



M.Eng. Year 1 - Design Workshop
Semester 2
CVE5101-2 (Structural Engineering)
Triq Id-Difiza Ċivili Highway Bridge Project
Over Wied Il-Għasel in Mosta

Unit Co-Ordinator:

Professor Marc Bonello

Design Tutors:

Professor Marc Bonello, Professor Dion Buhagiar, Dr Jeanette Mireille Muñoz Abela, Dr John Valentino, Dr Adrian Mifsud, Dr Nathan Vella, Professor Alex Torpiano & Professor Simon Paul Borg (by appointment).

Design Brief:

This workshop will have a 14-week duration, commencing on Thursday, 12th February 2026.

Design Project Submission Dates:

Design Project Concept: Friday 27th February 2026

Structural Appraisal of Design Project Proposals: Friday 3rd April 2026

Final Submission of Design Project: Monday 25th May 2026

Design Project Review Date: To be announced

Design Project Deliverables: Design Project Drawings (presented on 3 in No. A0 Boards), Small Physical and/or Digital Working Model, Structural Calculations, Technical Design Report and MS Power-Point Presentation.

Credits Assigned: 58.33% (14 weeks/24weeks x 100%) of 15 ECTS.

Method of Design Project Assessment: Oral & MS Power-Point Presentation of Design

Design Project Objectives:

The aim of the design project workshop is to produce 2 in No. conceptual highway bridge designs using different structural materials, preparing preliminary structural analysis and design calculations for initial sizing, and producing general arrangement structural drawings, as well as detail drawings for the selected structural system for a highway bridge to span Wied Il-Għasel in Mosta, as shown on the attached aerial photograph (Figure 1) and site plan (Figure 2) (*Courtesy of the Planning Authority Map Server*). The bridge is to replace the existing stone and reinforced concrete arched bridge between the roundabout in Triq Id-Difiza Ċivili at the Western side of the valley and Triq Ragusa on the Eastern side of the valley in Mosta. The proposed highway bridge, which has a span of circa 75m, is to be designed complete with amenities and pedestrian access down below into Wied Il-Għasel.

In this respect, the proposed highway bridge must seek to maximise the clear span across Wied Il-Għasel, whilst, at the same time, it should also seek to avoid any intermediate bridge deck supports projecting down to the valley floor. The highway bridge design must include, *inter alia*, the following facilities and amenities:

- Provision for pedestrian and cyclist traffic footpaths on both sides of the bridge.
- Provision of street lighting poles.
- Bridge expansion joints.
- Bridge deck support bearings.
- Parapet railings including concealed artificial down-lighting.
- Passage of public health and utility services from the underside of the bridge, from one end of the bridge to the other.
- Provision for storm water drainage of bridge deck.
- Crash barriers.
- Street furniture.
- Protection from objects falling onto the underlying pedestrians within Wied Il-Għasel.
- Renewable clean energy generation to meet the power demands of the highway bridge.
- All other ancillary equipment.

It should be noted that the highway bridge design project proposal may also include traffic channelization of the existing surrounding road network as well as minor expropriation of third party

property, wherever the acquisition of this property is deemed to be necessary for the benefit of the design project and in the public interest.

Furthermore, the following fundamental design principles are to be considered:

- (i) Provide 2 in No. different preliminary structural solutions for the proposed highway bridge, providing justification for your selected structural solution.
- (ii) The selected structural solution must then be designed in detail.
- (iii) The structural solutions provided must be novel and suitable for this environmentally-sensitive site.
- (iv) No bridge supports may be constructed within the valley.
- (v) The valley cannot be used for any construction activity whatsoever.
- (vi) Provide pedestrian access from the proposed highway bridge down below into Wied Il-Għasel.

Design Parameters:

Bridge loading: MSA EN 1991-1 and Load Model 1 (LM1) to MSA EN 1991-2.

Wind loading: Basic Design Wind Speed of 31 m/s.

Temperature Effects: Temperature movements are to be taken into consideration.

