

**ECE2002 - ANALOG ELECTRONICS CIRCUITS**

# **FM TRANSMITTER**

## **FINAL PROJECT REPORT**

**Submitted by**

**SOUBHAGYA ROUTRAY (19BEC0237)**

**SANKHA PATRA (19BEC0864)**

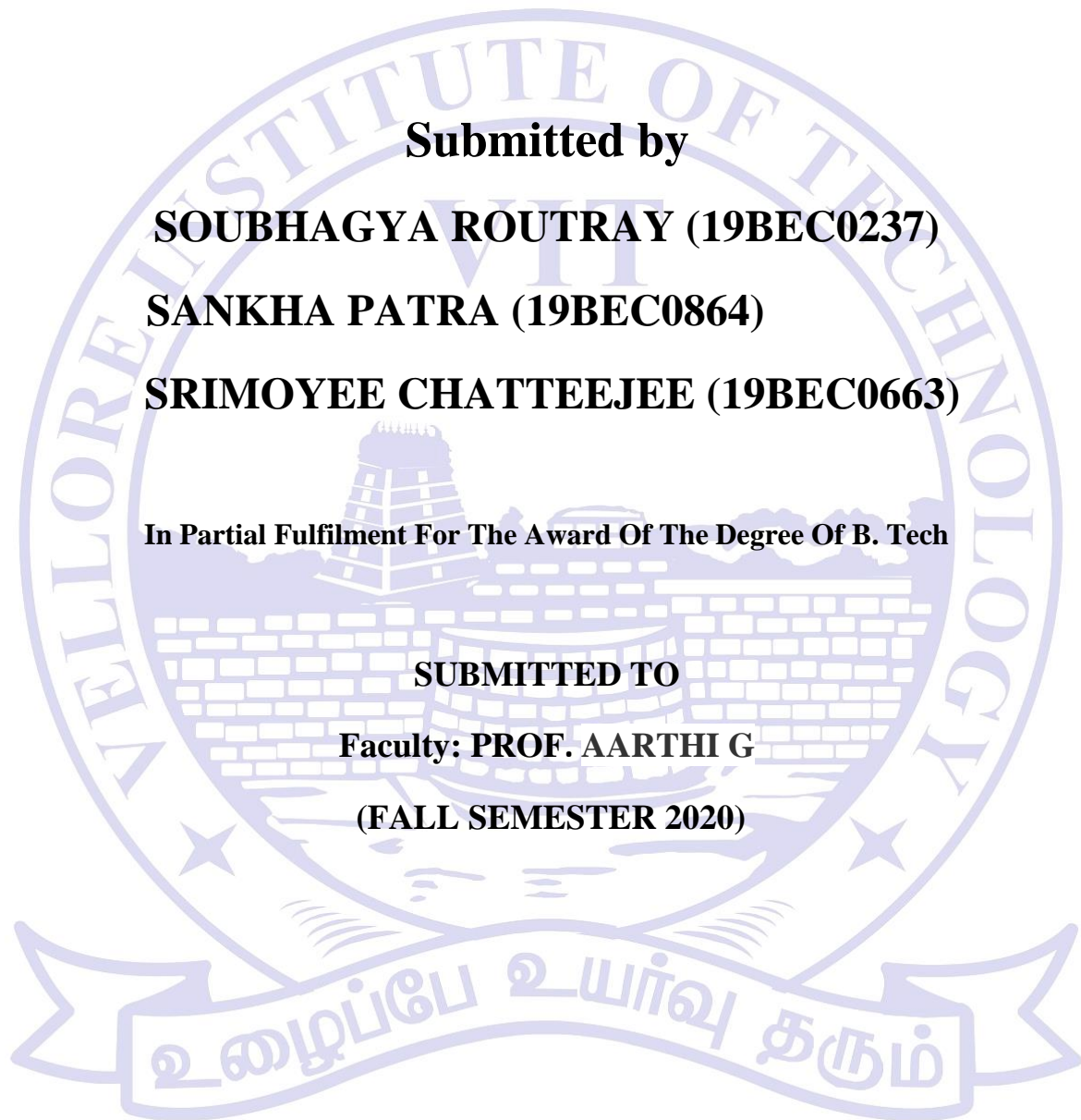
**SRIMOYEE CHATTEEJEE (19BEC0663)**

**In