

## B(Eng) Hons Civil Engineering

### Engineering Design Project

#### Student Project Brief

Revision 01

2020/21

<b>Unit Name</b>	<b>Engineering Design Project</b>
<b>Unit Code</b>	tbc
<b>Level</b>	FHEQ 6
<b>Credit Value</b>	15
<b>Location(s) of Delivery</b>	STI Myanmar University (Yangon and Mandalay campus)
<b>Period(s) of delivery</b>	Semester 1
<b>Marks</b>	100% coursework
<b>AHEP 3 IEng Learning Outcomes</b>	D1i, D2i, D3i, D4i, D6, EL1, EL6i, P6i, P11i, G1, G4i
<b>JBM Core Threads</b>	Design, Sustainability, Health and Safety Risk Management, Professionalism and Ethics
<b>Unit co-ordinator</b>	Dr Nyein Zin Latt

### 1.0 INTRODUCTION

The Executive Management Board of STI Myanmar University has approached you to assist them to develop the Main Flagship Center of the new STI Myanmar University development, Dagon Seik Kan Campus. Your services will be required from the earliest stage:

An 11-acre prime site in Yangon has been purchased by the client, a leading provider of private education in Myanmar. A multiple-phase, mixed-use development is planned, to include a student village, staff housing, retail shops, 4-star hotel, 100 bedded hospital, teaching and learning building, recreation areas, sports facilities, swimming pool, restaurants, auditoriums, Harvard style lecture theatre halls, and library.

The first phase of the project is to construct an 8,000 m<sup>2</sup> four storey main Flagship Center. The client wishes to maximise the potential of natural light, open space and stunning views available from the site.

This document introduces the design challenge and the way in which the brief will be administered. Reference must be made to other documents to fully understand the way that the unit will run, and to the BREO VLE site for all detailed documents, including client brief, site plans, planning guidance, geotechnical report, survey drawings. See the Unit Guide, the Unit Assessment Brief and the individual Unit Task Sheets that will be supplied to you during the semester.

There will be four stages to this project, corresponding with the design stages 0-3 of the RIBA Plan of Work:

- Stage 1 (20%) – Masterplan: strategic direction, preparation and brief including design scheme, engineering proposals and feasibility analysis
- Stage 2 (20%) – Conceptual Scheme Design
- Stage 3 (40%) - Developed Design
- Stage 4 (20%) – Group Visual Presentation

## 2.0 DETAILS OF THE PROJECT

The focus of this unit is the development of the main Flagship Center of the new development of STI MU at Dagon Seik Kan Township, Yangon. The Executive Management Board of the STI has worked on the University's strategy and 20-year road map plan. It has determined to establish a new big campus facilitating a student base of several thousands comprising international students and locals from all the States and Divisions of Myanmar.

This brief and all the accompanying information are provided for the unit as an exercise only. The data provided in this site brief is real and should be used only to gain information on the site. The design of the existing site and master-plan should be ignored for the purposes of the unit; this brief may contradict existing planning permissions and teams are asked to redesign the actual scheme accordingly. It is important that you produce new ideas and schemes for your designs and do not copy the actual plans for the Dagon Seik Kan Campus.

The scheme requires the generation of new master-plan designs based on the requirements of the brief.

### Basis for Design and Materials

The entire works should be designed in accordance with the requirements of the current Myanmar National Building Code and Guidelines. You may also make reference to Eurocodes. You are free to use additional materials you consider adequate.

The client is committed to reduce the carbon footprint of the development to a minimum, optimising the use of heating, cooling, mechanical ventilation etc. There is also a strong interest towards the use of smart materials and the generation of energy. The development must set an example of efficiency from construction and during its operational life, proving that this building is future ready. It must show the client as a leader in innovation and it must be beautiful.

### The site

Site address: Main road of Min Ye Kaung Pon Street, Dagon Seik Kan Township, Yangon.

