Course Project Guide

This guide provides instructions for your class projects. Please read the guide carefully, and follow the instructions for submission. It will help you deliver a thoughtful, high-quality project. Example projects from previous course offerings can be found on bCourses in the "Term Project" folder.

Timeline

All deliverables must be submitted through the appropriate "Assignment" on bCourses.

Deliverable	**Date (Due W@11:59p PT)**
Project Declaration	Sep 8, 2021
Project Proposal	Oct 6, 2021
Progress Report	Oct 27, 2021
In-Class Presentation	Week of Nov 29, 2021
Final Report	Dec 10, 2021 (Due F@11:59p PT)
Self/Team Evaluation	Dec 10, 2020 (Due F@11:59p PT)

Contents

1 Introduction

1.1 Synopsis

The Energy Systems and Control course projects intend to provide students with a "hands-on" opportunity to apply systems and control concepts to the energy application of their choice. As a result, excellent projects will identify an energy system of interest, and a particular systems and control tool. Creativity is highly valued in outlining ideas. Moreover, students are encouraged to select topics that synergistically leverage their own research, other course projects, industry experiences, or our industry sponsored projects.

1.2 Requirements

Teams should consist of 5-6 students. The projects must contain a specific energy system application. Moreover, they MUST apply one of the tools discussed in class, e.g. modeling, state estimation, optimization, machine learning, or control. Most importantly, the project scope must be commensurate with a 15 week semester course. Warning: You will almost certainly propose more than you can practically accomplish.

2 Deliverables

2.1 Declaration [2 pts]

Submit the following three pieces of information:

1. Project Team: Names & e-mails of each team (5-6 per team).
2. One to three sentence description of project topic. You are *not bound* to this topic, and are free to propose something different when the actual project proposal is due. The idea is, simply, to get your team assembled and brainstorming ideas ASAP.
3. Systems-and-Control Tool: Which systems-and-control tool(s) will your project apply? You must pick at least one among: (a) CH1 - Mathematical modeling, (b) CH2 - State Estimation, (c) CH3 - Optimization, (d) CH4 - Machine Learning, (e) CH5 - Optimal Control. See the course notes for a flavor of each topic.

Selected project reports from previous years can be found on bCourses.

2.2 Proposal [5 pts]

- Page limits: 4 page with figures and references
- Submitted on bCourses under "Project Proposal" Assignment

The format must follow the outline below:

(I) **[Title & Team Member Names]**

(II) **[Abstract]** Summarize the project in 200 words or less.

(III) **[Introduction]**

(a) **[Motivation & Background]** This section provides answers to the following questions. Why is this topic interesting and important to study? What are the challenges associated with managing this particular energy system? Teams may optionally indicate how their previous experiences uniquely position themselves to study this topic. Teams may also indicate how this topic synergistically combines with their own research, other classes, etc.

(b) **[Focus of this Study]** Provide a precise statement (2 or 3 sentences) of this study's focus, contextualized within the broader energy issues and related literature. Points will be removed if you provide a long description.

(IV) **[Relevant Literature]** List the key references that provide the relevant background for your project. These references should be included in an enumerated list at the end of the document. These references can include published articles, textbooks, etc.

(V) **[Statement of Work]** Everything else is preamble. This is the meat of your proposal! Provide a table, or enumerated lists of tasks you plan to execute. Of course, this is only a projected work plan, as you may change course as the project unfolds. List what each team member will be responsible for.

(VI) **[Summary]** Summarize the project's aim and results. A reader should understand the main ideas by only reading the abstract and summary.

2.3 Progress Report [6 pts]

- Page limits: 8 pages max single column, with figures and references
- Submitted on bCourses under "Progress Report" Assignment
- The progress report should follow the final report format, shown below. Of course, incomplete sections are expected.

2.4 Final Report [15 pts]

The project report parameters are as follows:

- Page limits: 15 pages max single column, or 8 pages double column (IEEE format) with figures. The 15 pages does not include references and appendices.
- Submitted on bCourses under "Project Report" Assignment
- Consider feedback from the Progress Report.

The format must follow the outline below:

(I) **[Title & Team Member Names]**

(II) **[Abstract]** Summarize the project in 200 words or less.

(III) **[Introduction]**

(a) **[Motivation & Background]** This section provides answers to the following questions. Why is this topic interesting and important to study? What are the challenges associated with managing this particular energy system? Teams may optionally indicate how their previous experiences uniquely position themselves to study this topic. Teams may also indicate how this topic synergistically combines with their own research, other classes, etc.

(b) **[Relevant Literature]** Summarize the key references that provide relevant background for your project topic. Identify common trends in the literature. Categorize questions and/or ideas. Then identify open questions without solutions. Use this motivate your project. If your literature review is insufficient, or just a grocery list of citations, then points will be removed. These references should be included in an enumerated list at the end of the document. These references can include published articles, textbooks, etc.

(c) **[Focus of this Study]** Provide a precise statement (2 or 3 sentences) of this study's focus, contextualized within the broader energy issues and related literature. Points will be removed if you provide a long description.

(IV) **[Technical Description]** The bulk of the report is the technical description. Describe, in concise yet technical detail, the methods, models, parameters, formulations, algorithms, results, etc. Use descriptive figures. The adage "a picture is worth a thousand words" holds true in technical writing. Use mathematics and equations. Mathematics provides a concrete and precise description, and avoids the subjectivity of word descriptions. Your technical description should be adequately descriptive in the technical aspects such that a future 295 team can reproduce your results.

(V) **[Discussion]** Provide a thoughtful discussion on the results obtained. How does it advance sustainability in energy systems? What new aspects does it elucidate? How are systems and control tools uniquely positioned to answer these questions? What are next steps for a future student team?

(VI) **[Summary]** Summarize the project's aim and results. A reader should understand the main ideas by only reading the abstract and summary.

2.5 In-Class Presentation [10 pt]

Your in-class presentation & critique will consist of a 10 minute presentation plus a 5 minute Q&A session.

The project presentation should include:

1. Provide a 10 minute oral presentation, and 5 minute Q&A session.
2. Clearly state what problem you are trying to solve.
3. Motivate why this problem is important.
4. Summarize and analyze any relevant literature
5. Describe your methods, especially mathematical models, algorithms, and optimization formulations
6. Provide results and discussion
7. All team members must be present. All team members need not talk, but can respond to questions.
8. Submit your slide deck on bCourses (can be done after your presentation).

Your evaluators will include the professor, the GSI, and your classmates

2.6 Self/Team Eval [2 pt]

Complete the associated survey. A link will be distributed during RRR week.