies and even have an exercise routine in climbing up the stairs while changing classes. The beauty of the project lies in the fact that the individual roof tops are covered by lush green grass which when viewed from far seem to blend with the landscape.
BUILDING STRUCTURES

METROPOL PARASOL (BILBAO, SPAIN)
- will be use as museum and community center. Restaurant, museum, plaza and farmers market will be founded at this wooden building.
- With concrete base and wooden structure, this wooden parasol is able to offer innovative design of wooden building.
BUILDING STRUCTURES

ANNUR JAMEK MOSQUE, LABUAN
(inspired by aerospace design)
The wheel has an overall diameter of 35 metres (115 ft) and consists of two opposing arms which extend 15 metres beyond the central axle and take the shape of a Celtic-inspired, double-headed axe. Two sets of these axe-shaped arms are attached about 35 metres (115 ft) apart to a 3.5 metres (11 ft) diameter axle. Two diametrically opposed water-filled caissons, each with a capacity of 80,000 imperial gallons (360,000 l; 96,000 US gal), are fitted between the ends of the arms.
NONBUILDING STRUCTURES
NONBUILDING STRUCTURES

GENTING SKYWAY, GENTING HIGHLAND,
NONBUILDING STRUCTURES

PENANG BRIDGE

PENANG 2ND BRIDGE
IMPORTANCE OF STRUCTURAL KNOWLEDGE

- The primary goal of a structural design is to design a structure, regardless of the type, that’s built with solid integrity, with a great amount of care paid to dependability and safety of the structure.

- The importance of structural knowledge:
  - Safety
  - Durability
  - Strength
  - Cost
  - Duration of construction
  - Access to material
  - Sustainability, environmentally friendly etc...
1993 - Highland Tower (Malaysia)

Failure due to improper piping system due to new development projects – Bukit Antarabangsa. The land in the area exposed to water absorption that cause land slide. It was later found that the contractor reduced the depth of piling. Casualties: 48.
1986: Singapore - New World Hotel Collapse

On 15 March 1986, the building rapidly disintegrated in less than a minute, leaving little time for anyone within it to make their escape. It is believed that the structural engineer did not calculate the dead load (load of the building itself) thus cause the failure. Casualties: 33.
1995: Sampoong Department Store, Korea

In less than 20 seconds, a section of the five-story building came crashing down into the basement, killing over 500 people. The building had a number of structural modifications during its lifetime which contributed to the collapse. It was originally designed as an office building with four floors, and constructed in 1987. When it was later converted to a department store (with additional fifth floor to house a restaurant), support columns were cut away to accommodate escalators.
Casualties: 500
Initially, the side of the building that failed was designed to be a two story structure, while the other side was designed to be three stories. Late in the construction process, it was decided that both sides of the building should be equal heights, and a third story was added to the shorter side. Unfortunately, the live load due to occupancy is typically much greater than the design load for a roof. As a result, the structure supporting the new third story was subjected to much greater loading than was originally anticipated. Casualties: 23 deaths, 380 injured.
PROJECT 7: INTERLINKED
Issued by: Dr. Norhidayah Md. Ulang
PROJECT 7A: ANALYSIS OF HBP SPACES

- Analyse the ‘HBP SITE’ with all its existing buildings and surrounding
- The site analysis should consist of:
  - Location (Key Plan, Location Plan & Site Plan – not to scale)
  - Sun Orientation and Prevailing Wind
  - Vegetation and Views
  - Circulation (Vehicular & Pedestrian)
- All of these analyses should be drawn graphically on one HBP Site Plan (A3 size). Photos/sketches can be added next to the ‘Analysed Site Plan’ to show the interesting or important parts of the site.
- All of the Key Plan, Location Plan, Analysed Site Plan and Photos/Sketches should be composed in one A2 size cartridge paper (on board)
- Medium: Pen Ink, Pencil Colour/Watercolour/Marker & Photos)
Goal of site analysis

• To achieve a successful design, site analysis is a must & should be done carefully

• Site Analysis involves taking an inventory of site elements and analyzing these factors relative to the clients needs & aims

