Critical Design Review Assignment

ASEN 4018, Senior Projects I: Design Synthesis
Fall 2014

1.0 Document Purpose

This document specifies the required elements and deliverables for the Critical Design Review assignment, along with a grading rubric.

2.0 Review Objectives

The Critical Design Review (CDR) marks the end of the detailed design phase of your project. The major goals of this phase are to turn your conceptual ideas and preliminary designs into concrete engineering design products and corresponding development plans. The CDR presents the overall design, describes how it meets requirements, and conveys the key decisions about what will be purchased vs manufactured, how the system will be integrated and tested, and what resources are needed to carry this out. A successful CDR results in approval to expend your budget toward developing the design into a working prototype.

With this context in mind, the CDR presentation should address the following questions, in order:

- What is the purpose of the project and what are its specific objectives (measures of success)?
- What is the proposed design solution, and how does it work?
- What are the critical project elements for meeting the success criteria?
- What are the associated design requirements and how does the design satisfy them?
- What are the remaining risks and their mitigations?
- How will the design be verified and validated?
- How is the remaining work organized?

Each of these is discussed in a subsection below, along with the corresponding grading weighting.

2.1 Project Purpose and Objectives (5%)

Recap the project descriptions that appeared in the PDD, CDD, and PDR. It should be a concise overview that assumes the review board has not just reviewed these earlier documents. That is, the CDR should stand alone as a description of the project from concept through design solution. Typically, this overview will include a CONOPS, updated to help explain the project purpose and specific objectives as quickly and clearly as possible.

Clear what project is about and what it must accomplish to be successful (4-5 pts)

Mostly clear, but some parts are vague (say which) (3-4 pts)

Many parts are vague (say which) (2-3 pts)

Project is only superficially defined (say why) (0-2 pts)

2.2 Design Solution (10%)

This is a top level description of the overall outcome of your design efforts. It should show what the whole system looks like, its key parameters (dimensions, mass, data rates, etc.), what the major elements or subsystems are, and most importantly, how it works. Include a functional block diagram. This provides the context and terminology for more detailed descriptions later in the presentation.

Clear what all major elements of the design are, and how the design works at a top level (8-10 pts)

Some elements are vaguely defined or poorly explained (say which) (6-8 pts)

Key elements seem to be missing or were not explained (say which) (4-6 pts)

Can't tell what the whole design is or how it basically works (0-4 pts)

2.3 Critical Project Elements (5%)

This is a description of what is most important to success of the project, and why these elements were chosen to focus on in this presentation. This discussion should convey your understanding of how the system works and what design features, attributes, or characteristics are most important to that functionality.

Critical elements make sense, and priority selection was related to project objectives (4-5 pts)

Some critical elements were missing, or reasoning for including them was missing (say which) (3-4 pts)

Most critical elements seem poorly understood in terms of project objectives (2-3 pts)

Little understanding of critical elements in project is evident (0-2 pts)

2.4 Design Requirements and their Satisfaction (30%)

This section provides details on how specific design requirements were developed for critical project elements to achieve the functional objectives and success criteria. A complete list of requirements is not sought. Rather an explanation of which key requirements are driving the design, and how the current design satisfies them. You must make the case that the system will work to satisfy the functional requirements by describing the design details using drawings, diagrams, schematics, flow charts, etc. that come from research, analyses, simulations, and precursor experiments. Engineering design detail and quantification is needed to convince the review board that you understand all the important issues and have workable design solutions. A good overview of the design (2.2) and a good discussion of critical elements (2.3) will enable you to focus on a few most important design issues here with your limited presentation time.

Key design aspects were explained clearly and in detail, indicating a good grasp of the engineering issues, and the associated design choices were well justified. It is apparent that the design will work. (23-30 pts)

Some key aspects were not well explained, or some key design choices were poorly supported (say which). Doubts remain about the likelihood of success in some areas, but they are not serious enough to hold project spending until they are rectified. (16-23 pts)

An understanding of some of the key issues is lacking, or the design is not mature enough to tell (say which). The design is not likely to satisfy the objectives, and more engineering work is needed before project funds can be released. (8-16 pts)

Many key elements are poorly designed or understood. Much more work is needed to justify release of project funds. (0-8 pts)

2.5 Project Risks (10%)

Provide a risk matrix, showing identified risks and an assessment of their likelihood and severity of consequences to the success of the project. These risks must be credible and specific to your project. An cogent discussion of risks is one of the ways that your understanding of the project and how it works is conveyed to the review board.

