Project Plan: Analog Circuit Simulator (ANASIM)

# Introduction

This project plan outlines the development process for ANASIM, a basic analog circuit simulator. The project will be completed by a group of 3 students and involves implementing and testing various circuit components (resistor, capacitor, and inductor) within a graphical user interface using OpenGL. The simulator will utilize a cost function based on Euler's method to approximate circuit behavior under applied voltages. The project plan includes a schedule, cost estimation, and a quality assurance plan to ensure timely delivery and software reliability.

# Schedule

## Week 1 (September 27 - October 3): Project Setup & Component Implementation

Familiarization with OpenGL: Explore the OpenGL graphics library and its integration with Visual Studio.

■ Reference provided link: [Configuring Visual Studio for OpenGL Development.](https://content.byui.edu/file/2315e65e-a34a-48d3-814d-4175a2b74ed5/1/intro/165-opengl-visualStudio2017.html)

■ Study OpenGL API documentation: [OpenGL API Documentation Overview.](https://www.opengl.org/Documentation/Specs.html)

Review Existing Code: Understand the provided code base (Component.h, AnalogCircuit.h, AnalogCircuit.cpp, AnalogCircuitMain.cpp).

Component Class Implementation: Begin implementing the Resistor, Capacitor, and Inductor classes, deriving them from the Component base class.

Refer to the provided formulas for voltage calculations.

## Week 2 (October 4 - October 8): Component Testing & Cost Function Implementation

Unit Testing: Develop test cases for each component class to verify their functionality.

Cost Function Implementation: Complete the implementation of the cost function within the AnalogCircuit class.

■ Ensure the cost function iteratively approximates the current (I1) to minimize the difference between applied voltage and the sum of component voltages (J1).

## Week 3 (October 9 - October 13): Integration, Initial Testing, and Submission

Graphics Integration: Integrate the circuit components with the OpenGL graphics library to visualize circuit behavior.

Integration Testing: Test the interaction between components, the cost function, and the graphical display.

Prototype Submission: Submit the project plan and a working prototype by Wednesday, October 9th.

## Week 4 (October 14 - October 17): Thorough Testing & Refinement

Comprehensive Testing: Conduct thorough testing with various input voltages and circuit configurations.

■ Include edge case testing to ensure robustness.

Bug Fixing: Address any identified bugs or issues.

## Week 5 (October 18 - October 24): Finalization and Documentation

Code Cleanup: Optimize code for efficiency and readability.

Documentation: Ensure comprehensive documentation for all code, functions, and classes.

Answer Assignment Questions: Prepare detailed responses to the assignment questions, providing insights and potential improvements.

## Sunday, October 27: Project Submission

Final Submission: Submit the complete project, including all source code, documentation, and answers to the assignment questions.

## Cost Estimation

Based on an hourly rate of $50 per person-hour, the cost estimation for the project is as follows:

| Task | Estimated Person-Hours | Cost (USD) |
| --- | --- | --- |
| OpenGL Familiarization | 8 | $400 |
| Component Class Implementation | 16 | $800 |
| Unit Testing | 8 | $400 |
| Cost Function Implementation | 8 | $400 |
| Graphics Integration | 8 | $400 |
| Integration Testing | 4 | $200 |
| Comprehensive Testing | 8 | $400 |
| Bug Fixing | 4 | $200 |
| Code Cleanup and Documentation | 8 | $400 |
| Answer Assignment Questions | 4 | $200 |
| Total Estimated Cost | 76 | $3800 |

## Quality Assurance

To ensure the reliability and functionality of the ANASIM software, the following quality assurance measures will be implemented:

Code Reviews:

○ Regular code reviews will be conducted among group members to identify potential errors, improve code quality, and ensure adherence to coding standards.

Unit Testing:

○ Each component class (Resistor, Capacitor, and Inductor) will undergo rigorous unit testing to validate their individual functionality.

Integration Testing:

○ After integrating the components, the interaction between them, the cost function, and the graphical display will be thoroughly tested.

System Testing:

○ The complete system will be tested with various input voltages and circuit configurations, including edge cases, to ensure overall system stability.

Debugging:

○ A systematic approach will be utilized to identify and resolve any bugs or issues that arise during testing. This involves using debugging tools and techniques to trace code execution and pinpoint the source of errors.

Documentation:

○ Clear and concise documentation will be provided for all code, functions, and classes, enhancing code understanding and maintainability.

This comprehensive quality assurance plan aims to deliver a reliable and functional analog circuit simulator that meets the project requirements.