NARULA INSTITUTE OF TECHNOLOGY

Department of Electronics & Communication

LAB PROFILE

BASIC ELECTRONICS LAB

Objectives:

This is a first level laboratory in which students are introduced with Electronics & Communication Engineering for the first time and are trained with preliminary of Electronics.

Experiments:

Training in this laboratory is done through properly planned structured programme with the following sequences:

i) Introduction and identification of different active and passive electronic devices / components.

ii) Familiarization with different signal sources and instruments used in electronic engineering. In the process student can learn the significances of the manufactures specifications etc.

iii) To learn the use/ handling of different measuring instruments like multimeters, C.R.O etc.

iv) Find and studies on the various characteristic of different active devices like diodes (PN Junction Diode, Zener Diode, LED) transistors, field effect transistor, Photodiodes and to determine the different parameters of these devices

v) To recognize Half Wave & Full Wave rectified sinusoidal signal & find out different parameters.

vi) Familiarization with op-amp & measurement of it's different parameters.

vii) Implementation of different logic gates & Boolean functions using different Ics.

Facilities available:

1. In this laboratory there are sufficient number of working benches (nearly 10), so that the students can work comfortably. Each of the benches are fully equipped with:

a) Signal sources

b) Power supply

c) Measuring instruments like digital multimeter, C.R.O etc.

2. There are two working benches are set aside for assembly of circuits, with facilities of soldering and desoldering, electronic tool kits etc.

Major Equipment in the Lab

1. Various power supplies – fixed and variable variety with different current rating. Make – Enova, Aplab etc. Some of the power supply are in use designed and fabricated technical staff of the department.
2. Digital multimeters (Mastech ,Vartech)
3. Cathode ray oscilloscope (Scientech)
4. Function Generator (Scientech)
5. Regulated DC power supply (Scientech)
6. FET Test Set (Detech, Scientech- Nvis Technologies)
7. PN Junction Diode / Zener Diode Test Set (Detech, Scientech- Nvis Technologies)

8. Op-Amp Power Supply (Sushma Electronics)
9. Rectifier Test Set (Detech, Scientech- Nvis Technologies)
10. Op-Amp Test Set (Microtech Industry)
11 Transistor Test Set (Detech, Scientech- Nvis Technologies)
12 Multi power Supply (Scientech)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. Most of the technical staffs have undergone first aid and fire fighting training.

DIGITAL ELECTRONICS LAB

Objectives:

Digital Electronics is technology subject which is intended to make students familiar with different types of designs as sequential logic circuits, combinational logic circuits, trouble shooting of various digital systems & study of various digital systems. Knowledge of basic electronics & digital techniques is useful in understanding theory and practicals of the subjects. For years, applications of digital electronics were confined to computer systems. Today digital electronics are applied in many diverse areas such as telephony, data processing, radar, navigation, military systems, medical instruments, process controls etc.

Experiments:

In this laboratory students are introduced with digital ICs and their specifications and are skilled with practical digital circuit design. Training in this laboratory is done with accurate planned structured programme with the following sequences:

i) Introduction and identification of different digital IC chips and their specifications, concept of V_{cc} and ground, verification of the truth tables of logic gates.

ii) To learn the use of different ICs and LEDs for designing logic circuit and verifying the results respectively.

iii) Study of basic gate diagrams and realize the same with universal logic gates .

iv) Realization of different codes and also the conversion technique like BCD to Excess-3 and vice-versa, BCD to decimal to drive 7-segment display using multiplexer etc.

v) Construction of various combinational circuits such as adder, adder circuit using shift Register

and full adder, subtractor, simple decoder, multiplexer, parity generator and comparator using logic gate ICs or any specific chip.

vi) Study of the difference between combinational and sequential circuit and realize the need of function generator,CRO for the design of sequential circuits like RS-JK and D flip-flops using universal logic gates; universal Register using JK flip-flops and logic gates or using multiplexer and flip-flops ; asynchronous & synchronous up/down counter; ring counter and johnson's counter sequential counter with irregular sequences etc.

Facilities available:

Sufficient number working benches (more than 8) are there in this laboratory for the easiness of students work. Each of the benches are fully equipped with:

i) Power supply

ii) Function Generator

iii) C.R.O etc.

Major Equipment in the Lab

1. Fixed and variable Various power supplies (Elnova, Aplab)
2. Multiple power supply (Scientech)
3. Digital multimeters (Metravi,Mastech)
4. Function generators: (Aplab,Systronics,Intilect,Scientech)
5. Cathode ray oscilloscope (Aplab)
6. IC Tester:
7. Digital IC Tester (Minmax Electronics)
8. Analog IC Tester (Minmax Electronics)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and

precautionary measures that has to be adopted in any electrical laboratory.

2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. Most of the technical staffs have undergone first aid and fire fighting training.

