ECE 445 Lecture 3 Spring Semester 2026

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Agenda

4:00 Introduction/agenda – Arne

4:05 John Hart's pitch

4:10 Use of Chat GPT and LLM in the course – Viktor

PCB Tips - Viktor

4:30 Bryce video pitch

4:40 Proposal and Design Document - Arne

5:00 Ethics - Arne

5:15 Q&A

Proposal and Design Document
Spring 2026

Arne Fliflet

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Updated Course Schedule and Team Assignments

- Proposals, due in Week 4, motivate and summarize your project
- The Design Document, due in Week 6, provides a complete and detailed design for your project (due in 3 weeks)
- The Design Review, held in Week 7, is a structured presentation of your project to instructors, TAs, and peers.
- In-lab Breadboard Demo in Week 8 with instructor and project TA shows subsystem hardware at breadboard stage
- Progress Demo in Week 12 shows PCB controlling subsystems
- The Project Demonstration and Final Presentation are held during Week 15
- Best project judging and pitched project reviews are held in Week 16 when Final Report and Lab notebooks are due,

The Proposal

The proposal contains four sections whose purpose is to articulate:

1. **Introduction**
   What is your problem? Why is it important? How do you propose to solve it? What is different about your approach?
2. **Design and Requirements**
   How will you implement your proposed solution?
   What are the requirements each component needs to satisfy?
   What is the most difficult part?
3. **Societal Impact, Engineering Standards, Ethics, and Safety**
4. **References**

1. Introduction

- **Title page**
  - Project title, team number, team members, TA, Instructor, Course No.
- **Problem and background**
- **Solution with visual aid**
  - Visual aid should give an impression of physical device
- **High-Level Requirements**
  - What quantitative characteristics must your project exhibit to solve the problem?
  - Maximum of 3 – in complete sentences

2. Design

- **Block Diagram** – How are components connected?
  - Each block is a subsystem
  - Shows power and data connections between blocks
  - Modularity: each block is a self-contained subsystem with inputs and outputs
- **Subsystem Descriptions**
  - System summary
  - Description of each subsystem and how it connects to others
  - Important subsystems typically include power, controller, sensor, actuator, and display components
  - Communication methods and microprocessor needed
- **Subsystem Requirements** – quantitative and testable
  - Not from datasheets
- **Risk analysis** – Which requirement will be most difficult?

3. Societal Impact, Engineering Standards, Ethics and Safety

- Discuss how your project meets needs in public health, safety and welfare considering economic, environmental, social, cultural, and global factors
- Identify the engineering standards (IEEE, ACM, UL, etc.) that apply to your project
- Understand how IEEE/ACM codes of ethics and course ethics guidelines relate to your project
- Discuss ethical concerns for your project – if none justify yourself
- Discuss electrical and mechanical safety concerns referring to course safety guidelines page
  - Consider safety of yourselves and end users
  - If you have hazardous elements to your project, you may need special training and adopt special procedures for your project.

4. Citations and References

- A list of references formatted using the IEEE standard
- Should include things like
  - Textbooks, journal papers, or data sheets
  - Informative articles or tutorials used
  - IEEE code of Ethics
  - Internet (YouTube) links may be included but are not considered references by themselves
  - Let us know if you are carrying over projects from other places (classes, startups, student teams, ECE 445 project …)

Writing Tips

- Proposal is the first formal course document and will be graded as such
- Use writing resources on the course website
- Follow IEEE citation guidelines
- Use provided LaTeX or Word template
- Use correct formatting for figures, tables, schematics, etc.
- Use of AI is allowed but you must take ownership of all written work, and references.
- Design Document and Final Report build on Proposal.

The Design Document

- The design document communicates the complete and detailed design of your project
- It consists basically of the same sections as the proposal but is substantially more detailed and includes new project information
- The introduction section should be similar to the proposal introduction but should include any updates such as changes to the high-level requirements
- The design section will be more detailed and contain new information
  - The block diagram should contain more information about voltages, currents, and signals
  - The physical diagram of the project should indicate physical dimensions, placement of sensors and actuators, and be accompanied by a descriptive paragraph

The Design Document, continued (1)

  - There should be a detailed and quantitative description for each subsystem
  - Supporting material may include circuit schematics, simulations, calculations, measurements, flow charts, mechanical diagrams
- Requirements and Verifications Table
  - List the requirements for your project to work.
  - Provide a verification procedure for each requirement
  - Do not include information from datasheets
- Tolerance Analysis
  - Identify most challenging requirement and show mathematically that subsystem design can be feasibly implemented and meet its requirement
- PCB Design
  - Circuit and board schematics
  - Passed audit?

