**Critical Design Review Report**

**Objective**

The Critical Design Review Report (CDRR) is the written version of your Critical Design Review presentation. It is an opportunity to flesh out and detail what you presented in the CDR. Its primary purpose is to show your ability to communicate your work to others effectively in written form. Assume you are writing the report for someone new to the project.

**Submission**

The CDRR is a team assignment and is therefore a fusion of all team members' inputs. Adhere to the format specifications in the linked "CDRR Format" document. The page limit is 30 pages all-inclusive (i.e., text plus figures of all kinds) for everything other than the prefatory information and optional appendices. The appendices will not be graded, but you can use them to include reference material that is useful to your project and for the sake of consolidating all relevant material in one document.

**Examples**

The best CDR Reports from last year are posted along with this assignment. As before, remember that these are not perfect models, in part because the content guidelines are continually refined - the ultimate guide is the CDRR Guidelines document you are reading now.

**General guidelines**

1. The report must have specific and accurate content to be understandable.
2. Discussion is highly weighted. Do not include very "raw" data (e.g., code).
3. Be clear, concise, logical, and grammatically and orthographically correct in your writing.
4. An explanation must accompany all figures, equations, charts, and lists.
5. Figures must be adequately captioned, labeled, and referred to in the text.
6. Include page numbers starting with the page after the Table of Contents.
7. Follow the formatting guidelines attached to this assignment.

**Content**

The CDRR consists of the following components:

1. Prefatory information
2. Project description
3. Use case
4. System-level requirements
5. Functional architecture
6. Cyberphysical architecture
7. Current system status
8. Project management
9. Conclusions
10. References
11. Appendices (optional)

Items 2-6 should involve refinements/revisions of what you presented first in your CoDR, then in the PDR and CDR. Refer to the CoDR Content Guidelines for additional details on their contents. Items 7-9 are the meat of the CDRR.