Partial Fulfilment For The Award Of The Degree Of B. Tech**

**SUBMITTED TO**

**Faculty: PROF. AARTHI G**

**(FALL SEMESTER 2020)**

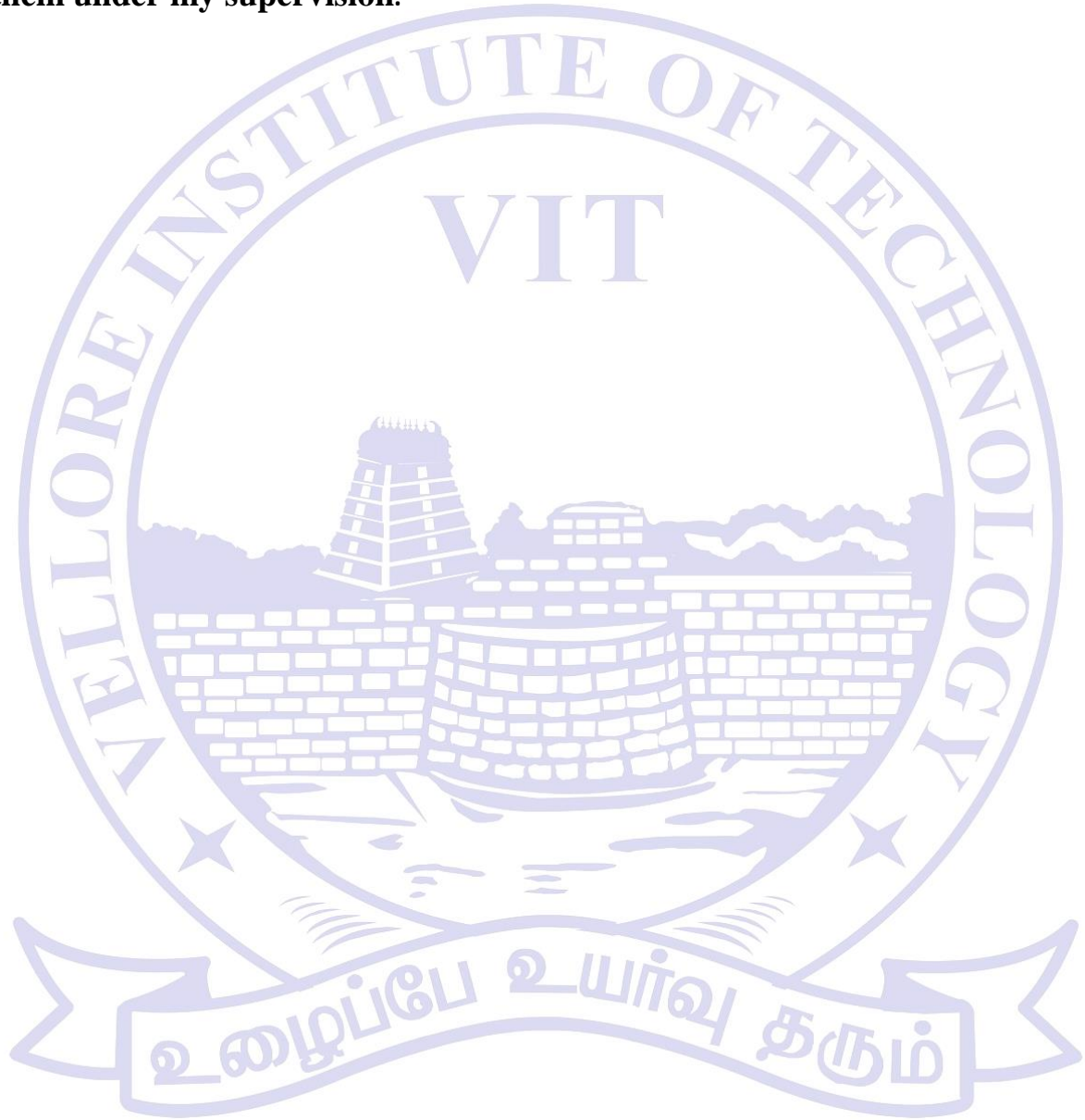


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Vellore-632014, Tamil Nadu, India

