PROJECT ABSTRACT

Op-Amp Trainer Kit

A hands-on op-amp trainer kit with a socketed TL072, patch-cord-selectable amplifier modes (inverting, non-inverting, summing, difference, comparator, integrator) and an onboard ±12 V supply.

01. Title

Op-Amp Trainer Kit

02. Introduction / Background

Operational amplifiers are the most versatile building block in analog electronics, yet students often meet them only as equations — the inverting and non-inverting configurations stay on paper. A trainer kit with a socketed op-amp, onboard dual supply and patch-cord-selected modes lets the student wire each classic configuration in minutes and watch it work on a scope, building intuition that survives the exam.

03. Problem Statement

Analog-electronics labs need a reusable platform where students can configure and measure the standard op-amp circuits quickly and safely. Breadboarding from scratch each time wastes lab hours and invites wiring errors; a dedicated trainer with selectable modes, buffered test points and a protected onboard supply solves this.

04. Objectives

- Provide six selectable op-amp modes: inverting, non-inverting, summing, difference, comparator and integrator.
- Use a socketed TL072 so the IC can be swapped and the kit survives mistakes.
- Include an onboard regulated ±12 V dual supply so no external supply is needed.
- Supply a complete experiment manual with theory, wiring steps and expected waveforms.

05. Proposed Methodology

The TL072 sits in a socket on the trainer board, powered by an onboard ±12 V regulator pair. Each mode's resistor network is brought to patch terminals; the student connects the configuration with patch cords, applies a function-generator input, and measures gain, phase and waveform at buffered test points. The manual derives each circuit's transfer function and states the expected readings, which the student verifies.

06. System Architecture / Working

- Onboard ±12 V dual supply → socketed TL072 power pins
- Mode resistor networks → patch-cord terminals → op-amp input/output
- Function-generator input → selected configuration → buffered test points
- Oscilloscope/multimeter → measured gain, phase, waveform vs theory

07. Hardware / Software Requirements

- TL072 dual op-amp in socket
- Onboard ±12 V regulated dual supply (transformer/adapter based)
- Patch-cord terminals, mode resistor networks, test points
- Experiment manual; function generator + oscilloscope for the lab (student side)

08. Expected Outcomes

- Six working, measurable op-amp configurations on one board.
- Student-measured gains matching the theoretical derivations in the manual.
- A complete experiment manual with theory, steps and expected waveforms.
- Complete report, PPT and viva Q&A; on op-amp circuits.

09. Applications

- Analog-electronics lab sessions across inverting/non-inverting amplifier experiments.
- Demonstrating summing, difference, comparator and integrator behavior live.
- A reusable department asset for op-amp coursework and viva preparation.

10. Future Scope

- Add active-filter modes (low-pass, high-pass, band-pass).
- Add a Wien-bridge oscillator mode using the same socketed op-amp.
- Add a digital readout of gain/phase using a small microcontroller add-on.