

Milestone 1 (M1): Technical Design Review

Technical Design Document Due Date: Monday, February 26th, 2024 @ 9:00am

Design Review (completed in PRA session): Week of February 26th, 2024

Grade Value: 20% of final grade (individual mark)

What is the purpose of M1?

At this stage in the course, all teams should have completed a schematic design for their assigned subsystem. The schematic design should be complete within Altium Designer, and the design should pass an Electrical Rules Check (ERC). Before moving to the PCB design, Milestone 1 will simulate a *design review*, a common practice in industry to discover issues early in the design cycle and prevent costly fixes later in the process. For common Design Review checks, see Altium's [Schematic Review Checklist](#). A design review should be considered as a collaborative meeting where everyone participating has the same goal: to produce a block that meets the requirements.

M1 will be a technical review of the subsystem design. In parallel, the teams will be conducting a presentation, OP1, that will be tailored towards a non-technical audience. In industry, M1 would be a review amongst engineers, and OP1 would be a review with the business/commercial teams. It is critical for all engineers to be able to communicate ideas to any audience and to tailor the content appropriately.

What are the deliverables of M1?

Milestone 1 comprises two deliverables: A **Technical Design Document** and a **Design Review**. The **Technical Design Document** will be a brief overview of the subsystem as designed by the team to meet the expected requirements set out in the ICD. This document will provide information on the subsystem's inputs, outputs, and the expected functionality of the design. The team should include the schematic as an appendix in the document. **This document will be submitted by the deadline indicated, prior to the Design Review with your TA.**

The **Design Review** will be delivered to an audience of TA(s) and peers during the regularly scheduled PRA session during the week of February 26th, 2024, in the computer lab (BA3128). Students are free to choose the format in which they present key information about their subsystem's design (e.g. using slides, OneNote, etc.) but the summary should take 5 minutes or less. During the Design Review, the TA(s) will ask questions about the Technical Design Document, schematic design, the components selected, and how they will meet the requirements of the subsystem as defined in the ICD. The teams will be expected to answer the questions by walking through their schematic/slides and showing design choice notes, including calculations and Multisim simulations if appropriate. **If supplementary information is presented (e.g. slides), it must be submitted by the deadline as the Technical Design Document.**

For a successful Design Review, the team is expected to demonstrate a clear understanding of the proposed circuit and to show, through design notes and tools, that the circuit will meet the requirements.

Technical Design Document Structure (target page count per section)

This document is intended to be an informal summary of the subsystem's design and the intended audience for the document is technical. In industry, this document would be attached along to the calendar invitation for the Design Review with senior designers and other technical colleagues that need to participate in the review. This would allow time for individuals to review and make comments to the design before the meeting, and it has the same purpose here.

This document should be clear and concise. The length should be no more than 2 pages, and the schematic of the subsystem and any results (e.g. graphs of measurements, supplemental information, etc.) should be appended to the document (the appendix doesn't count towards page count). An overview of the document is below:

1. *Subsystem Overview (Less than 0.5 of a page)* – Provide a high-level description of the subsystem.
2. *Input / Output Signals (0.5 page)* – Provide a table of the subsystem's inputs and outputs and add a description for each.
3. *Subsystem Design (1 page)* – This section should describe how the proposed design handles the input signals and how the output signals are generated. Describe how the key components were selected, how they were evaluated to meet the requirements, and any simulation results that may have been used to demonstrate the desired functionality. In the case of circuit schematics, use schematic reference designators (i.e. U1, R2, L5) within the text to describe specific components and the impact they have. Add supplementary information to an appendix if you feel it can be helpful in supporting the design decisions made.

Remember that this material will be read by your Lab TA in preparation for the Design Review. Provide in the document critical information and present this information in a manner that you feel is logical and clear for the subsystem your team is responsible for creating. It is not expected that you describe the selection process for every component, but instead, highlight the key components that have the most impact on the performance of the proposed circuit.

Document House Keeping

Document Formatting: This document will be submitted electronically in PDF format. The document should have 1" margin all around, with 1.5 line spacing for the body text with a minimum font size of 12pt. Append the schematic to the end of the document, ensuring that the schematic is legible and that all components and nets are clearly visible.

Length: The overall length of the document should be less than 2 pages. This is an informal document for colleagues but ensure that the formatting is clear and organized in a logical manner.

Submission: One member of the team should submit the document in PDF format on Quercus.

Design Review Meeting

The Design Review will happen in your scheduled lab session during the week of February 26th, 2024. The Design Review Meeting will be up to 30 minutes in duration, but **summaries presented by teams must be limited to 5 minutes or less** to leave sufficient time for questions. The TA will lead the Design Review and

ask questions about the schematic and the functionality of the proposed circuit. During the session, the TA will ask to see the Electrical Rules Check (ERC) results from Altium Designer. If there are issues, warnings, or errors, the team will need to explain what the cause is and how they plan to revise the design to address errors. The TA may request to see simulations or calculations that support component selection. It is recommended that each team take advantage of their OneNote notebook to track and document design decisions.

It is expected during the Design Review that all team members contribute. Milestone 1 is individually marked, and the TAs want to hear from each team member and see evidence of work on your team's OneNote notebook.

Teams should come to the design review with their:

1. Summary file submitted on Quercus
2. Schematic open in Altium
3. Evidence of the correct functioning of their subsystem ready to present, such as:
 - a. Multisim graphs
 - b. Experimental measurements (e.g. screenshots, videos)
4. Bill of materials (list of components used)
5. Optionally, presentation or OneNote page containing what is needed to walk the audience through the design (including potentially some of the items above)

Teams should also assign:

1. A leader to walk the audience through the design and/or OneNote notebook
2. A scribe to take down notes arising from the design review