

Project Proposal Guidelines

Aerospace Senior Projects (ASEN 4018 & 4028)

1.0 Document Scope

All undergraduates in Aerospace Engineering Sciences take a required two semester course sequence in Senior Projects. This sequence includes *ASEN 4018 Senior Projects I: Design Synthesis* and *ASEN 4028 Senior Projects II: Design Practicum*. This document describes how potential projects are proposed.

2.0 Project Content

Proposed projects should embody the objectives and expected content called out in the Course Syllabus ([AES-SRP-001](#))¹. The syllabus states:

“The objectives of the ASEN 4018/28 Senior Projects course sequence are:

- *to teach standard professional aerospace engineering practices,*
- *to teach the elements of conceptual and detail design,*
- *to teach the elements of fabrication, integration, verification and test,*
- *to provide an opportunity for students to develop expertise in their particular areas of technical interest, and*
- *to integrate design analysis methods learned in prior courses.”*

To these ends, students work in teams on specific projects. Teams consist of between 4 and 8 Aerospace Engineering seniors. The Syllabus calls out expected content for the projects:

“All projects are expected to:

- *Conceive, design, fabricate, integrate, test and verify a product, device or system.*
- *Develop designs using quantitative, engineering analysis of appropriate complexity, reflecting the academic background expected of Aerospace Engineering seniors.*
- *Use standard engineering practices, including the development of requirements, specifications, drawings, schematics, verification plans, and test results.*
- *Use an appropriate set of professional project management tools and practices to ensure project progress, quality and timeliness.”*

¹ Course documents can be found at <http://www.colorado.edu/ASEN/SrProjects>.

3.0 What is Expected from Project Customers?

3.1 Course Activities

When a project customer is “outside” the course, (s)he is expect to provide a minimum level of support to course meetings and activities. “Outside” means that they are either faculty not receiving teaching credit for the course, CU research staff, or are outside CU.

The course document “Faculty Guidelines” ([AES-SRP-002](#)) defines the roles and responsibilities of the faculty, staff, and project customers. This information is summarized here. Project customers are expected to:

- Draft, submit and negotiate the PDD with the students, faculty and staff.
- Provide project team advice (as available)
- Participate in the project reviews (PDR, CDR and Final)
- Participate in Project Advisory Board (PAB) grading meetings, providing input to the PAB faculty who determine the grades.
- Provide some level of resource support for the project.

3.2 Project Resources

External and Internal project customers are expected to provide a portion of the resources for the project *if* they they expect to receive some measurable benefit from the results of the project.

In the course of two semesters (9 months), an 8-person team will spend approximately 3600 hours of effort.² Project customers should consider this level of effort in determining their possible sponsorship.

Project sponsorship can be provided in several ways:

- Project Advising. Provide technical advice to the student teams, meeting with them on a regular basis
- Project Facilities. Provide special facilities, such as test facilities, fabrication equipment, test equipment, or design/analysis software
- Project Funds. Provide project funds, through CU to the department that are used by the specific project team for the proposed project.

4.0 What Products are Provided to the Customers?

In return for their support, Customers receive the following products from the students:

- PDR Data Package
- CDR Data Package
- Semester I Final Report

² 8 students x 4 credits x 4 hours/credit/week x 28 weeks

- Semester II Final Report
- Project hardware and software, if that was a condition negotiated for the provision of resources (see Section 3.2).

5.0 How are Projects Proposed?

5.1 Project Customers

Projects are proposed by Project Customers. Project Customers may be (1) CU faculty; (2) CU research staff; (3) engineers or scientists from outside CU; or (4) the students themselves.

5.2 Project Definition Document

5.2.1 Purpose

All Project Customers are asked to draft an initial version of a Project Definition Document (PDD). The PDD is a short document that provides top level project background, objectives, constraints, and available resources. The PDD provides specificity for a project idea so that students, faculty and customers can understand and agree to the content of the projects.

The best model for understanding the role of the PDD may be the typical content one sees in NASA Requests for Proposals. The PDD should:

- Provide a basic background and context for the project idea
- Consist of quantitative objectives and constraints that, whenever possible, are specific enough to be used in a requirements analysis
- Provide objectives and constraints that “ask questions” that are “answered” by the project, not “dictate solutions”
- Define any important interfaces

The PDD is not meant as a project recruiting device. Project Customers will have an opportunity to present their ideas directly to the students in class.

It is acceptable for proposes to have many TBD’s identified in their PDD drafts. These TBD’s can be negotiated later with the students and faculty during the first two weeks of class.

5.2.2 Content

To ensure consistency in how the PDD’s can be reviewed, the PDD should use the following outline:

1.0 Project Information

1.1 Project Title and Acronym

Descriptive title; acronym picked by students

1.2 Project Customer(s)

Names and contact information

2.0 Background and Context

Up to three short paragraphs describing the background motivation and the overall context for the proposed project. The reader

should be able to understand the origin of the project idea insofar as this is relevant to the production of requirements.

3.0 Objectives

3.1 Overall Objective

Provide a short, one-sentence statement of top level objectives

3.2 Functional Objective 1

3.2.1 Objective

Provide a short sentence for the functional objective. Tables are acceptable for listing data.

3.2.2 Discussion

Discuss the background and definitions used this objective

3.2+x (Repeat for each functional objective)

4.0 Required Engineering Expertise

Provide a list of technical expertise and how it is applied to the project. This identifies the necessary skill set for the students, and will help them understand what they will learn in the project. Provide this in a table with headings "Technical Expertise" and "How Applied."

5.0 Resources

5.1 Facilities

Describe unusual or special facilities needed for the project and how they will be made available.

5.2 Additional Advisors

Identify other individuals who can be contacted for project advice. Do not include the "customers" identified in 1.2.

5.3 Funds

Identify funds to be made available to the project other than the funds provided by the department. Describe how these will be made available.

5.2.3 PDD Template and Example

An example of a PDD that can also be used as a document template can be found at http://www.colorado.edu/ASEN/SrProjects/Templates/Example_PDD.doc.

5.3 PDD Presentation to the Students

During the first week of class in the Fall, potential Project Customers will have an opportunity to present and discuss their project ideas with potential student team members.

5.4 PDD Negotiation Period

Project customers, prospective student team members, and the PAB will collectively review and revise the PDD during the first two weeks of the Fall semester. Once all have agreed to the content of the PDD, the project is deemed approved and the team may proceed.

As projects evolve, requirements analysis may lead to a need to negotiate changes to the PDD. The PAB must give final approval to all project PDD's. The PAB must also approve any changes to the PDD's.

5.5 PDD Submittal

5.5.1 How

Proposed PDD's can be submitted by EMail to the Course Coordinator identified in the [Syllabus](#) on the course web site. (S)he distributes the PDD to the students and to the faculty in the course.

5.5.2 When

PDD's are solicited throughout the academic year. Proposals for the Fall semester, as a practical matter, must be submitted to the students by the start of classes.