• Gather relevant information about the properties of the site, from topography to climate to wind pattern and vegetation

• Analyze these features and incorporate them into the design
Example Site Condition:
Example...
Example of Site Analysis (on ‘one Site Plan’ drawing)
Example of Site Analysis (on ‘one Site Plan’ drawing)
Example of Site Analysis (on ‘one Site Plan’ drawing)
Example of Site Analysis (on ‘one Site Plan’ drawing)
Based on your site analysis (best view, circulation, vegetation etc), determine the most suitable HBP buildings to be linked by HBP Skyway (that can protect us from the rain), either:

i) Interlink 1: HBP Main Office (E49) and Resource Centre (E40)

or

ii) Interlink 2: Lecture Hall (E48) and Studio Building (E08)

Then, design an outstanding structure (and façade) of the skyway that can be a ‘landmark’ by itself

Draw the presentation drawings of the skyway in one A2 size cartridge papers (on board), which consists of Plan, Front Elevation, Rear Elevation and Side Elevations in 1:75 scale.

Medium: Pen Ink and Pencil Colour/Watercolour/Marker
Lecture Hall (E48) and Studio Building (E08) (Distance Assumption: 18 meters), (could be a ‘curved skyway’)

For both INTERLINKS, a ‘skyway’ is to be constructed to connect 1st floor (3.5m from ground level) of both buildings

HBP Main Office (E49) and Resource Centre (E40) (Distance Assumption: 18 meters)
PEDESTRIAN BRIDGE/SKYWAY

• A **footbridge** or **pedestrian bridge** is a bridge designed for pedestrians and in some cases cyclists, animal traffic and horse riders, rather than vehicular traffic.

• Footbridges complement the landscape and can be used decoratively to visually link two distinct areas or to signal a transaction.

• In many developed countries, footbridges are both functional and can be beautiful works of art and sculpture.
• For poor rural communities in the developing world, a footbridge may be a community's only access to medical clinics, schools and markets, which would otherwise be unreachable when rivers are too high to cross.

• Simple suspension bridge designs have been developed to be sustainable and easily constructible in such rural areas using only local materials and labor.
• An enclosed footbridge between two buildings is sometimes known as a **skyway**. Bridges providing for both pedestrians and cyclists are often referred to as greenbridges and form an important part of sustainable transport movement towards more sustainable cities.
• Footbridges are often situated to allow pedestrians to cross water or railways in areas where there are no nearby roads to necessitate a road bridge.

• They are also located across roads to let pedestrians cross safely without slowing down the traffic.

• The latter is a type of pedestrian separation structure, examples of which are particularly found near schools, to help prevent children running in front of moving cars.
BRIDGE OF ASPIRATION, LONDON
The continuous curve and gradual ramp of the crescent bridge allows common access for all users. The alignment of the elliptical deck on the axis of the upstream section of the river offers varied and unusual views whilst allowing headroom below the bridge for river traffic.
PEACE BRIDGE, USA
PEDESTRIAN BRIDGE, RHODE ISLAND
PEDESTRIAN CIRCLE BRIDGE, MELBOURNE
SURF AVENUE BRIDGE, BROOKLYN
PROPOSED ‘FUTURISTIC’ STEEL AND GLASS BRIDGE
HELIX BRIDGE, MARINA BAY, SINGAPORE (inspired from DNA shape)
Based on the design and dimensions of your HBP Skyway (Project 7B), build its **STRUCTURAL MODEL** in 1:50 scale.

- **Medium:**
  - **Model Base:** A3 Size Hardboard or Plywood
  - **Structural Model:** Cardboard / Perspex / or Balsa Wood (relatively expensive)

For all the 3 Projects (7A, 7B & 7C), you will work **in group of 6** (subgroup of your current group) – the group will be decided by Group Coordinator

- **Project Issued:** 22 October 2012 (Monday)
- **Project Submission:** 9.00am, **5 November 2012** (Monday) *(to your Group Coordinator) at DKE48A*
Examples of Structural Model *(various materials)*
ANY QUESTION?