L-Università ta' Malta
Faculty for the
Built Environment

# B.Sc.(Hons) in Built Environment Studies
# BEN3101 – Design Workshop
# OCC_A – Pedestrian Footbridge Project

**Unit Co-Ordinator:**
Professor Marc Bonello

**Design Mentors:**
*On a weekly basis:*
Dr Nathan Vella, Perit Carmelo Barbara, Dr Konrad Xuereb & Perit David Xuereb.

*On an ad hoc basis:*
Prof. Ing. Simon P. Borg may be consulted for any building engineering services requirements of the design project.

**Programme:**
This Design Workshop will have a 7-week duration, starting on Wednesday 25th September 2024. The Design Project Deliverables for this Design Workshop are to be submitted by Tuesday 12th November 2024. The date of the Oral Presentation and Final Design Review for this Design Workshop will be communicated in due course.

**Objective:**
The Msida Campus of the University of Malta is well-connected to the surrounding arterial roads, with Triq Dun Karm to the South, Mater Dei General Hospital to the West and Triq Reġjonali to the East. However, the North boundary of the University Campus is separated from the village of Kappara by means of the valley at Wied Għollieqa. Although there is an existing narrow rural footpath, which provides pedestrian access from the lower boundary of Car Park No.1 through the valley to the Southern boundary of Kappara, this footpath is unsafe due to its uneven surface and, at night, it is unlit (as shown in the overall site plan and the aerial site photograph obtained from the Planning Authority Map Server that are attached at the end of this design project brief).

For this reason, there is a need to provide a direct and safe access, by means of a pedestrian footbridge, from the Northern boundary of the University Campus to the Southern boundary of Kappara. However, as yet, it is unclear where the footbridge is to be located on plan, that is, where the end supports of the footbridge are to be located. Given the scientific and ecological importance of the diverse habitats within Wied Għollieqa, no construction will be allowed within the valley and, therefore, no intermediate supports may be constructed within the valley.

Therefore, it is necessary to conduct a site analysis in order to determine the existing site constraints, the location of the valley boundaries on both sides of the valley as well as the topography of the terrain. In this way, it would be possible to determine the ideal position of the pedestrian bridge, since its location and elevation above the valley floor will also determine its overall span. Apart from the end supports, intermediate supports are allowable as long as the latter supports are not located within the extents of the valley. Depending upon the elevation of the footbridge above the valley floor, it may also be necessary to provide an access staircase and passenger lift at one or both ends of the footbridge.

For this purpose, different structural materials may be considered in order to achieve a sustainable design with the lowest possible carbon footprint and environmental impact, taking into consideration the important fundamental structural design principles of sustainability, resilience, durability, structural efficiency, accessibility and amenability.

Footbridges have developed into an exciting genre in the field of bridges. Pedestrian footbridges are primarily functional structures, but they must also engage with both the pedestrian user– at close proximity – and with the site. In this case, the Site is situated across the important valley of Wied Għollieqa in Msida in between the Msida Campus of the University of Malta and the nearby village of Kappara. The issues of construction methodology, including appropriate foundations as well as the erection methodology must, therefore, be taken into account within the design process.

The act of crossing the bridge is, therefore, also an opportunity for pedestrians to experience the vistas up and down Wied Għollieqa. Bridges can become places, where the pedestrian interacts with the surroundings, or which one can exploit as a vantage point over particular views. Bridges can help pedestrians cross from one point to the other, but they can also encourage them to linger on and to stop in the middle of the space between the departure and arrival points. Pedestrian bridges must also address the issue of safe and comfortable access, and safe and comfortable passage across, at all times of the day. Protection from the inclement weather and from objects falling into the valley below, the provision of footbridge railings and artificial lighting issues must, therefore, also be carefully studied during the design stage.

Pedestrian footbridges provide an opportunity to use different building and finishing materials. Since the pedestrian experiences such materials from a much closer distance than when crossing major highway bridges, the choice of these materials, both structural and finishes, as well as the details of the junctions between these materials, become much more important design decisions. Pedestrian footbridges are, therefore, an excellent opportunity for inter-disciplinary design collaboration.

## Design Methodology:

It is intended that this Design Workshop would be an opportunity to study the holistic DESIGN PROCESS, starting from an understanding of the Site, an understanding of the functional requirements, and a survey of case studies– examples of existing pedestrian footbridges from which to learn.

**The first two weeks will be devoted to this part of the design process, which will be undertaken on the basis of group work, and which will be concluded by the First Intermediate Presentation/ Seminar to be held on Wednesday 9th October 2024. At the same time, each one of you** will **individually** develop **two alternative design concepts,** which will be explored and assessed.

