

**Experiment 10:** Design and implementation of analog circuits using op-amp and MOSFET.

## Objectives

In this experiment student will attempt to design an analog circuit to perform some assigned functions by applying the knowledge what they've learned from previous experiments. During the laboratory period student will assemble and test the designed circuit for a successful implementation. Student will demonstrate the circuit's performance at the end of the lab session, and also will provide a more detailed description of its performance in the lab report.

## Core Equipment:

MOSFET, Op-Amp.

## The Design Problem

Design an automated room size ratio to volume controller using the basic concept of analog electronics. The system should be capable to identify the room size and also will amplify or de-amplify the volume of the audio signal based on the size of the room.

Task specifications:

- Student should be gone through the recent technologies to incorporate a suitable detector in their design to realize the room size.
- Student should design the circuit beforehand and simulate it in a circuit simulator (Modern engineering tool) to understand the operation of their proposed design.
- Student will implement the hardware during the laboratory time and will be allowed to do minor adjustment to achieve the design goal.
- Student should maintain the ethics and standards of professional engineers.

## Deliverables

### 1. Lab report (Hardcopy)

The proposed design will be demonstrated in the lab report that student must submit along with the following documents in support of it:

- ✓ The final detailed specification of the design.
- ✓ A comprehensive system block diagram identifying all sub-circuits and their various purposes
- ✓ A complete circuit schematic identifying all component values
- ✓ Data (frequency response plots, oscilloscope screen shots, simulation outcome, etc.) demonstrating that the circuit meets the design specification.

- ✓ Student must attach a picture of the hardware implementation as an evidence that student has used analog trainer power supply, the signal generator, and the oscilloscope.

## 2. Simulation file and Demo Video (Softcopy)

- ✓ Student will also submit the simulation file.
- ✓ Student may submit a demo video to provide a live demonstration of the system.

### Marking Rubrics

Criteria	2	1	0	Marks
Depth of Knowledge on analog circuits to support the proposed design. (P1 and K5)	Demonstrate extensive knowledge on analog electronics and use first principle analytical approach (FPAP)	Demonstrate moderate knowledge on analog electronics and hardly use FPAP.	Demonstrate poor knowledge on analog electronics and doesn't use FPAP.	
Knowledge on analog technologies to select appropriate components to meet the desired needs. (K6)	Capable to select equipment accurately to serve the design purpose.	Capable to select equipment moderately to serve the design purpose.	Capable to select equipment inaccurately.	
Use laboratory instruments following Standard Operating Requirement. (P5)	All the procedures are clearly listed in steps and design is easily reproducible based on those steps.	All the procedures are listed with few gaps in information but it would allow one to replicate design.	Procedures are not accurately listed.	
Ability to write laboratory reports, including figures, tables and graphs.	Professional and accurate representation with appropriate label and title.	Accurate representation but without appropriate label and title.	Data are Inaccurate, representation is poor.	
Verify and conclude experimental results	Conclusion includes summary where the findings supported the hypothesis, possible sources of error, and what was learned from the experiment were clearly emphasized.	Conclusion includes overview of the task And what was learned from the experiment were only highlighted.	Conclusion reflects little effort.	
Total Marks:				