ANALOG ELECTRONICS LAB

Objective:

The laboratory introduces students to practical, circuit design and contributes significantly to provide them with engineering skills. The experiments covered in this laboratory are synchronized with its theoretical part, so that students might be able to understand the practical aspects of it. Students can build simple circuits by understanding electronics schematics and set working prototype circuits. The purpose is to teach analog circuit design theory and to give the student an understanding of the factors governing the behavior of electronic circuits. Topics covered also demonstrate the need for strong electronic component in other scientific and engineering fields. The students are encouraged to analyze the requirements and determine the fundamental criteria of sound circuit design the main intention of this laboratory is to give introduction to different steps used in the design of electronic systems according to industrial standards.

Experiments:

In this laboratory students are introduce to design, assembly, testing, and trouble-shooting of analog electronic circuits. Experiments encompass a wide range of topics such as amplifiers, filters, power supplies, power control, oscillators, and communication circuits. In this laboratory experiments are done through following planned sequences:

1) Learn the various applications of diode like-clipper, clamper, full wave rectifier etc.

2) Study voltage regulator using Zener diode and measure ripple and regulation characteristics without and with capacitor filter.

3) Find and studies on the various characteristic of B.J.T & F.E.T and to determine their different parameters.

4) Study some important aspects of different power amplifiers configurations.

Eg.- class A & class B, class C & Push-Pull amplifiers

5) Design a two-stage R-C coupled amplifier & study of its gain & Bandwidth.

6) Realization of different applications of operational amplifier - current mirror, level shifter circuit & V-to-I , I-to-V converter,.

7) Find and studies the different configuration of multivibrators using NE 555

8) Design and construct switched mode power supply, voltage regulator using regulator IC chip

9) Construction of simple function generator using IC chip.

10) Study of a digital to analog converter and vice versa.

Facilities available:

1. In this laboratory there are sufficient number working benches (nearly 10), so that the students can work comfortably. Each of the benches are fully equipped with:

    a) Function generator

    b) Power supply

    c) Measuring instruments like digital multimeter, Cathode Ray oscilloscope, LCR meter etc.

2. There are two working benches are set aside for assembly of circuits, with facilities of soldering and disordering, and other testing equipments like DSO, Power meter etc which are mainly used for project and some innovative experiments.

Major Equipment in the Lab

1) Function generator- (Scientech)

2) Variable Power supply: fixed and variable variety with different current rating. Make – Elnova, Scientech etc. Some of the power supply is in use designed and fabricated by students and technical staff of the department.

3) Digital multimeters (Mastech-M3900)

4) Oscilloscope

i) Cathode Ray Oscilloscope. (25MHz, 30 MHz, scientech)

ii)Digital Storage Oscilloscope. (100MHz, scientech)

5) L.C.R Meter(Aplab).

6) Distortion Meter(Scientech).

7) Output Power Meter. (Scientech)

8) Trainer Kit.

a) Transistor Push Pull Amplifier. (Omega)

b) Switch Mode Power Supply. Nvis technologies

c) Analog To Digital Converter. (Scientech)

d) Digital To Analog Converter. (Scientech)

e) V.C.O & PLL. (Scientech)

f) Tuned Amplifier. (Scientech)

g) Push Pull Amplifier.(Scientech)

h) Class A Amplifier. (Scientech)

i) Class B Amplifier. (Scientech)

j) Class C Tuned Amplifier. (Scientech)

k) Transistor Characteristics Trainer. (Nvis technologies)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. Most of the technical staffs have undergone first aid and fire fighting training.
5. Laboratory is equipped with and Emergency Power Off System.
6. All students, are advised to obey the dos' and don'ts mention in the lab.

MICROPROCESSOR AND MICROCONTROLLER LAB

Objectives:

In the last twenty five years or so, microprocessors and microelectronics in general have brought about a revolution in computer science, manufacturing, telecommunications as well as in space and high-energy physics. In view of the impact of this new technology .In recent years the Laboratory has organized and provided support not only to courses strictly related to Microprocessors, but also to other activities related to telematics, programming of real-time systems, data acquisition systems, digital signal processing and scientific instrumentation. The goals of this lab is to supplement the theory course (Microprocessor and Micro-controller) to assist the students in obtaining a better understanding of the operation of Microprocessor and Micro-controller architecture, programming ,and application part to provide experience in analyzing and test of Microprocessor and Micro-controller using trainer kits .The basic function of these lab is :

- To understand basic theories of Microprocessor and Micro-controller system
- To learn the programming of Microprocessor and Microcontrollers.
- To understand the applications Microprocessor and Micro-controller and different peripheral systems.