**The aspects of structural stability are obviously important, and the opportunity should be taken to integrate principles of structural behaviour at the conceptual design stage.**

The **emphasis of this Project** will not be on numerical analysis work, but **on the understanding of the basic principles of structural stability and resilience**, mostly using physical and/or digital 3-D models, and approximate simple methods of analysing structural behaviour.

**Basic structural concepts of one of the two proposed alternative design concepts will be presented at the end of the fourth week, in a Second Intermediate Presentation/ Seminar to be held on Wednesday 23rd October 2024.**

**The Design Project Deliverables are to be submitted in PDF Format on BEN3101 OCC_A UM VLE online facility at the end of the seventh week on Tuesday 12th November 2024**.

**Finally, the Assessment of this Design Workshop will be carried out in a Final Oral Presentation at a date to be communicated in due course.**

## Your Design Workshop presentation should include as a minimum:

(a) At least, 1 in No. working 3-D physical and/or digital model of your final structural design concept.

(b) Not more than 2 in No. A0 sheets. The submission of drawings should include an architectural plan, an architectural elevation and large-scale detailed sections of your proposed pedestrian footbridge, namely one longitudinal section and two transverse sections (one transverse section at mid span of your pedestrian footbridge and another transverse section at a footbridge support).

(c) An A4 Design Report (not exceeding 30 in No. pages), that has the following content:
- (i) Introduction and scope.
- (ii) Case studies and discussion on structural design concepts.
- (iii) Two alternative design proposals and considerations influencing your choice of design.
- (iv) Final proposed design of the pedestrian footbridge, including structural justifications for your proposal.
- (v) Additional structural details, which may not have fitted within the 2 in No. A0 sheets.

(d) An MS Power Point Presentation (not exceeding 20 in No. slides) to be used during the Oral Presentation of the Design Project.

### The emphasis of this Design Workshop will be focused upon:

**(a) The quality of your critical analysis of the design problem.**

**(b) Your alternative structural design proposals, and your assessment of such design alternatives.**

**(c) Design quality aspects, which should deal with:**

- **(i) The clarity of the pedestrian access (beginning and end of the footbridge).**
- **(ii) The soundness of your proposed structural system, and the construction and erection methodology.**
- **(iii) The quality of the proposed materials, and the way that they are detailed and implemented within your proposed structural design.**
- **(iv) The artificial lighting scheme.**
- **(v) The way your design proposal integrates within the context of the Site.**

### Learning Outcomes:

This design project workshop envisages the following learning outcomes for the pedestrian bridge design project:

- An ability to **identify, formulate and solve engineering problems**, to select and apply relevant methods from established analytical, computational and experimental methods, to recognise the importance of non-technical – societal, health and safety, environmental and industrial – constraints.
- An ability to develop and **design engineering structures and systems in detail** to meet established requirements, that can include an awareness of non-technical considerations, and to select and apply relevant design methodologies.

- An ability to conduct searches of literature, to consult and to critically use scientific databases and other appropriate sources of information, to **carry out structural simulation and critical analysis** in order to pursue detailed investigations and research of technical issues.
- An ability to consult and **apply design codes of practice and safety regulations**.
- An **understanding of applicable materials, equipment and tools, engineering technologies**, and their limitation.
- An ability to **communicate effectively** information, ideas, problems and solutions.
- An ability to **function as a member of a design team** and to cooperate effectively with peers.

### Assessment Criteria:

Assessment of the individual student design projects will be carried out by means of an oral examination following a MS Power-Point presentation by the students of their individual design project deliverables submitted on the BEN3101 OCC_A UM VLE online facility by the deadline for submissions. Every student will be allocated a maximum of 15 minutes for the oral presentation, following which there will be a 5-minute Q & A (Question and Answer) session with the BEN3101 OCC_A Board of Examiners. The assessment marks, which will be assigned by the examiners, will be based upon the following assessment criteria:

| ***Learning Outcome*** | ***Mark*** |
|---|---|
| **Identify, formulate and solve engineering problems** | ***10*** |
| **Design engineering structures and systems in detail** | ***50*** |
| **Carry out structural simulation and critical analysis** | ***10*** |
| **Apply design codes of practice and safety regulations** | ***5*** |
| **Understanding of applicable materials, equipment and tools, engineering technologies** | ***10*** |
| **Communicate effectively** | ***10*** |
| **Function as a member of a design team** | ***5*** |

### Suggested Further Reading:

Keil, Andreas, *Pedestrian Bridges - Detail Practice*, Edition Detail, Munich 2013.