Dropped pin

Near Dagon Seikkan Township, Yangon

<https://maps.app.goo.gl/tVfKUs87pioNgbst7>

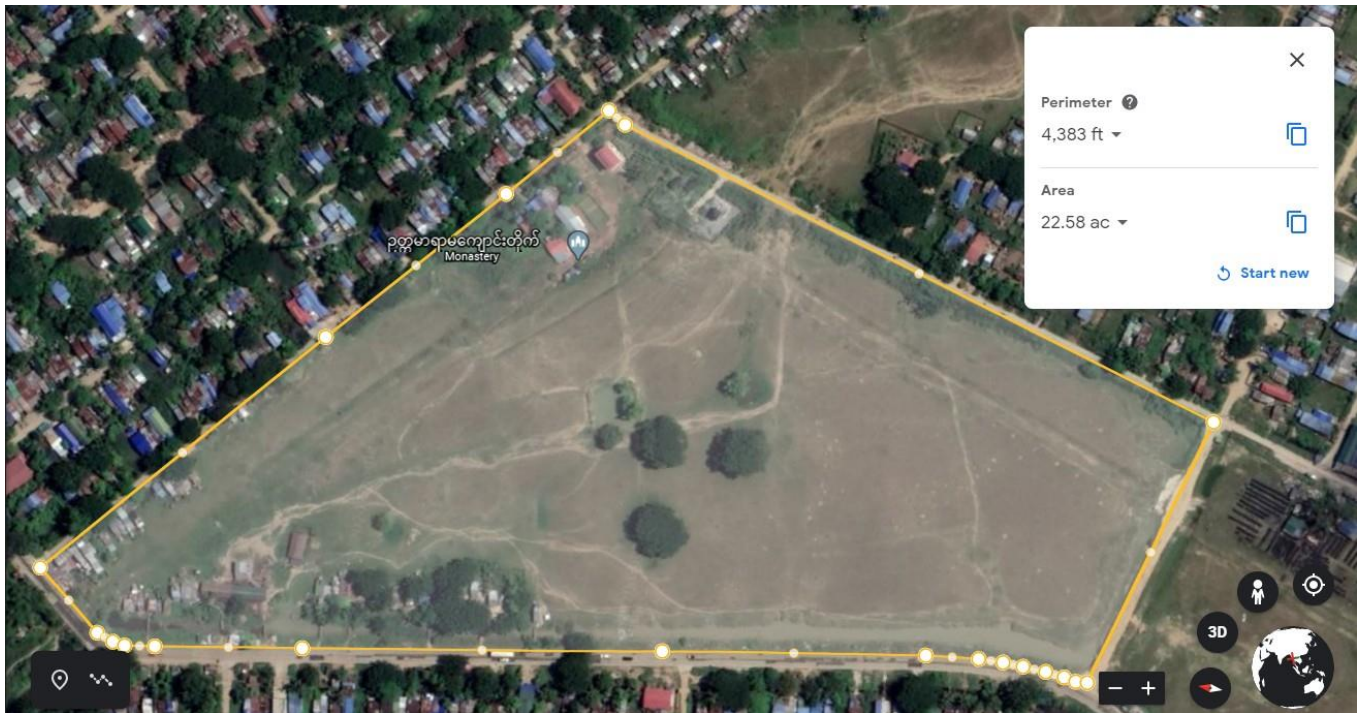


Figure 1 – Topographical view of the site (source: Google)

### Client Requirements

- A sustainable masterplan for a new mixed-use development in Yangon, providing the best environmental quality for its users
- Maximize natural light and open space
- Requirement for some area/s of green spaces
- Minimize impact on residents in local area

### Minimum Area Requirements

- 4,000 m<sup>2</sup> - teaching / learning classrooms
- 1,000 m<sup>2</sup> - auditorium
- 2,000 m<sup>2</sup> - office, reception, open area, retail, recreation, labs, catering facility

### Architecture

- 4 storeys
- 8,000 m<sup>2</sup> total floor area
- Double height entrance foyer
- Services area

### Environmental

BREEAM – Aim at Outstanding, minimum acceptable Excellent

### Residents

Identify local residents/businesses in the surrounding area

## 3.0 DESIGN STAGES

### Stage 1 – Masterplan (20%)

Attend the first project meeting with the client. The client will explain their needs (financial, architectural, environmental, etc.), and the planning conditions requested by the Yangon City Council. You will be asked to develop a conceptual Masterplan of the site and present it as a series of sketches and drawings. This will include an assessment of usable floor area, structural proposals and construction methods or systems to make the scheme viable.