# CERTIFICATE

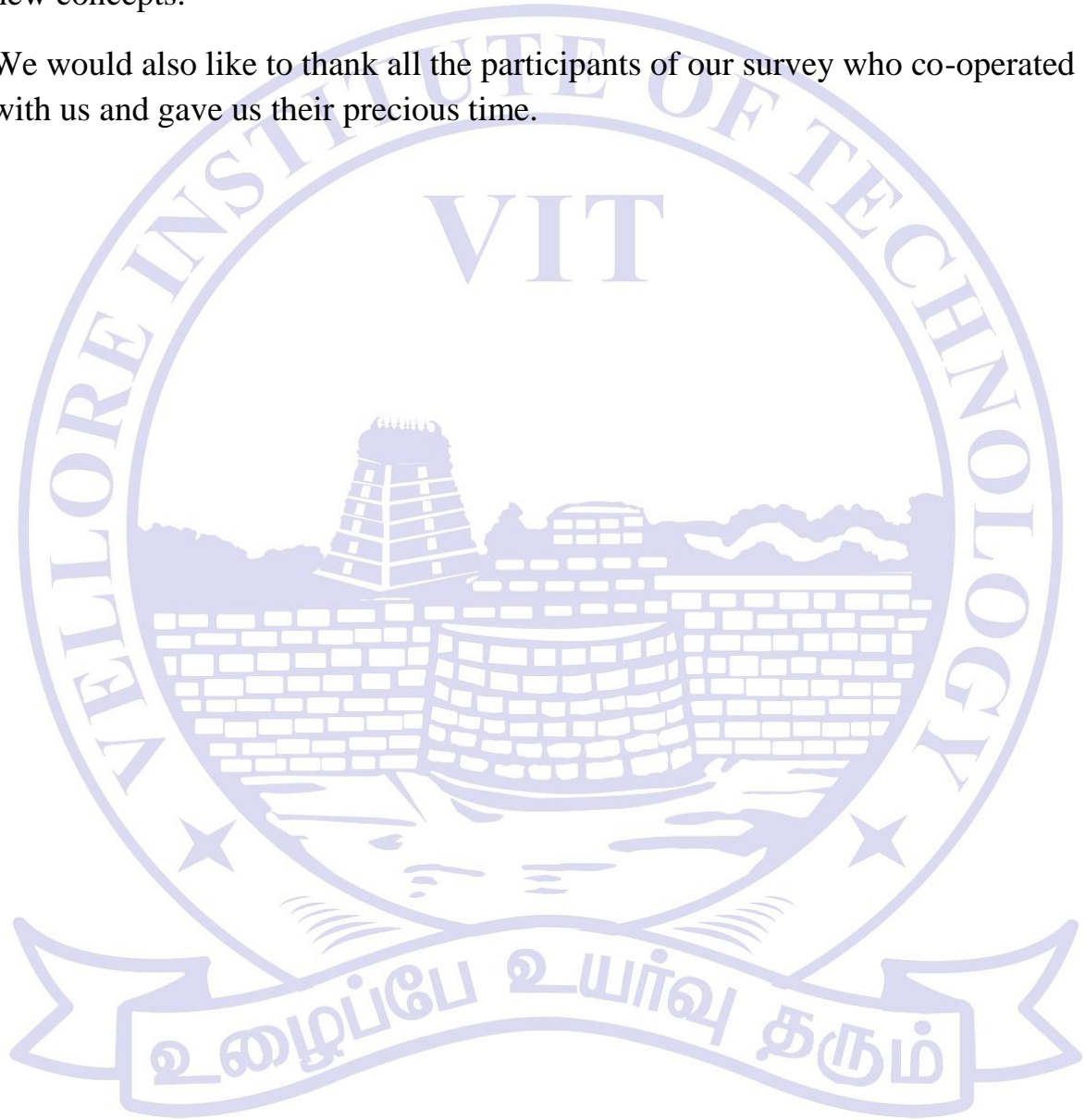
**This is to certify that the project work entitled “FM TRANSMITTER” submitted by SOUBHAGYA ROUTRAY (19BEC0237), SANKHA PATRA (19BEC0864) and SRIMOYEE CHATTEEJEE (19BEC0663) to Vellore Institute of technology, Vellore, is a bonafide project work carried out by them under my supervision.**



## ACKNOWLEDGEMENT

We would like to express our special thanks and gratitude to our professor and the project guide **Prof. AARTHI G** as well as **VIT University** who gave us this golden opportunity to work on this wonderful project in the subject **ANALOG ELECTRONICS CIRCUITS**, which helped us in research and helped us learn new concepts.

We would also like to thank all the participants of our survey who co-operated with us and gave us their precious time.



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# 1. OBJECTIVE OF THE PROJECT

The project's goal is to create an FM transmitter which transmits a signal or sound to an FM Transmitter without need of cables. We will be building the circuit using Multisim. To review present day FM Transmitter and their limitations. The FM Transmitter used in wireless microphones also find huge application in mobile phones as these circuits are integrated in them thus music is played without the need of cables.



## 2. INTRODUCTION

Frequency Modulated (FM) signal transmitter is a small device that can transmit Frequency Modulated signal over short range.

The FM transmitter receives human voice signals through microphone which is simulated using an AC voltage source in Multisim. It further amplifies it, modulates it over carrier and finally transmits it. Ideally, the output of the transmitter can be received by anyone who tunes it in the frequency of our transmitter.

A short-range FM transmitter is a low-power FM radio transmitter that broadcasts a signal from a portable audio device (such as an MP3 player) to a standard FM radio.