Experiments:

i) Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical).

ii) Familiarization with 8085 simulator on PC

iii) Programming using kit and simulator for:

a) Table look up

b) Copying a block of memory

c) Shifting a block of memory

d) Packing and unpacking of BCD numbers

e) Addition of BCD numbers

f) Binary to ASCII conversion

g) String Matching Multiplication using Booth's Algorithm

iv) Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit e.g. subroutine for delay, reading switch state and glowing LEDs accordingly

v) Study of timing diagram of an instruction on oscilloscope .

vi) Keyboard and Multi-digit Display with multiplexing using 8255

vii) Study of 8051 Micro controller kit and writing programs for Interfacing of Keyboard, DAC and ADC using the kit.

viii) Serial communication between two trainer kits .

Facilities available:

I. In this laboratory there are sufficient number working benches (more than 10), so that the students can work comfortably. Each of the benches are fully equipped with:

Sl no.	Name of the equipment	Model no.
1	8085 Microprocessor trainer kit	ESA 85-2
2	8085 Microprocessor trainer kit	VMC 8501
3	8051 Microcontroller trainer kit	VMC 51 LCD
4	8085 Microprocessor trainer kit	85-04
5	8085 Microprocessor trainer kit	SBSI
6	8051 Microcontroller trainer kit	Silicon
7	Seven segment display interface module	VMC 8501&51LCD
8	DC motor interface module	VMC 8501&51LCD

9	Stepper motor interface module	VMC 8501&51LCD
10	EPROM Eraser	-

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. Most of the technical staffs have undergone first aid and fire fighting training.

SIGNALS & SYSTEMS LAB

Objective:

The Signals and Systems is concerned with the representation of signals and the study of the changes that occur to them as they pass through systems. The study of Signals and Systems is to allow one to predict, with some certainty, the behaviour of systems when they are subjected to different input signals. The problem solving and analytical skills that the student acquires through the study of the subject can often help him in his later career to tackle and solve problems in a systematic manner.

Looking ahead, the scope of potential applications of the methods of Signals and Systems will continue to grow as engineers are faced with new challenges involving ever more complex systems and processes.

Experiments:

Software part

1. Students can visualize the Z-domain analysis of: a) Sinusoidal signals b) Step functions.

2. Verify the output of Fourier and Laplace transformations of a signal.

3. To study convolution theorem in time and frequency domain.

4. To Study Signal Synthesis via sum of harmonics.

Hardware part

1. To study LPF &HPF, band passes and rejects filters using RC circuits.

2. To demonstrate how analog signals are sampled and how different sampling rates affect the outputs.

3. To study sampling theorem for low pass signals and band pass signals.

4. To determine the components of: a) Square wave b) Clipped sine wave.

Facilities available:

1. All the hardware experiments are done by the students component wise.
2. Each setup consists of a bread board, Signal source, Digital multimeter and CRO.
3. In case of simulation part, couple of students may work on a single PC.

Major equipments in the lab:

1. Cathode Ray Oscilloscope (Scientech ,20MHz, 25MHz, 30 MHz, 50 MHz)
2. Function Generator: i) Scientech, ST-4060,1MHz
    1. Instek, GFG-8216A, 3MHz

3. Digital Multi-meter (Metravi-19)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that have to be adopted in any simulation based laboratories, like don't enter with shoe, switched off the PC before leaving the lab, never used infected pen drive or CD in the lab, etc.

2. For hardware experiments, faculty and technical assistances monitor the proceedings all the time and instruct how to handle electrical equipments, like, when to power on, how to take readings, analysis of the results with respect to the theory, etc,

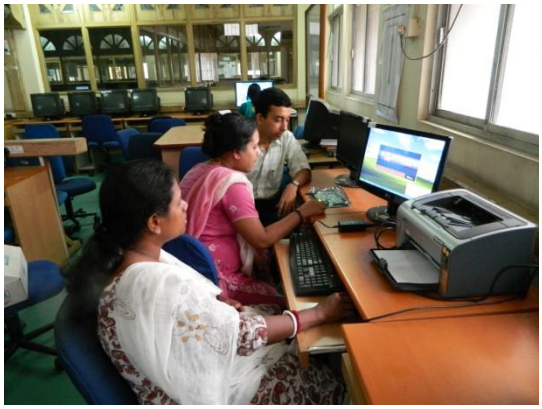
3. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

4. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

5. Most of the technical staffs have undergone first aid and fire fighting training.

DIGITAL SIGNAL PROCESSING LAB

Objective:



Digital Signal Processing (DSP) can be described as the processing of signals using digital techniques or digital computers. A signal is a piece of information in binary or digital form. Digital Signal processing techniques improve signal quality or extract important information by removing unwanted part of the signal.

Digital Signal Processing accounts for a substantial proportion of the world market for electronic devices. And therefore, the leading electronics manufacturers have invested heavily in DSP technology.

