

Deliverable: The Iterative Project Outline

CBE 30235: Introduction to Nuclear Engineering

Due: Wednesday, April 8, 2026

Assignment Overview

Now that you have completed your AI-Assisted Study Guide and have a verified library of peer-reviewed sources, it is time to build the architectural blueprint for your 6,000 to 7,500-word final paper.

Large Language Models cannot generate a cohesive, accurate, highly technical engineering document from a single prompt. If you ask an AI to simply "write a paper on nuclear reactor thermal-hydraulics," it will generate repetitive, non-technical bloat that will result in a failing grade.

To prevent this, your next major deliverable is a **Highly Detailed Project Outline**. Think of this document not as a traditional, high-level English paper outline, but rather **something that closely resembles the actual lecture notes provided in this class**. It must be granular, mathematically rigorous, and fully structured.

1 The Iterative AI Process

Creating this outline should be a highly interactive, iterative conversation between your group and your chosen AI tool (e.g., Gemini, ChatGPT, Claude). Do not just accept the AI's first attempt at an outline.

- **Drilling Down:** If the AI gives you a superficial bullet point (e.g., "Discuss coolant flow"), prompt it to drill deeper. (*"Expand the 'coolant flow' section into three specific subsections detailing the Navier-Stokes assumptions used, the pressure drop calculations across the grid spacers, and the specific empirical correlations for Critical Heat Flux. Include the governing equations."*)
- **Developing Offshoots:** As the AI generates more detail, use it to explore relevant engineering offshoots. If a material science issue arises in a thermal-hydraulics section, prompt the AI to build a new, dedicated subsection exploring that specific material failure mode.
- **Streamlining and Pruning:** Conversely, AI will often drift into irrelevant tangents or create excessive bloat. You must act as the senior engineer. If a section strays too far from the core physics, prompt the AI to streamline the outline, consolidate redundant subsections, and refocus on the underlying math.

2 Outline Requirements

Your outline must be structured as a formal L^AT_EX document. It must explicitly detail the engineering content that will populate each section. A successful outline will include the following for **every section and subsection**:

1. **Target Word Count:** An estimated word count for the subsection to ensure your final compilation safely hits the 6,000-word minimum without requiring filler.
2. **Core Engineering Concepts:** A bulleted list of the specific physics, thermodynamics, materials science, or neutronic principles to be discussed (just like the class lecture notes).
3. **Specific Equations and Math:** Explicitly list the mathematical models, formulas, or differential equations you will incorporate and solve.
4. **Target Citations:** Placeholder references indicating which specific peer-reviewed papers from your Study Guide assignment will be used to support the claims in that specific section.

3 Formatting and Submission

This assignment is also a test of your group's ability to set up a clean, compilable L^AT_EX environment before you begin writing the full draft.

- **Format:** The outline must be written using L^AT_EX. Set up your preamble exactly as you intend to for the final paper (including packages for math, graphics, and hyperlinked citations).
- **Submission Mechanics:** You must submit **both** the compiled PDF of your outline **and** the raw L^AT_EX source code (‘.tex’ file).
- **Due Date:** Wednesday, April 8 (right after Easter break).

Professor's Note on AI Strategy:

Once I approve this outline, your group's workflow will be to take these highly specific subsections one at a time and feed them *back* into your AI to draft the actual prose. Because you have already forced the AI to drill down into the equations and specific literature, your drafting prompts will be highly constrained and much less prone to hallucination.