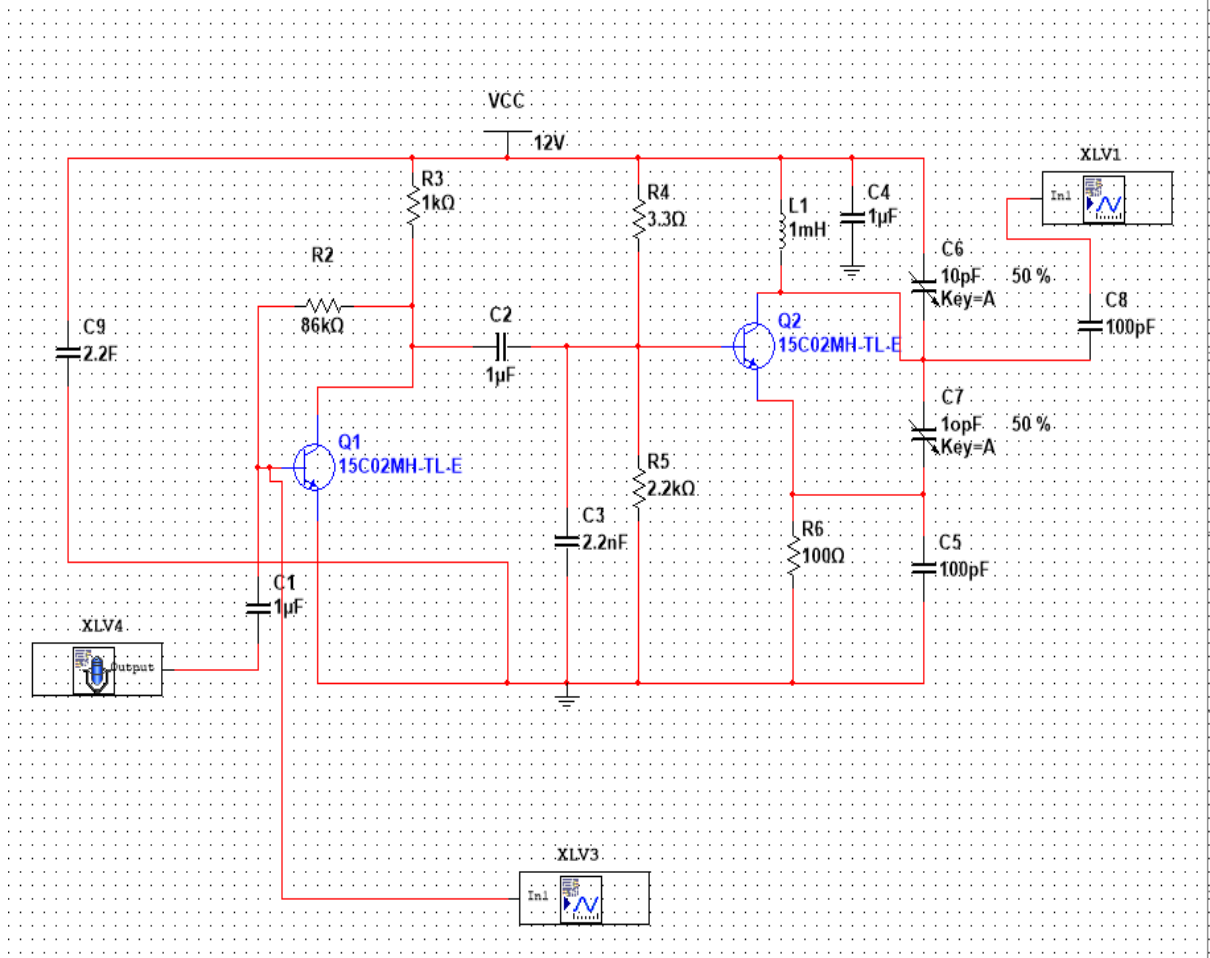
Most of these transmitters plug into the device's headphone jack and then broadcast the signal over an FM broadcast band frequency, so that it can be picked up by any nearby radio. This allows portable audio devices to make use of the louder or better sound quality of a home audio system or car stereo without requiring a wired connection.

Being low-powered, most transmitters typically have a short range of 100–300 feet (30–100 meters), depending on the quality of the receiver, obstructions and elevation. Typically, they broadcast on any FM frequency from 87.5 to 108.0 MHz in most of the world. In this project we design the circuit in such a way that, the circuit will collect the input through aux cable and broadcast with in FM frequency range.

The broadcasted output can be collected with a FM radio.



### 3. CIRCUIT DIAGRAM



## 4. COMPONENTS REQUIRED

### Capacitors:



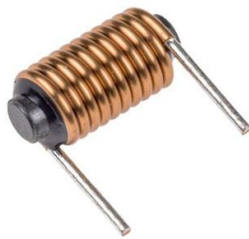
2.2F - 1 | 2.2nF - 1 | 1µF - 3 | 100pF - 2

### Resistors:



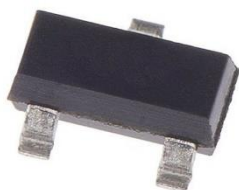
1kohm - 1 | 2.2kohm - 1 | 3.3ohm - 1 | 86kohm - 1 | 100ohm - 1

### Inductors:



1mH - 1

### Transistors:



15C02MH-TL-E - 2



**Key:**

10pF - 1 | 10pF - 1

**VCC :**

12v - 1

**Ground:**

2

**Other:**

Microphone - 1 (Input)

Antenna - 2 (Output)

## 5. COMPONENTS DESCRIPTION

C1- Coupling capacitor transmits our voice signal to transistor.

C2- Coupling capacitor

C8- Couples the signal sent to it by the combination of Q2, tank circuit which is called oscillating and modulating stage.

C9- Bypass capacitor(power supply bypass capacitor) blocks D.C signal.

R2- Collector base bias resistor( biases the base of transistor.