Experiments:

1. Realization of different kinds of discrete signals.
2. Effect of different arithmetic operations on the discrete signals.
3. Study the utility of convolution of two sequences using different methods.
4. Familiar with frequency domain analysis of the discrete signals using z-transform and Fourier transform.
5. Simulate DFT & IDFT & study their properties.
6. Study the difference between linear and circular convolution and its application.
7. Realization of the Butterworth Filter with different set of design parameters.
8. Simulation of FIR Filters using Rectangular, Hamming, Hanning, Bartlett windows and comparisons of these designs
9. Realization of the filters using DSP module made by Texus Instruments. We have TMS5416 module for audio signal processing and TMS6713 for Image processing.

Facilities available:

1. In this laboratory 33 Desktop PCs are available equipped with Matlab software.
2. All the PCs are connected with LAN and internet connection.
3. Hands on experiment with real time signal can be precessed using TMS Kit.
4. The lab is fully AC.

Major equipments in the Lab:

1. Desktop PC
2. DSP Starter Kit TMS320C5416 (Texus Instruments)
3. DSP Starter Kit, TMS320C6713 (Texus Instruments)
4. 50 MHz CRO
5. 10MHz Function Generator
6. MATLAB 7.0.1 (Mathworks)
7. MATLAB 2008b (Mathworks)
8. DELL workstation

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any simulation based laboratories, like don't entere with shoe, switched off the PC before leaving the lab, never used infected pen drive or CD in the lab, etc.

2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

4. Most of the technical staffs have undergone first aid and fire fighting training.

5. To grow the interest on DSP, some experiments beyond the syllabus are performed as below:

We have implemented one experiment on music signal.

a) Extract the high and low frequency components of the signal and play it using an amplifier.

b) Change the Bass and Treble according to our needs.

c) Also modify the volume.

d) Adding noise to the signal

e) Design our own filter and tested it on a noisy signal.

SOLID STATE DEVICE LAB

Objectives:

This lab is newly introduced in the curriculum of WBUT for the B.Tech students of ECE 2nd year 3rd semester. The purpose of this lab is to realize the characteristics of various semiconductor devices such as BJT, JFET, and RC coupled amplifiers etc. using breadboard and also using suitable software.

This lab gives the proper justification of theoretical knowledge in practical domain by the help of numerous components and equipment present in the laboratory.

Experiments:

1. Study the input characteristics curve of BJT in Common Emitter mode of operation.
2. To obtain the output characteristics curve of BJT in Common Emitter mode of operation. Hence determine the hybrid parameters.
3. To observe the drain and transfer characteristics of JFET. Hence determine the FET parameters.
4. Study the variation of small signal voltage gain with frequency of JFET.
5. Observe the variation of small signal voltage gain with frequency for single stage CE amplifier.
6. Analysis of the drain and transfer characteristics of a MOS structure using suitable software.
7. To obtain the C-V characteristics of Varactor diode using suitable software.

Facilities available:

1. In this laboratory there are sufficient number of working benches (more than 10), so that the students can work comfortably. Each of the benches are fully equipped with:

a) Function Generator

b) Power supply

c) Measuring instruments like digital multimeter, A.C milli voltmeter, C.R.O etc.

2. There is a working bench, set aside for assembly of circuits, with facilities of soldering and de-soldering, electronic tool kits etc.

Major Equipments in the Lab

Power Supply (ATC)

CRO (ATC)

AC Millivolt meter (ATC)

Function generator (ATC)

General information about the laboratories:

1. Before starting the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. This lab is equipped enough to support the hardware projects for the final year students of ECE and also for the projects performed by the students from 2nd year onwards.
5. Many students have also taken help from this lab to participate in TECH FEST.

ANALOG COMMUNICATION LAB

Objectives:

All kind of signals we deal with in nature are analog. Analog Communication is an essential part of modern day technology. The course provides comprehensive, hands-on instruction in the terminology, principles, and applications of the analog communication circuits.

Experiments:

This is a laboratory where students are aquinted with Communication Engineering for the first time and are skilled with preliminary of Communication .Training in this laboratory is done through properly planned structured programme with the following sequences:

i) Measurement of modulation index of an AM signal.

ii) Measurement of output power with varying modulation index f an AM signal(for both DSB-SC & SSB).

iii) Measurement of distortion of the demodulated output with varying modulation index of an AM signal (for both DSB-SC & SSB).

iv) Measurement of power of different frequency components of a frequency modulated signal & the measurement of the bandwidth.

v) Design a PLL using VCO & to measure the lock frequency.

vi) Design a FM demodulator using PLL.

Facilities available:

1. In this laboratory there are sufficient number working benches (more than 10), so that the

students can work comfortably. Each of the benches are fully equipped with:

i) Signal sources

ii) Power supply

iii) Measuring instruments like digital multimeter, A.C milli voltmeter, C.R.O, Experiment Kit etc.

2. There are two working benches are set aside for assembly of circuits, with facilities of soldering and desoldering, electronic tool kits etc.

Major Equipments in the Lab:

1. Various power supplies – fixed and variable variety with different current rating. Make – Enova, Aplab etc. Some of the power supplies are in use designed and fabricated by technical staff of the department and project students.