Component descriptions

1. Prefatory information.
2. First page: Title page with the **team name, team members’ names, date,** and **project title**.
3. Second page: Abstract (250 words or fewer)
4. Starting on the third page: Table of contents.
5. Project description. This is a **refined** project description consisting of user needs and your resultant proposed method of meeting them. It focuses on end results, not the details of the technology. Use this as a brief introduction to orient the reader to be able to better understand what follows.
6. Use case. Give a **refined** version of your use case coupled with a **graphical representation** of the system in its **use case/mission environment**. The use case should make clear what your system will do.
7. System requirements. These should be broken down to the subsystem level.
8. Identify any requirements changes since the PDR with justification for the changes.
9. Functional architecture
   1. This must include a block diagram showing your system’s **major functions and the flow** (information, energy, material) between them.
   2. In the CDRR, there should also be descriptive explanatory text.
10. Cyberphysical architecture
11. This must include a block diagram showing your system’s **major cyberphysical components (hardware & software) and the flow** (information, energy, material) between them.
12. In the CDRR, there should also be descriptive explanatory text.
13. Include individual software components/algorithms in flowchart form.
14. Current system status
    1. Spring-semester targeted system requirements. Identify the system requirements and corresponding subsystems and system elements emphasized during the spring semester development. This goes first in this section in keeping with good systems engineering practice: identify your design requirements, then describe below the work you did to satisfy them.
    2. Overall system depiction. Use a photograph to depict the current status of your overall system. If you can’t fit it into one photograph, use several and connect them as needed.
    3. Subsystem descriptions/depictions. Describe and depict the subsystems developed during the spring semester. Start with an overall system depiction. Use design drawings, photographs, schematics, and other visual means to convey the status of your system/subsystems.
    4. Modeling, analysis, and testing. Include a summary of any modeling, analysis, and testing you performed in order to design your system to specification and unit-test its components.
    5. Performance evaluation against the Spring Validation Demonstration (SVD). Summarize how well your system performed against the scenario and metrics specified by your SVD.
    6. Strong/weak points. Highlight current system strong and weak points and needed areas of refinement.
15. Project management
16. Work Breakdown Structure. Present the three-level Work Breakdown Structure you developed in the Systems Engineering class. Include whatever textual description is necessary to make its contents clear.
17. Schedule
    1. Include a schedule with biweekly (every other week) granularity for the fall semester.
    2. Answer these key questions:
       1. What are the major system development milestones in the remaining schedule?
       2. Are you behind, ahead of, or on schedule? If behind, how will you catch up?
18. Test plan. Present a high-level test plan for the fall semester including the Fall Validation Demonstration.
    1. Discuss significant subsystem and system testing activities of your project. Highlight important elements of those tests.
    2. Use a table to identify capability milestones for these fall-semester Progress Reviews (PR):
       1. PR 7: Early September
       2. PR 8: Mid-September
       3. PR 9: Early October
       4. PR 10: Mid-October
       5. PR 11: Mid-November
       6. PR 12: Late November
    3. Describe the Fall Validation Demonstration (FVD), to be conducted in early December, with greater detail than the other capability milestones, including these essential elements:
       1. The test conditions: location, needed equipment, size and nature of operating area, etc.
       2. A list of steps your system will be put through written in a sufficiently clear way for someone with no knowledge of your project to be able to test the robot.
       3. A set of quantitative performance metrics that your system will be measured against during the validation experiment. Typically, these metrics will be written into the list of steps in the previous item.
       4. Use graphics to the extent possible to illustrate your FVD.
19. Budget
    1. Include a refined parts list.
    2. Answer these key questions:
       1. What is your total budget?
       2. What are the big-ticket items that comprise the majority of your budget?
       3. How much/what percentage have you spent to date?
20. Risk management
    1. Provide an update on the risks you identified in the Preliminary Design Review (PDR) and have been tracking/addressing since then.
    2. As you did for the PDR, present the following (examples of which are given below), updating both tables to reflect any changes since the PDR:
       1. A Risk Management table with Risk ID, Risk, Requirement, Type, Likelihood, Consequence, Mitigation.
       2. A Risk Likelihood-Consequence Table
21. Conclusions
22. Key lessons learned during the spring semester: Discuss lessons related to both systems engineering and project management. List and discuss at least three technical lessons specific to your system.
23. Key projected activities during the fall semester: These activities should align with relevant Project Management elements discussed in sections 8a, 8b, and 8c.
24. References. Include references consulted.
25. Appendices (optional). These might include supporting documentation for your project in the form of code, drawings, brainstorming, etc.

The table below gives a loose guideline for the number of pages per element and the exact number of points per element.

| **Critical Design Review Report Element** | **Pages** | **Weight** |
| --- | --- | --- |
| 1. Prefatory information | 0 | 0.2 |
| 2. Project description | 0.5 | 0.3 |
| 3. Use case | 1.5 | 0.8 |
| 4. System-level requirements | 3 | 1.4 |
| 5. Functional architecture | 2 | 1.4 |
| 6. Cyberphysical architecture | 2 | 1.4 |
| 7a. Current system status: Targeted requirements | 1 | 0.3 |
| 7b. Current system status: Overall system depiction | 0.5 | 0.5 |
| 7c. Current system status: Subsystem descriptions/depictions | 3.5 | 2.5 |
| 7d. Current system status: Modeling, analysis, testing | 2 | 1 |
| 7e. Current system status: SVD performance evaluation | 2 | 1.5 |
| 7f. Current system status: Strong/weak points | 1 | 1.4 |
| 8a. Project management: Work Breakdown Structure | 1 | 0.5 |
| 8b. Project management: Schedule status | 1 | 0.5 |
| 8c. Project management: Test plan | 4 | 2.5 |
| 8d. Project management: Budget status | 1 | 0.5 |
| 8e. Project management: Risk management | 2 | 2 |
| 9a. Conclusions: Lessons learned | 1 | 0.5 |
| 9b. Conclusions: Key fall activities | 0.5 | 0.5 |
| 10. References | 0.5 | 0.3 |
| **Totals:** | 30 | 20 |