R3- Provides collector current

R4, R5 are bias resistor for Q2

L1,C4,C6 forms tank circuit (oscillating circuit)

C7 is a variable capacitor which is used to maximise range of transmitter

$$f = \frac{1}{2\pi\sqrt{L_1 C_6}}$$

Q1- Amplifies input signal

## 6. METHODOLOGY

**There are two stages in FM transmitter**

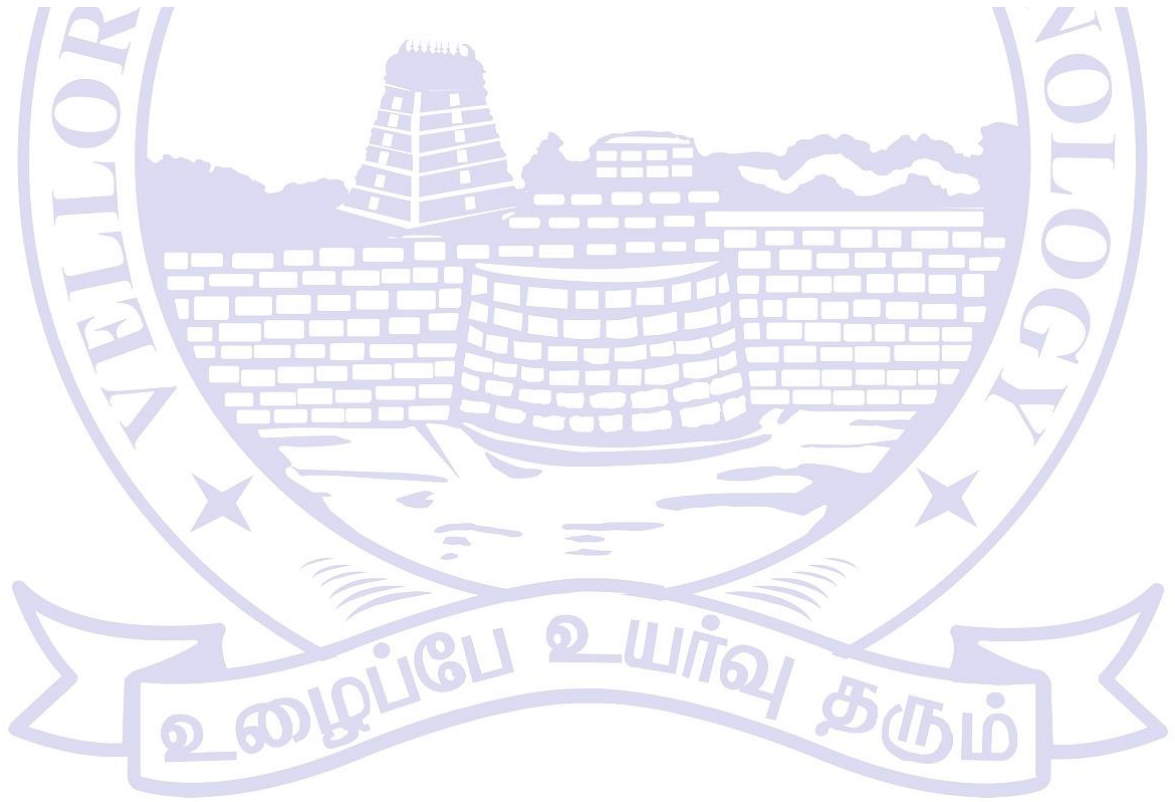
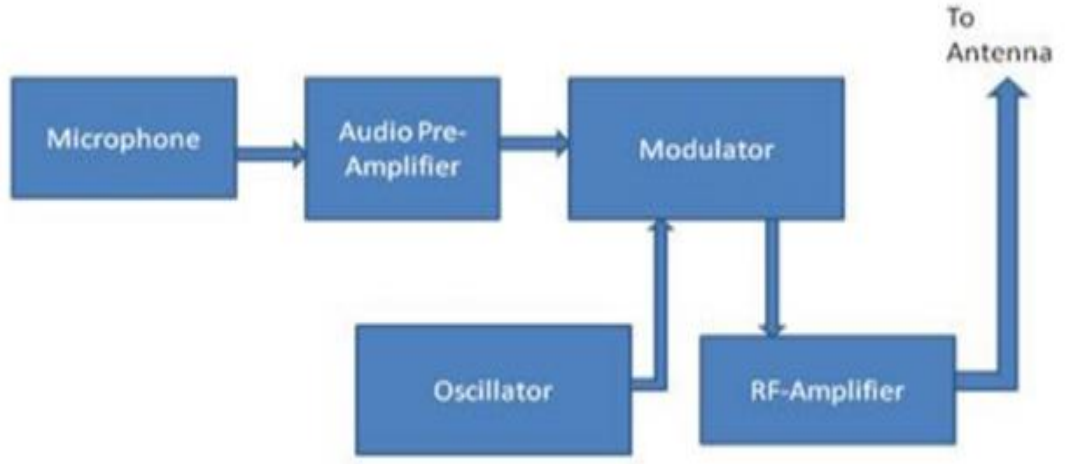
**In the first stage which is called amplitude modulation stage** and here the audio I.e input signal obtained from the mic is passed through the transistor Q1 where its amplitude gets modulated in order to modulate the output signal of the LC circuit in FM (I.e frequency modulation wave) Form.