You should consider (but not limited to):

1. Engineering impact: an assessment of usable floor area, structural proposals, construction methods or systems to make the scheme viable, location of the building, future proof concept, sustainability, fire, landscaping, existing infrastructure and underground services, etc.
2. Social impact: a consideration of heritage and conservation of the area, architectural impact and how the proposed building will impact on the community, line of sight, comfort of pedestrians, long-term transportation and affordability, etc.

You are asked to prepare a 20-year road map-plan' making a recommendation to your client (Executive Management Board of STI Myanmar University). You should include your reasoning and analysis on the notes above and any other relevant information you wish to include.

The road map plan will include a series of sketches and drawings. This will include assessment of useable floor area, structural proposals and construction methods or systems to make the scheme viable. The client wants you to focus mainly on the multidisciplinary engineering and social impact.

Present your vision, highlighting any innovative elements that you have chosen to incorporate into the development, and explaining any other strategies you may have used to design the distribution of the overall accommodation across the site.

Show the links between the new development, the existing building(s), surrounding landscape, and the urban areas beyond. This should include visual and physical links. Provide a statement of the sustainability of your proposal and any unique initiatives that are proposed in your road map plan. Develop an outline financial projection for your scheme, indicating projected returns on the various proposed uses. Outline how the project will be delivered from design to operation; provide a master program which is phased to cover the design, construction and use of your proposed scheme.

#### Submission

Your submission will be:

- A group report submission, 2 pages of single sided A1 poster to be submitted electronically on BREO.

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Deadline of Stage 1 submission	week 4
Poster Group Presentation	week 5

Deliverables		
Develop a <b>conceptual road map plan</b> with a complement of sketches. The Masterplan should consist of 2 pages of single sided A1. One A1 should cover <b>engineering impact</b> and the other A1 sheet should cover the <b>social impact</b> .		
S1.1	<b>Engineering</b> shall include (but not limited to) an assessment of usable floor area, structural proposals, construction methods or systems to make the scheme viable, location of the building, future proof concept, sustainability, fire, landscaping, existing infrastructure and underground services, etc.	5 marks
S1.2	<b>Social Impact</b> shall include (but not limited to) a consideration of heritage and conservation of the area, architectural impact and how the proposed building will impact on the community, line of sight, comfort of pedestrians, long-term transportation and affordability, etc.	5 marks
S1.3	<b>Quality, graphics</b> and <b>presentation</b> on the poster. (5 minutes per group)	5 marks
S1.4	Poster presentation assessed on <b>oral presentation, clarity</b> and <b>communication</b> .	5 marks
	Total	20 marks

## Stage 2 Conceptual Scheme Design (20%)

The group is asked to develop two conceptual structural solutions for the main Flagship Center building. This will include a description of the proposed arrangements of the structural system, structural materials and preliminary sizes of the different elements; columns, slabs, walls, beams and foundations. The description must include the structural solution; diagrams of how loads are transferred to the foundations, and a demonstration of how lateral stability is maintained. All calculations must be to comply with the relevant codes and standards. The report should include a description of the proposed arrangements of the structural system, structural materials and preliminary sizes of the different elements, columns, slabs, walls, beams and foundation strategy. The description must include the structural solution; how loads are transferred to the foundations and demonstrate how lateral stability is maintained.

Your submission will be:

- A briefing document outlining your proposals and their key advantages, hand sketches and models must be included. (no more than 10 pages of A4)

Stage 2 is recommended to be completed by weeks 8.