Basis for Structural Design:

- (a) You should carry out a preliminary structural analysis and design of the highway bridge foundations, abutments and piers. The bridge deck and other structural elements supporting the deck should be designed in detail.
- (b) The design project should include bridge deck bearings for articulation, expansion joints, parapet railings and bridge deck storm water drainage.
- (c) In your structural foundation design, you are to refer to the Geological Maps for the Maltese Islands in order to determine the nature of the subsoil on site.
- (d) Consideration should be given to all stages of erection, while overall stability effects should be checked under a nominal wind load of 2kN/m^2 (unfactored) applied over the projected surface area of the highway bridge in elevation.
- (e) Seismic loading and aerodynamic effects on the proposed highway bridge need not be considered at this stage.

The design project **duration is 14 (fourteen) weeks**, and there will be an intermediate informal review of your design project work as well as a final formal design project review as indicated in the attached schedule below.

Learning Outcomes:

The Design Project workshop envisages the following learning outcomes:

- The student should **demonstrate a thorough knowledge of the principles of engineering and good engineering practice**, based on the handling of technical information and statistics, mathematics, physics, material science, fabrication technologies and other technical/earth sciences appropriate to the disciplines covered in the Master's Programme.
- The student should be able to **use this knowledge to propose innovative and creative solutions to specific multi-disciplinary complex engineering problems**, selected following the specific Master's Degree Programme, in full respect of cultural, societal, sustainability and aesthetic constraints.
- The student should **demonstrate the ability to develop and use theoretical models and new technologies** by which the behaviour of the proposed project can be predicted, **and to show that independent technical judgement can be applied through analysis and logic**, applying principles of good design to facilitate manufacture, assembly, maintenance, and quality, at economical cost.
- The student should **demonstrate that, depending on the project theme, civil, structural, constructional, environmental, and other engineering problems, including project management issues, associated with the proposal have been addressed**, keeping in mind cost, quality and time issues.
- The student should **demonstrate an adequate knowledge of the construction and fabrication industries, organisations, regulations and procurement procedures** involved in translating design concepts into buildings and integrating plans into overall planning.
- The student should **demonstrate that resource management issues and the provision of infrastructural support systems can be addressed**, keeping in mind sustainability and resilience principles, respect for the engineering profession, for the engineer's responsibility to colleagues, to employers and/or clients, to the community and to the environment so as to ensure well-being, **and also that those technical, financial and human considerations in the management of engineering projects, can be competently and independently addressed, and be communicated effectively.**

Assessment Criteria:

The CVE5101-2 Design Project Deliverables are to be uploaded on to the CVE5101 study-unit area of UM VLE by 23:59 Hours on Monday 25th May 2026. 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 UM VLE online facility by the deadline for submissions. The date and venue of the Design Project Reviews will be communicated at a later date. The assessment marks, which will be assigned by the examiners, will be based upon the following assessment criteria:

Learning Outcome	Mark
Demonstrate a thorough knowledge of the principles of engineering and good engineering practice.	10
Use this knowledge to propose innovative and creative solutions to specific multi-disciplinary complex engineering problems.	10
Demonstrate the ability to develop and use theoretical models and new technologies, and to show that independent technical judgement can be applied through analysis and logic.	10
Demonstrate that, depending on the project theme, civil, structural, constructional, environmental, and other engineering problems, including project management issues, associated with the proposal have been addressed.	50
Demonstrate an adequate knowledge of the construction and fabrication industries, organisations, regulations and procurement procedures.	10
Demonstrate that resource management issues and the provision of infrastructural support systems can be addressed, and also that those technical, financial and human considerations in the management of engineering projects, can be competently and independently addressed, and be communicated effectively.	10

Use of Artificial Intelligence (AI):

While the use of Artificial Intelligence (AI) in this design project is not prohibited, any use of AI software or sources, however marginal or extensive, must strictly be declared and acknowledged within the Design Report. Failure to do so may lead to significant penalisation of the Design Project Marking.

Plagiarism & Collusion:

When writing their 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 \(um.edu.mt\)](https://um.edu.mt)

Furthermore, while students are allowed to work within student groups, it is important for students to keep in mind that their design projects will be marked only for individual academic effort. In this respect, students are strongly advised to avoid submitting an individual design project, which is essentially identical, or very similar, to another or other design project/s, since such design project submissions will be heavily penalised by the examiners for collusion.