**In the 2<sup>nd</sup> stage which is called oscillating and modulating stage** and here Q2 along with L1,C6 forms tank circuit(oscillating circuit).If the current is passed through L1 Inductor and the variable capacitor C6, the FM Transmitter Circuit will start oscillating with resonant to that of the carrier frequency (i.e frequency of the carrier signal)

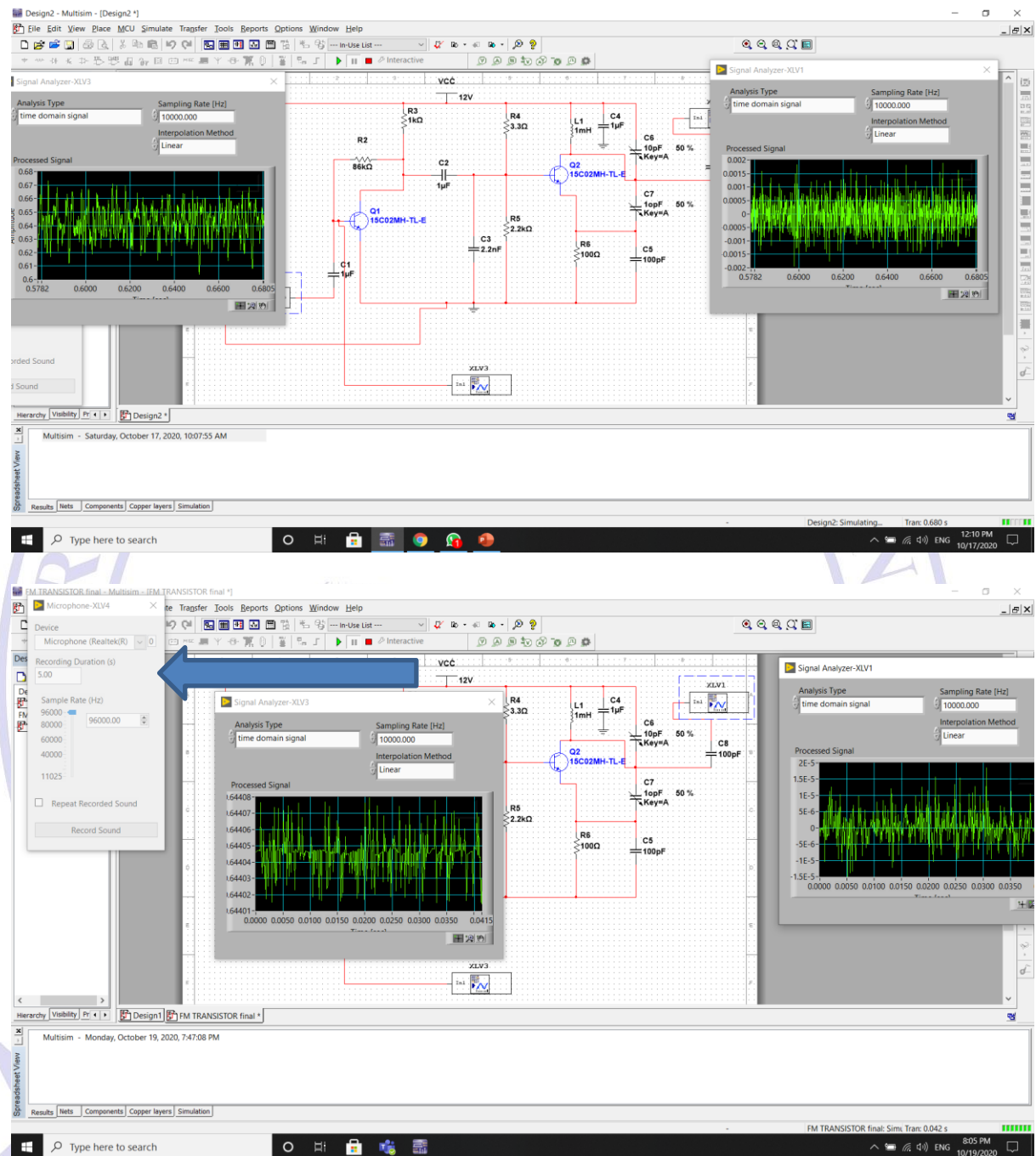
**The oscillator is required in FM Transmitter Circuit in order to generate the radio frequency carrier waves.**

Here, the main purpose of the variable capacitor is to vary the resonant frequency in order to obtain the best FM Signal Frequency band. The modulated signal is then transmit or radiated as a radio wave with the frequency of FM frequency range. Here C7 is used to maximise the range of transmitter. So in the op signal some noise is added but the op signal is modulated.