2. Digital multimeters : Metravi-19

3. Audio signal generators : i) Scientech, ST-4060,1MHz

ii) Instek, GFG-8216A, 3MHz

4. Cathode ray oscilloscope : Scientech (20MHz, 25MHz, 30 MHz, 50 MHz)

5. DSB, SSB/AM Transmitter Trainer kit: Scientech, ST-2201

6. DSB, SSB/AM Receiver Trainer kit: Scientech, ST-2202 (also used as super heterodyne receiver)

7. FM Transmitter & Receiver Trainer Kit; SCIENTECH, ST-2203

8. TDM Modulation & Demodulation Trainer Kit; SCIENTECH, ST-2102

9. PLL Trainer kit: Futuretech

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.

2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

4. Most of the technical staffs have undergone first aid and fire fighting training.

5. Lab is equipped with first-aid box.

DIGITAL COMMUNICATION LAB

Objectives:

Analog systems have been dominant over the last century. However, over the last two decades digital communications have become prominent because of the increase in performance it provides. Digital systems allow for increased data transmission and more resistance to noise. There are many different ways to modulate binary digital signals depending on the communication system. The goals of this lab is to supplement the theory course (Digital Communication systems) to assist the students in obtaining a better understanding of the operation of digital modulation schemes and to provide experience in analyzing and test of digital communication systems using simulation software as well as lab instruments. Also Laboratory experiments deal with the measurement of SNR, Modulation Index, PCM, and spread spectrum etc. In brief

1. To understand basic theories of digital communication system.
2. To design and implement digital modulator and demodulator
3. To understand the applications of digital modulator and demodulator circuits.

Experiments:

Analog systems have been dominant over the last century. However, over the last two decades digital communications have become prominent because of the increase in performance it provides. Digital systems allow for increased data transmission and more resistance to noise. There are many different ways to modulate binary digital signals depending on the communication system. The goals of this lab is to supplement the theory course (Digital Communication systems) to assist the students in obtaining a better understanding of the operation of digital modulation schemes and to provide experience in analyzing and test of digital communication systems using simulation software as well as lab instruments. Also Laboratory experiments deal with the following experiments:

1. To understand how Digital modulation like ASK, FSK, PSK is done & what is the output waveform.
2. Studies on Delta modulator & Demodulator using trainer kits
3. To understand the digital to Analog and Analog to Digital conversion.
4. To generate the PN sequence in lab.
5. Studies of PCM transmitter and receiver.
6. Study of line coders: UPNRZ, PRZ, BPRZ, PNRZ
7. Studies on Adaptive delta modulation using trainer kits
8. Studies on PCM/TDM system
9. Studies of direct sequence spread spectrum modulation and demodulation

Facilities available:

1. In this laboratory there are sufficient number of working benches (more than 8), so that the students can work comfortably. Each of the benches is fully equipped with:

i) Experiment Kit.

ii) Signal sources.

iii) Power supply.

iv) Measuring instruments like C.R.O.

2. There is a Spectrum Analyzer which is also used on requirement basis.

Major Equipment in the Lab

1. Various Kit: ASK, FSK, PSK, TDM, Delta Modulation, Adaptive Modulation, PCM, A/D, D/A converter etc. (Scientech)
2. Regulated dual DC Power supply
3. Multimeters: Digital multimeters.(Metravi-19)
4. Audio signal generators (Instek, Scientech)

5. Cathode ray oscilloscope.(Scientech ,20MHz, 25MHz, 30 MHz, 50 MHz)
6. Digital Storage Oscilloscope.
7. Spectrum Analyzer.(GW Instek, 1GHz)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
4. Most of the technical staffs have undergone first aid and fire fighting training.

ADVANCED COMMUNICATION LAB (B.TECH)

Objectives:

In this lab we study the latest communication techniques. The optical fiber communication technique is one of the developments in the field of communication where the information is transmitted from one place to another through optical fiber in the form of light defying the electromagnetic interference and increasing the bandwidth. Apart from this satellite communication and mobile communication is the fastest growing segment of the communication industry.

The satellite communication is where artificial satellites are launched in the orbit and are used for various applications of telecommunication, the First generation (1G) cellular systems in the U.S called the Advance Mobile Phone Service (AMPS), used FDMA and the second generation (2G) digital systems called GSM 1. The GSM standard uses a combination of TDMA and slow frequency hopping with frequency-shift keying for the voice modulation.