The Design Document, continued (2)

- Cost and Schedule
  - Bill of materials including source and cost
  - Labor cost based on new-grad estimates including overhead
  - Schedule: timetable of expected sequence of design, lab, and purchasing tasks broken down among team members
- Societal Impact
  - Expand on factors identified in the proposal
- Engineering Standards
  - Discuss how your project meets or does not meet relevant standards

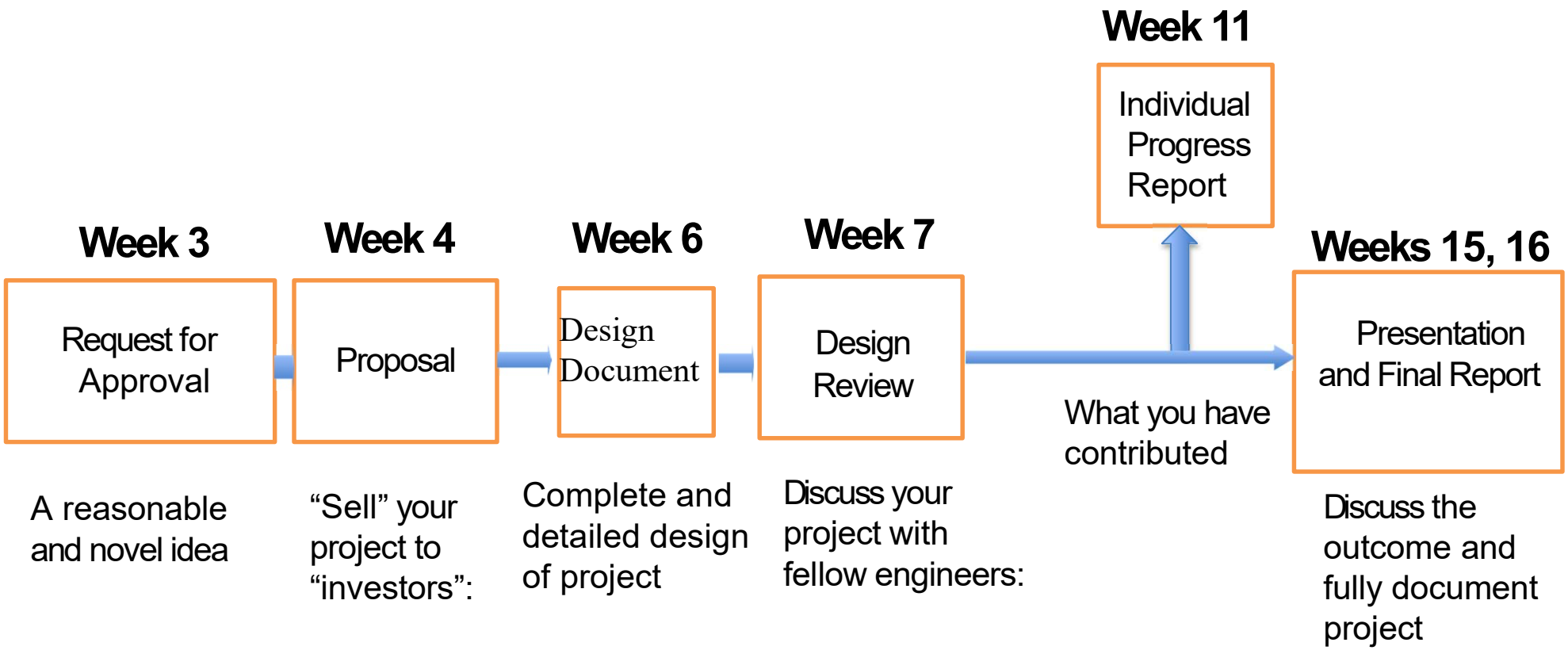
The Design Document, continued (3)

- Ethics and Safety
  - Expand on ethical and safety issues raised in your proposal
  - Document procedures to mitigate the safety concerns of your project
  - Discuss high-risk factors with instructor
- Citations
  - Proposal reference list must be updated

The Design Review

- 30-min. presentation based on design document
  - Teams will talk from design document
  - Discuss block diagram
  - Summarize power, controller, sensor, activator, and display subsystems.
  - R&V Table
  - Tolerance analysis
  - Cost and Schedule
  - Safety
  - References
- Attended by instructor, two TAs, and peer reviewers
- May require project adjustment
  - Look at scope and complexity
- See Design Review grading rubric

Documentation Roadmap



Check calendar for due dates