For input frequency:We can change the sample frequency through the microphone itself depending how much we want and following it our output frequency through the antenna also changes depending on what frequency we are providing at the microphone and the frequency at the antenna is measured as  $f = \frac{1}{2\pi} \sqrt{\frac{1}{L1 \cdot C6}}$ , C6 is variable capacitor whose value can be changed depending on what frequency we are providing at the microphone



## 7. RESULT AND DISCUSSION



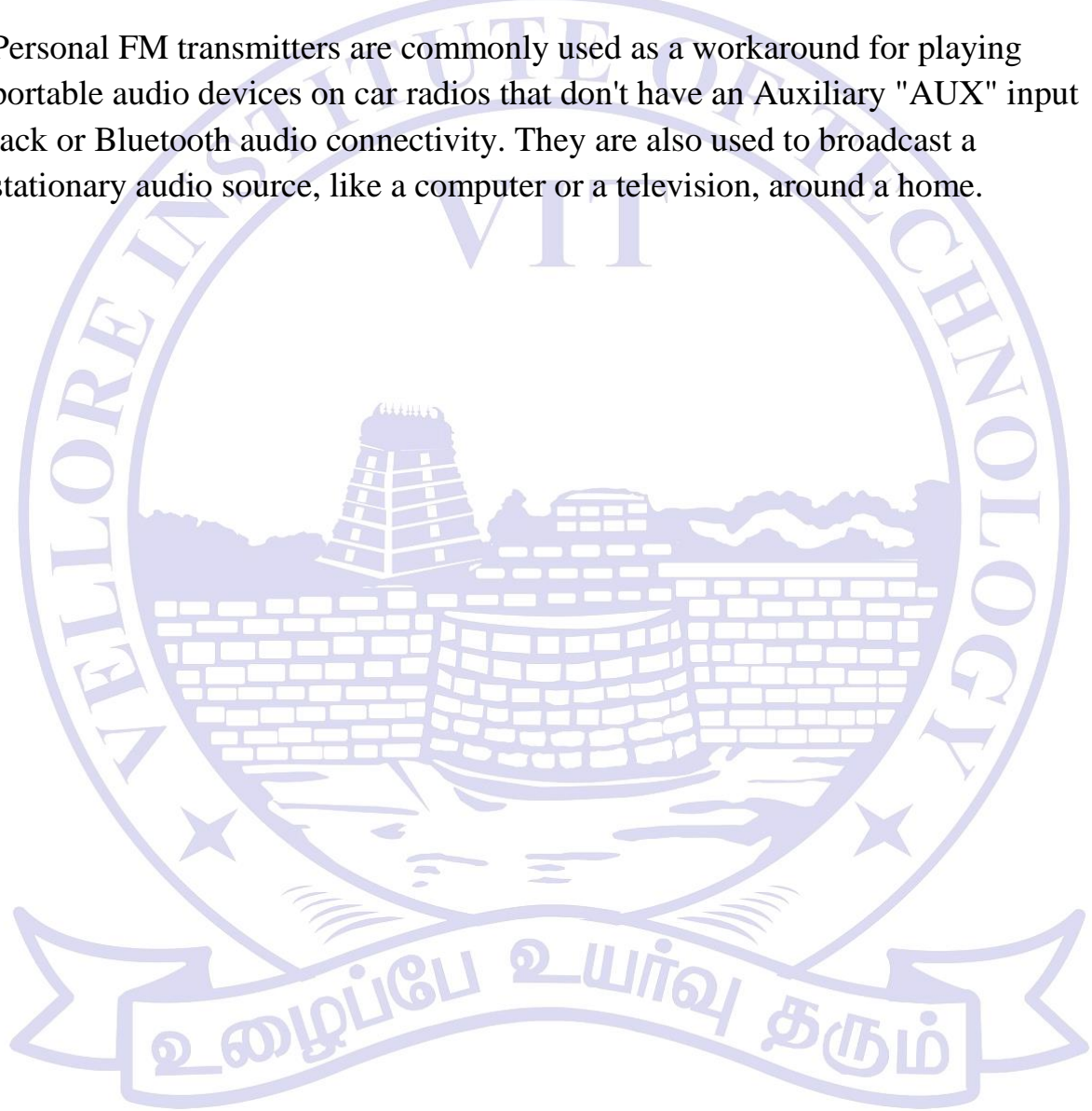
The FM transmitters are used in the homes like sound systems in halls to fill the sound with the audio source. These are also used in the cars and fitness centers. The correctional facilities have used in the FM transmitters to reduce the prison noise in common areas. The FM transmitters are easy to use and the price is low. The efficiency of the transmitter is very high. It has a large operating range. This transmitter will reject the noise signal from an amplitude variation