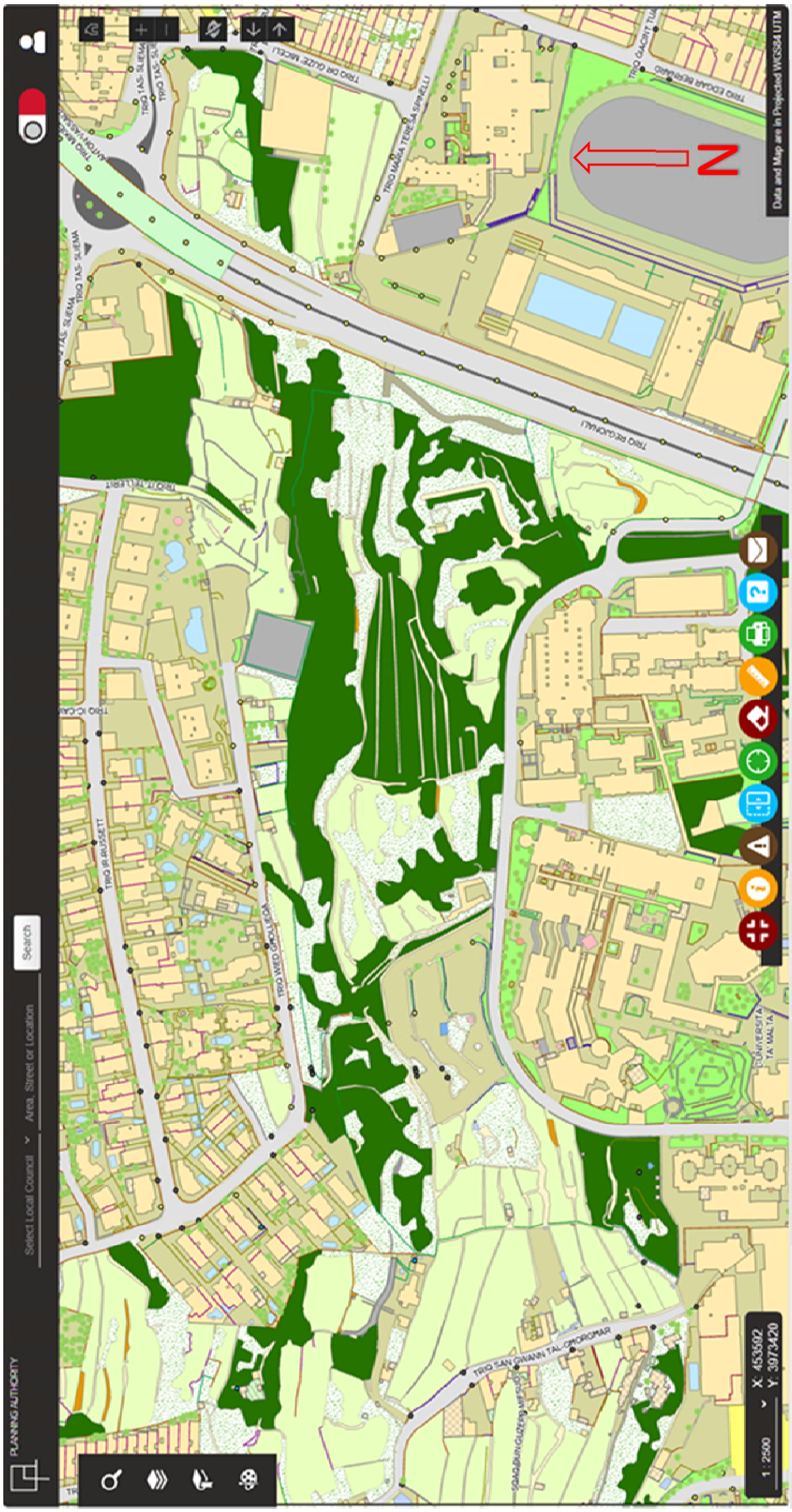
Schlaich Bergermann und Partner, ed. C.Hellstern et al., *Detail Engineering 1*, Edition Detail, Munich 2011.

### Plagiarism:

When writing the Technical Design Report, students should be mindful of the regulations on plagiarism and collusion of the University of Malta, which may be consulted online at:

Student Conduct - Office of the Registrar - L-Università ta' Malta (um.edu.mt)

# OVERALL SITE PLAN



# AERIAL SITE PHOTOGRAPH