Design Project Timeline

CVE5101-2 (Structural Engineering)

Design Project Workshop – Semester 2

SEMESTER 2 Start Date: 12th February 2026 End Date: 25th May 2026		
Task 1	Conceptual Design and Design Considerations	Professor Marc Bonello Professor Dion Buhagiar Dr Jeanette Muñoz Abela Dr John Valentino Dr Adrian Mifsud Dr Nathan Vella
The following tasks involve:		
Week 1 - Week 2 Commencing: 12th February 2026	You will prepare several concept designs for a highway bridge across Wied Il-Ghasel. Your design concepts are to be based on existing case studies; you are expected to explore the various types of bridge configurations that are typically used for bridges of this span. Structural solutions should seek to be innovative, elegant and structurally-efficient. You are to consider solutions in different types of structural material.	
Informal Review – Task 1 27th February 2026	You will prepare preliminary sketches for your structural design concept proposals. You will be required to indicate your preferred choice of bridge design. You are not required to produce a formal submission , but you are to present sufficient material to highlight your thought process.	Professor Marc Bonello Professor Dion Buhagiar Dr Jeanette Muñoz Abela Dr John Valentino Dr Adrian Mifsud Dr Nathan Vella
Task 2	Preliminary Structural Design	Professor Marc Bonello Professor Dion Buhagiar Dr Jeanette Muñoz Abela Dr John Valentino Dr Adrian Mifsud Dr Nathan Vella
Week 3 – Week 7 Commencing: 27th February 2026	Having chosen your preferred structural system configuration, you will be required to prepare preliminary design calculations for initial sizing of the highway	

	bridge. You will take into consideration load patterns as prescribed in EN 1991, as well as wind loading on your structure. This task involves producing preliminary structural design calculations for the bridge, taking into consideration loading patterns, wind loading etc. Due consideration is to be given to how your bridge will be built on site.	
Task 3	Final Structural Design, Structural Calculations, Design Report and Presentation	Professor Marc Bonello Professor Dion Buhagiar Dr Jeanette Muñoz Abela Dr John Valentino Dr Adrian Mifsud Dr Nathan Vella
Week 8 – Week 14 Commencing: 3rd April 2026	During this phase, you will finalise your structural design, produce structural details and produce a detailed design report outlining the design process, the strategic decisions you made in arriving at your final design, and sufficient structural calculations to justify your highway bridge design proposal.	
Final Project Submission Week 14 25th May 2026	Design Projects are to be uploaded in a Single Bound PDF File in the CVE5101 Study-Unit Area on UM VLE.	
Formal Final Review Date to be Announced	This is a formal online presentation in front of a panel of examiners. You are to prepare 3 in No. A0 Boards that will include: (a) A general arrangement drawing showing the plan view of the bridge (dimensioned and annotated). (b) A general arrangement drawing showing the bridge elevation (dimensioned and annotated). (c) A general arrangement drawing showing the longitudinal section through the bridge showing the major components of your bridge, as well as the foundation layout (dimensioned and annotated). (d) A general arrangement drawing showing the transverse cross-section through the bridge showing the major components of your bridge, as well as the foundation layout (dimensioned and annotated).	

	(e) Details of major connections (selected in consultation with your design tutors) (dimensioned and annotated). Your final submission shall include, but not be limited to: (f) Sufficient detailed structural analysis and design calculations for the highway bridge. (g) A separate Technical Design Report (A4 format) highlighting: • Case studies of other highway bridges of similar span. • The main design constraints and design assumptions adopted, and sufficient design calculations to demonstrate the adequacy of your structural design. • A construction methodology plan, highlighting the highway bridge erection sequence and the corresponding site logistics. (h) A1 Drawing Portfolio with any details, which do not fit within the 3 in No. A0 Boards. <i>At the end of this design project phase, there will be individual design project reviews. You will be allotted 15 (fifteen) minutes to present your final design project using an MS Power Point Presentation not exceeding 30 (thirty) slides. You will be stopped if you exceed the time limit allotted for your oral presentation. A further 5 (five) minutes for questions will be allotted for your design project review.</i>



Figure 1: Proposed location of Triq Id-Difiza Ċivili highway bridge (Aerial Photograph)



Figure 2: Proposed location of Triq Id-Difiza Ċivili highway bridge (Site Plan)