## 8. CONCLUSION

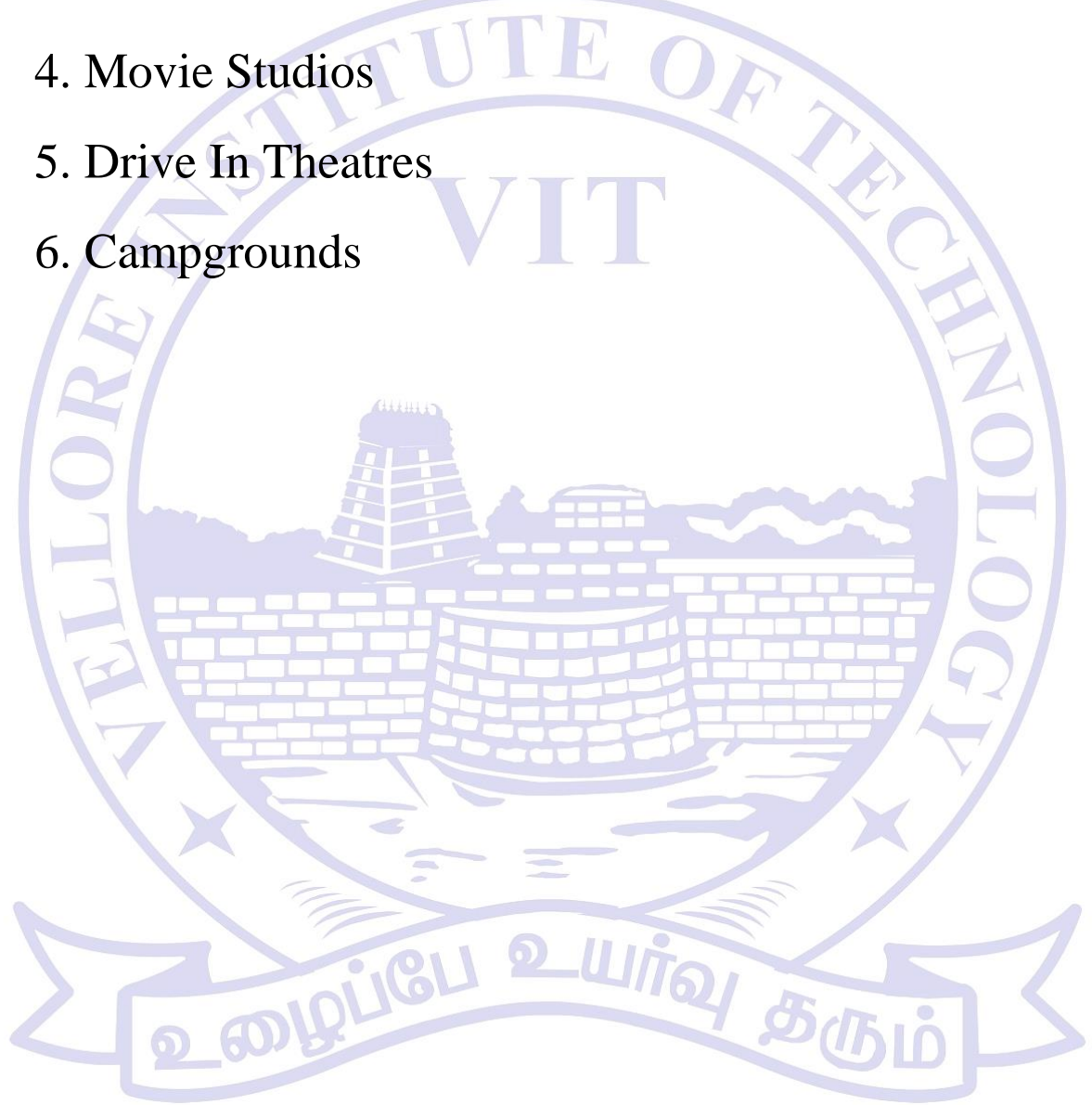
FM transmitter is a very handy and useful device to transmit to a radio station. This circuit can also be modified and extend the radius to 2km for the transmission of a radio or a song. This device is used in wireless microphones. It also finds huge application in mobile phones as these circuits are integrated in them, thus allowing to play music without the need of cables.

Personal FM transmitters are commonly used as a workaround for playing portable audio devices on car radios that don't have an Auxiliary "AUX" input jack or Bluetooth audio connectivity. They are also used to broadcast a stationary audio source, like a computer or a television, around a home.



## 9. FUTURE WORK

1. Baby Monitoring
2. Institution Organisation
3. Exhibition Halls And Trade Fairs
4. Movie Studios
5. Drive In Theatres
6. Campgrounds



## 10. REFERENCES

- [1] <https://www.elprocus.com/making-of-fm-transmitter-circuit-working-application/#:~:text=To%20generate%20the%20radio%20frequency,store%20the%20energy%20for%20oscillations.>
- [2] <https://youtu.be/tMsSe3Sw8d8>
- [3] <https://youtu.be/HqZKp05H2Mw>
- [4] R.L. Boylestad, Introductory Circuit Analysis, Eleventh Edition, Prentice Hall, 2007.
- [5] N. Braga, Pirate Radio and Video: Experimental Transmitter Projects, Newnes Butterworth-Heinemann Publishing, 2001..