Experiments:

The Advance lab provides a wide range of experimental setup as follows

- Measurement of numerical aperture of an Optical Fiber.
- Measurement of Propagation loss, bending loss, and Connector loss in an Optical Fiber.
- Studies of LASER Characteristic: A) Optical Power (Po) of a LASER Diode Vs LASER Diode Forward current (IF). B) Monitor Photo Diode Current (Im) vs. LASER Optical Power output.
- Studies of Frequency division Multiplexing and Demultiplexing.
- PC to PC communication link using Optical Fiber.
- Setting up a fiber optic analog link and study of PAM

- Studies on satellite communication System:

  a) To setup Active and passive Satellite Communication Link.

  b) To communicate Voice signal through Satellite link.

  c) To Transmit and Receive Various Wave from a function Generator through a satellite link using different combination of up link and down link frequency.

  d) To Transmit and Receive PC to PC Data through Satellite link.

- Studies on cellular mobile communication System: Working principle, input /output Signal of different sections, Transmitter and Receiver section. Study of SIM Card and its Detection, SIM reset, SIM Clock, SIM Data, and SIM Supply.

- Studies on GSM: Understanding of GSM Technology Signal like its network, network commands: Modem Commands, Simcard hardware commands, Network registration commands, Call control commands, Phone book commands, Message handling commands.

- Study of GPS system and determine the current location of the GPS receiver.

Facilities available:

In this laboratory we have the sophisticated equipment for Satellite communication, mobile communication and optical communication etc. So the students can work comfortably and analyze them . Each of the benches is fully equipped with:

- Function generator
- Optical power meters
- C.R.O

Major Equipment in the Lab

- Satellite Communication Trainer kit (Scientech)
- GSM trainer kit (Scientech)
- Mobile phone trainer kit (Scientech)
- Time division multiplexer and Demultiplexer (Scientech)
- Optical fiber trainer kit (Scientech)
- Optical fiber trainer kit for PC to PC communication (Scientech)
- Global Positioning system (Scientech)
- LASER trainer kit (Scientech)

General information about the laboratories:

(i) Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.

(ii) Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

(iii) Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

(iv) Most of the technical staffs have undergone first aid and fire fighting training.

RF & Microwave Engineering and EM theory & Transmission line Laboratory

Objectives:

1. There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the Microwave Test-Bench will be given. Lectures on measurement techniques and error calculation will also have to be organized.

2. In this context, the Microwave Laboratory at the Department of Electronics and Communication Engineering, Narula Institute of technology, Agarpara is motivated to work towards the design and analysis of microwave circuits, components and sub-systems including micro-machined devices for RF, microwave, millimeter wave applications.

3. Design, analysis, optimization and characterization of miniaturized RF and microwave components and devices based on new breakthroughs in microwave theory and techniques

Training in this laboratory is done through properly planned structured program with the following sequences:

Electromagnetic Wave and Transmission Lines Laboratory

a) Find and studies on the several of Standing Wave Pattern along a transmission line when the line is open-circuited, short circuited and terminated by a resistive load at the load end.

b) Familiarization of Smith chart on MATLAB platform, for this experiment need to learn theory Smith chart & basic concept of MATLAB Software.

c) To learn the radiation pattern of different type of antennas Eg: dipole, folded-dipole, 3-element Yagi-Uda antenna and measure HPBW & FNBW for corresponding antennas.

d) Comparative study to find beam width, gain and radiation pattern of a 3-element, 5-element and 7-element parasitic array (Yagi-Uda) antenna.

e) To calculate gain, directivity of a Pyramidal Horn Antenna with obtaining radiation pattern.

f) Familiarization with different signal on Spectrum Analyzer. In the process student can learn the significances of the manufactures specifications etc.

Microwave Engineering Laboratory

1. Measurement of wavelength, guide wavelength and frequency using X-band waveguide test bench. Calculation of broad wall dimension of a X-band waveguide.

2. Determination of phase and group velocities within a waveguide from Dispersion diagram [ω−β

Plot].

3. Measurement of unknown impedance using shift in minima technique. Unknown impedance may be inductive or capacitive.

4. Measurement the attenuation of different attenuator Eg: dissipative attenuation and reflective attenuation.
5. Determination of basic parameters of a directional coupler using calibrated attenuator.
6. Klystron characteristics using X-band waveguide test-bench.
7. Study of Gunn Oscillator characteristics using X-band waveguide test-bench.
8. Measurement of reflection coefficient using two directional couplers and one calibrated attenuator.
9. Measurement of phase shift of a microwave phase shifter
Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.
10. Measuring of dielectric constant of a material using waveguide test bench at X-band.
11. Measurement of Conduction EMI using LISN and spectrum analyzer
Frequency response of RF amplifier using spectrum analyzer with tracking generator

12. Introduction and identification of different filters using spectrum analyzer with tracking generator.

Facilities available:

In this laboratory there are sufficient number working benches (more than 10), so that the students can work comfortably. Each of the benches is fully equipped with:

i) Klystron based Microwave Test bench
ii) Gunn based Microwave Test Bench
iii) Antenna trainer kits.
iv) RF trainer kit
v) Transmission line analyzers trainer kit
vi) Microwave Horn antenna test benches
vii) Test Equipment CRO , VSWR meter, Spectrum analyzer with tracking generator, and Digital multimeter
viii) Multiple output power source

There are two working benches are set centralized for assembling RF circuits.