Deliverables		
S2.1	Describe how the <b>client requirements</b> and <b>site constraints</b> that will have an <b>implication</b> on the design.	2 marks
S2.2	Develop <b>two schemes</b> , describe the scheme and provide reasoning behind the choice of the scheme. Followed by a description of the proposed arrangements of the <b>structural system</b> and <b>structural materials</b> used. At this stage, the column grid should be determined appropriately. The client will make an informed decision to select the appropriate scheme to proceed to the next stage of design.	5 marks
S2.3	Preliminary design based on design charts / tables / quick hand calculations should include design of all <b>typical structural elements</b> , such as slabs, beams, columns, etc.	5 marks
S2.4	Develop <b>foundation strategy</b> , no calculation required. It is also required to submit a sketch on the load path and to demonstrate how the loads are transferred into the foundation.	2 marks

S2.5	Demonstrate how <b>lateral stability</b> is achieved for the two schemes with the aid of sketches, calculations required.	2 marks
S2.6	Preliminary thoughts on the <b>maintenance, buildability, sustainability issues and any health and safety issues</b> relevant to the scheme selected, max. 2 pages.	2 marks
S2.7	<b>Sketches</b> to compliment the two conceptual design schemes.	2 marks
	Total	20 marks

### Stage 3 Developed Design (40%)

The client will choose one of the two proposed schemes and you will be asked to develop a structural solution for this scheme. You will be asked to prepare a detailed design report with additional requirements, from the client, which may be emerged depending on your proposed scheme It will include the design of representative parts of the structure such as critical column critical wall, critical slab and transfer elements. In addition, the report should include a schedule of loads for foundation design and an estimation of the adopted foundation scheme (raft, number of piles etc.) are also required. The dynamic response of the structure should be commented upon. The report should contain a discussion of the significance of the dynamic response (i.e. vibrations, any noise factors) and any measures incorporated in the design to manage the response. Stability and deflection must be checked in accordance with the code of practice and calculated in appropriate directions. Special attention must be paid to arrangements to resist lateral loads and provide frame stability. You will need to use software in this stage for the calculation and modelling. Submissions should contain a graphical of the construction method (stage by stage) with descriptions, highlighting any critical phases during construction

Your submission will be:

- Group report submission for combined stage 2 and 3, max 70 pages single sided A4, structural drawings must be presented to scale in either A1 or A3. All sections must be combined into one single document to be submitted online to BREO.

Deadline of Stage 3 submission                      Week 14

	Deliverables	
S3.1	A detailed description of engineering solution to satisfy the <b>additional requirements</b> from the client and discuss its implications in design and construction.	3 marks
S3.2	<b>Detailed calculations</b> should include design of <b>critical structural elements, slabs, beams, columns and any transfer structures</b> . It should also include calculations on the <b>stability system</b> of the building.	10 mars
S3.3	As part of the quality assurance (QA) process, carry out <b>Design Verification Review (DVR)</b> to review the design for quality control.	3 marks
S3.4	<b>Load-take down</b> and a <b>schedule of loads</b> for foundation design.	2 marks
S3.5	An estimation of <b>foundation scheme</b> adopts (i.e. pad sizes, raft thickness or number, size of piles). Basic calculations required.	3 marks
S3.6	A description of the <b>dynamic response</b> of the structure such as vibrations and any noise factors, it should include any measures incorporated in the design to minimize the response.	3 marks
S3.7	Appendix 1 – Weekly <b>meeting minutes</b> with actions	2 mark
S3.8	Appendix 2 – A graphical of the <b>construction method</b> and a Gantt chart <b>programme</b> (stage by stage) with descriptions, highlighting any critical phases during construction.	3 marks

S3.9	Appendix 3 – <b>Structural drawings</b> including General Arrangements (GAs), 3D views, sections, <b>detailed sections</b> to reflect the detailed design calculations. <b>Drawing register</b> needs to be submit with the drawing set and the register must be linked to the drawings.	6marks
S3.10	Appendix 4 – <b>Loading plans</b> showing the loadings used for structural design at each level.	2marks
S3.11	Overall <b>presentation</b> and referencing	3 marks
	Total	40 marks

