# Microwave Engineering Lab

**Block No.4, Room No. 432, ECE Dept., MAIT**

## Aim and Objectives

**Microwave** systems have created a great impression on our society with the fast and excess production of various consumer yields. It extends openings for acquiring knowledge about in what way it can benefit the society for growing changes in the high frequency application.

Laboratory courses are an important aspect of any engineering curriculum. To make the learning process more effective, the experiments are performed which includes realistic elements, which can help to upgrade the knowledge of students. Hardware and software tools can be used by the students to become familiar with the objectives, equipments, procedures, calculations, and the expected outcome of the experiment.

The main objective of Microwave Engineering Laboratory is to familiarize the student with the practical application of microwave, antenna and wave propagation, to demonstrate the electromagnetic propagation using waveguide transmission line, to provide the state-of-art software for the design of various microwave circuits and also to empower the students to encounter the engineering requirements in this field. **Microwave Test benches** are used for study of rectangular waveguide transmission line characteristics. The test bench operates in X-band. Some experiments are performed using **Microwave Integrated Circuit (MIC) Kit**. **HFSS** is an **EM software tool** for simulating high frequency circuit such as antennas, RF and microwave components, microstrip filters and PCBs.

**Details of the Lab**

Total seven **Test benches** are available for study of **rectangular waveguide components**. The test bench is operated on X-band (Frequency range is 8 GHz-12 GHz). The Microwave Test Bench Comprises of high-Power source klystron and Gunn diode, isolator, Frequency meter, Attenuators, Slotted Line Section, directional Couplers, Isolators, Tee, Matched Load, VSWR meter, diode detector and various other microwave components.

**Microwave Integrated Circuit (MIC)** Kit in S band are also available to study the different components fabricated from microstrip transmission line.

**HFSS software** has been added to this Lab to achieve another milestone in terms of designs and simulations of microwave components.

## List of Experiments

1. To study Microwave Components at X-band.
2. To measure the frequency and wavelength using slotted line section and frequency meter.
3. To measure the Isolation and Insertion loss of Isolator and Circulator.
4. To study E-plane, H-plane and Magic Tee.
5. To measure Coupling Factor, Directivity and Isolation of directional coupler.

6. To measure VSWR and Reflection coefficient of different loads.
7. To study the characteristics of reflex Klystron & Gunn diode
8. Simulation of Transmission line: Waveguide & Coaxial line using HFSS*.
9. Simulation of directional coupler using HFSS. *
10. Simulation of E-plane and H-plane Tee using HFSS. *
11. Study of micro strip line and LPF using MIC kit/Software.
12. Study of BPF using MIC kit/ Software.

**List of Experiments Beyond Syllabus**

1. Measurement of radiation pattern of waveguide Horn antenna
2. Study of Microstrip patch antenna by simulation using HFSS Software*.

* These experiments may be performed using simulation software like HFSS, CST or IE3D (for planar circuits) etc.