Risks were specific and credible for this project, and reflect a good understanding of the issues of concern (8-10 pts)

Some risks were vague, generic, or poorly explained, but their consequences are not severe (say which) (6-8 pts)

Key risks with serious consequences were not identified or not explained (say which) (4-6 pts)

Little understanding of key risks in the project is evident (0-4 pts)

2.6 Verification and Validation (20%)

Describe how the design will be verified against predictive models through characterization testing. Use diagrams to convey the test set up, the facilities and equipment needed, and how the test works. Describe the measurements to be made, and key measurement issues (resolution, sampling rate, etc.) Show how the selected sensors, instruments, data acquisition, test fixtures, etc. provide the required capabilities.

Describe how the design will be validated against functional requirements and overall project success criteria.

Model development is appropriate, and characterization test objectives and methods are well-defined (16-20 pts)

Some key modeling aspects are missing or poorly developed, or some tests are poorly motivated or defined (say which) (12-16 pts)

Many verification and validation aspects are missing or ill-conceived (say which) (8-12 pts)

Verification and validation plans are inadequate for a successful project (0-8 pts)

2.7 Project Planning (20%)

A clear plan for carrying out the project in the Spring term is required. Your presentation should include the following planning components:

- Organizational Chart (OC), showing the leadership roles of all team members (2 pts)
- Work Breakdown Structure (WBS), showing all the work products for the project (5 pts)
- Work Plan (WP), showing the main tasks to accomplish the WBS products, along with their scheduling, in the form of a Gantt chart (5 pts)
- Cost Plan (CP), in the form of a financial budget, for all major items in the project, highlighting uncertainties and corresponding budget margins. (4 pts)
- Provide a Test Plan (TP) showing all major tests to be conducted and how they are scheduled. Note the use of specialized test equipment or facilities for which access is limited, and show that your access to these is feasible. (4 pts)

3.0 Deliverables

3.1 The CDR Data Package

The CDR data package includes:

1) **Power Point presentation (TEAM_CDR.ppt(x))**
2) **Any movie that is part of or linked into the presentation.**

3.2 Delivery Instructions

The electronic CDR Data Package should be delivered to the D2L dropbox by **11:59 PM, Monday, December 1, 2014**.

3.3 No Changes to the Submittal

No changes will be allowed to your presentation materials after the due date and time. No additional materials can be introduced at the presentation.

Teams must provide Paper Copies of your submitted charts to the PAB at the time of their CDR. Print 6 slides per page, front only. Best resolution is obtained by printing from pdf format.

3.4 Presentation Schedule and Format

Presentations will be scheduled during allotted class lecture and lab times beginning with class time on the following Tuesday, see the course calendar. All students are required to attend all presentations (see Course Syllabus).

The order of presentations is provided on the course calendar. Each group will be allotted 50 minutes. This includes 30 minutes of presentation, followed by 20 minutes of questions and answers from the PAB and audience. *These time limits will be strictly enforced.*

Teams should expect detailed questions from faculty, staff, customers, and students regarding their design decisions.

3.5 Lab Notebooks, Self and Peer Evaluations

Teams shall submit their design notebooks to their advisor, either in person, or in the cubby assigned to them in the LM room, at the due date and time of the FFR. This enables the notebooks to be referred to while preparing the CDR and FFR. The adviser will return the Lab books to the teams mailboxes after semester grades have been computed, in case they are needed for any project work over the winter break.

Self and peer evaluations for individual grade evaluations will be conducted during the two weeks of CDR presentations.

4.0 CDR Grading

As in the PDR, CDR group grades will be issued by the PAB, based on slide content and clarity of presentation. Team members will subsequently receive individual grades that may differ from the group grade, based on advisor assessment of the self and peer evaluations, design notebooks, and their own observations of individual contributions to the team.