### Stage 4 Group Visual Presentation (20%)

You will make a 15-minute group presentation on the developed design to the client and to invited members of the Industrial Advisory Board. The presentation will be followed by a 5-minute question and answer session. Presentations will be double marked and recorded for internal and external moderation. The presentation will carry 20% of the total marks. (Week 15)

Slides must be submitted before the deadline in ppt/pdf format on BREO. Attendance at the presentation is compulsory; attendance will be closely monitored, and it will affect the individual marks. Dress code: smart professional attire.

	Deliverables	
S4.1	Visibility of the designs, quality of the materials presented, justification needs to be made to demonstrate a high level of engineering solution and provide a good value of money for the client	10 marks
S4.2	Overall presentation on both visual and verbal.	5 marks
S4.3	Question and answer session	5 marks
	Total	20 marks

### 4.0 SUBMISSION

This is a group design project. You will be divided into groups of 6 members (maximum 7 members), each group should develop their own independent design. It is important that the group contains a good mixture of skills and knowledge. Each submission at each stage must include:

1. All coursework should be submitted online on BREO in pdf format, one single file to be submitted. The group must retain an additional copy of their coursework. Report to be submitted must satisfy the requirements of the project. **NOTE THAT ALL POINTS IN THE DESIGN BRIEF MUST BE ADDRESSED.**
2. For the final presentation, all groups are asked to present in front of a judging panel formed by representatives of the client, academics and experts from external experts and advisory from industries, the presentation will be marked by the judging panel.
3. Any calculations must be clearly presented with references made to the relevant clause and code of practice. Calculations can be made by hand or typed in a word processing software, All calculations must be clearly presented on A4 calculation sheets (uploaded on BREO) or your own paper format. The name of the person who produced the calculations should be marked on each calculation sheet. All calculations should be checked by a peer member of the group. Assumptions made during the calculation should be clearly stated. Calculations will be marked on accuracy, presentation and clarity of communication.
4. All drawings are structural drawings. Any drawings must be produced on A1 paper to scale in pdf. All drawings must be presented professionally with title block and legend. They can be produced either by hand or by computer software (AutoCAD, SketchUp or similar). Drawings will be marked on neatness, accuracy and information communicated.

5. Meeting minutes should be provided in the appendix. Group members must take turns to take the minutes of the weekly meeting. These minutes must include the decisions taken at the meeting with actions noting who is responsible for the noted actions. In addition to the minutes there must be a detailed description of the work that the group has completed over the past week. Each student must take the minutes of each meetings. The name of the minute taker must be noted on the minutes. These notes and minutes will be marked both individually and as a group.

### Assumptions

Teams should disregard any details of land ownerships, and/or state their assumptions in doing so.

### Site Information

A substantial amount of information (on planning and feasibility aspects of the site, services on the site and the results of investigations of the site) is uploaded to the BREO site for this unit and this information is freely available for use for this project but should not be used for any other purposes.

You should use the information provided as a basis for making any necessary assumptions and/or undertaking additional research. Groups must not contact any of the contractors or consultants or any member of the consortium currently working on the real project directly.

### Copyright

All copyright of the information remains the property of the authors. The use of real data is deliberate and intended to provide a realistic set of spatial, environmental, political and statutory constraints, which should inform development proposals. Teams are reminded that they must not UNDER ANY CIRCUMSTANCES imply to anyone that they are working on the real project.

### Acknowledgements

We thank the Executive Management Board of STI Myanmar University, for assisting us with the site for the unit this year. All copyright of the information remains the property of the authors. The use of real data is deliberate and intended to provide a realistic set of spatial, environmental, political and statutory constraints, which should inform development proposals. Teams are reminded that they must not UNDER ANY CIRCUMSTANCES imply to anyone that they are working on the real project.