Major Equipment in the Lab:

1. Various microwave sources –
    a. Solid state source (Gunn diode) Make – The Scientific Instrument Co.LTD
    b. Vacuum tube source (Klystron) Make – The Scientific Instrument Co.LTD
2. Spectrum analyzer with Tracking generator Make-Arihant Trading Company
3. EMI/ EMC Analyzer Make- Techno Scientific Co.LTD
4. Transmission Line analyzer Make- Techno Scientific Co.LTD
5. X- band Power meter with sensor Make- Techno Scientific Co.LTD
6. RF Power output meter Make- Agilent Technologies India. Pvt. LTD
7. CRO Make-Arihant Trading Company
8. VSWR meter Make – The Scientific Instrument Co.LTD
9. Antenna Trainer Kit Make- Shree Balaji Electronics

10 Movable short Make- Ranjan Electronics
11. Slide screw tuner Make- Ranjan Electronics
12. Multi hole directional coupler Make- Ranjan Electronics
13. Pyramidal Horn Antenna Make- Techno Scientific Co.LTD
14. Matched termination Make- Techno Scientific Co.LTD, Ranjan Electronics
15. E-H tuner Make- Ranjan Electronics
16. Magic, E- Plane, H Plane Tee Make- Techno Scientific Co.LTD, Ranjan Electronics
17. Phase shifter Make- Techno Scientific Co.LTD, Ranjan Electronics
18. Co-axial wave guide adapter
19. E-Plane Bend
20. Standard gain Horn
21. Mechanical Turn Table
22. Pick up horn
23. Slotted antenna narrow wall
24. Slotted antenna broad wall
25. Dielectric antenna
26. E- Sect oral Horn
27. H- Sect oral Horn
28. Parabolic disc antenna
29. Pyramidal horn
30. Precision short
31. Dielectric Liquid cell
32. Dielectric solid Cell with sample
33. Y-Circulator
34. T-Circulator
35. C-Band Microwave source
36. RF Trainer Kit
37. Printed Micro strip Yagi antenna
38. Printed (Micro strip) dipole Antenna
39. Micro strip Patch antenna
40. Detector mount with SMA adapter
41. Horn antenna with EP bend
42. Fixed attenuator Make- Ranjan Electronics

PC turns table interface cord software

General information:

Microwave characterization and modeling of discontinuities in an otherwise uniform waveguide, in this project my job is to calculate various types of discrete discontinuities by using experimental methods or tangent methods. *(M.Tech Project).*Students of Greater Kolkata College of Engineering and Management came for experiments and exam.

VLSI CIRCUITS & SYSTEM LAB

Objectives:

This lab has been established to give idea to the students about the configuration and simulation of Very Large Scale Integrated Circuits & Systems. Basic Objectives of this lab to explore various design style of simple and complex Integrated Circuits(IC) near to students. In this laboratory students are able to understand about models and model parameters of various devices like MOSFET, BJT, DIODE etc. which are suited for IC Technology. In this laboratory there is provision to configure and simulate CMOS Circuit & Systems also. It is possible to design of layout of various CMOS Circuits in micron, submicron and deep submicron level using Tanner Tools.

Experiments:

Following experiments are performed by B.Tech (E.C.E) 6^{th} semester students.

- Transient analysis of CMOS Inverter.
- Simulation of resistive load MOS Inverter.
- Study of voltage transfer characteristics(VTC) of CMOS Inverter.
- Study of voltage transfer characteristics(VTC) of resistive load MOS Inverter.
- Design and Simulation of logic gates(AND,OR,NAND,NOR,Ex-OR,Ex-NOR).
- Familiarization of SPICE model parameters of MOS.
- Design and simulation of single bit Full adder circuit.
- Design of resistive load MOS differential pair.
- Simulation of CMOS differential amplifier.
- Layout generation of NOT,AND& OR gates.

Facility available:

- This laboratory is mainly useful for design and simulation of VLSI circuits
- Schematic design , simulations and physical design of VLSI circuits are performed using License Tanner tools , version 13.0
- Well prepared Laboratory manual exists for beginner

- Laboratory is open for B-Tech ,M-Tech and R & D projects of related fields
- Laboratory is equipped with about 32 computers with LAN and internet facility
- Beyond schedule laboratory session , this laboratory is open for practice session for beginner
- The is fully air conditioning

Major equipments in the Lab:

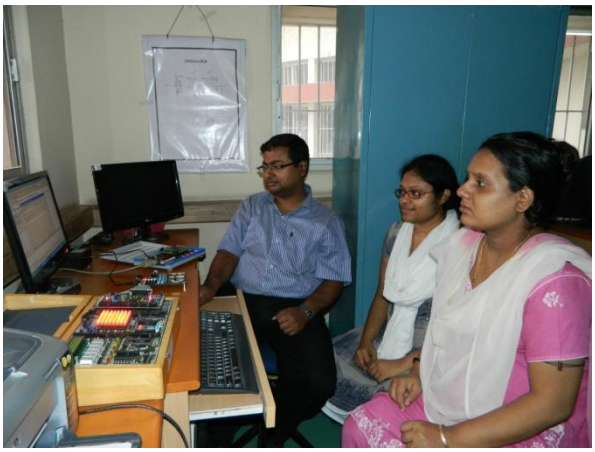
- License Tanner tools ,version 13.0
- Desktop PC

General information about the laboratory:

- At the first day of laboratory session students are instructed how to use the laboratory. Some awareness, dos & don'ts are discussed. Students are divided into groups and PCs are specified to each group for the semester
- Also in the 1st day of semester classes brief objectives and outcomes of the laboratory are discussed
- Beginning of every laboratory session brief recapitulation of previous days session, necessary explanation and objectives of experiments of current session are demonstrated by concern Faculty member. Then students are advised to perform the experiments with their own interest to become successful. They are instructed to analyze experimental result and to made conclusion. Students are also advised to prepare a well mannered laboratory notebook for documentation and to submit in next days session . Laboratory note books are checked, corrected and evaluated by concern Faculty members near to student .
- At the end of laboratory session students are also given next days assignment and advised to go through the theory portion of the experiment.
- This laboratory is maintained during and beyond laboratory session by well trained technical supporting staff under the supervision of the faculty members.
- Students also perform some innovative experiments which are beyond syllabus in this lab

ELECTRONICS DESIGN & AUTOMATION LAB

Objectives:



Traditionally integrated circuits have been developed using schematics. With shrinking silicon structures and higher integration densities, automated tools for Electronic Design Automation (EDA) have been developed.

This Lab will act as a good platform for the students of Electronics & Communication Engineering, those who would like to develop themselves in VHDL, beginning with the basics of the languages constructs used to design some of the very basic designs in digital electronics. Also it serves as a guide to make it understood the complete process to work through in designing onto Programmable logic devices like that is CPLDs and FPGAs, right from the simulation (zero delay to the implementation aspects). The Spice Simulation of different types of Inverter & Basic Logic Gates, basic digital circuit blocks using different types of logic design style, analog circuit simulation and Circuit Layout design of different types of digital & analog circuits using EDA Tools (i.e. TSPICE) will be carried out.The complete FPGA design process, including adding timing constraints, pin assignment, synthesis, placement &routing, bit-stream generation, will be carried out.

This **Lab helps to reduce uncertainties by providing knowledge as well as efficient software development and system integration.**

EDA software (tools) can be used to solve the problems encountered during synthesizing, analyzing, verifying and testing a design. We are seeking more powerful algorithms for solving these problems to minimize chip size and power consumption while optimizing chip performance. Currently, we especially focus on developing algorithms and methodologies for low-power, timing performance, and manufacturing yield optimization.

Experiments:

Training in this laboratory is done through properly planned structured programme with the following sequences:

- Familiarity with Spice simulation tool

- Spice Simulation of different types Inverter & Basic Logic Gates (NAND, NOR, EOR, XNOR) using different types of logic design style.
- Spice Simulation of different types basic digital circuit blocks (i.e., Adders, Multipliers, MUX, Decoder, R-S ,D , J-K Flip Flop etc.)
- Spice Simulation of different types of Differential amplifiers.
- Circuit Layout design of different types of digital circuits using EDA Tools (i.e. TSPICE).
- Familiarity with VHDL programming Language.
- Familiarity with FPGA based system design.
- Familiarity with Standard Cell Design & RTL Design using VHDL Software.
- Design of Different types of Adders, MUX, DMUX, Decoder, Encoder, Flip Flops, Shift Registers, Counters using VHDL and implementation and validation on FPGA
- Design of 8 bit synchronous Counter using VHDL and implementation and validation on FPGA
- Design of 8 bit bi-directional register with tri-stated input/output bus using VHDL and implementation and validation on FPGA.
- Design of a 12 bit CPU with few instructions and implementation and validation on FPGA.

Facilities Available:

- In this fully air conditioned laboratory, there are sufficient number of advanced computers with LAN Connection (more than 35), so that the each student can work individually with separate computer comfortably.
- In this laboratory there are sufficient number of advanced CPLD Kits (10 numbers), so that four numbers of student can implement their design using CPLD Kit simultaneously.
- Each of the computers are fully loaded with the original software's like:

  (i) TSPICE software

  (ii) Xilinx Software

(iii) Quartus II Altera Software .

- There are two High speed computers are set aside for Final year project and research purpose, with facilities of high valued softwares, connected with one FPGA kit and one Active HDL kit.

- There are one High speed computer (DELL Work Station) are set aside for using as a server for the research purpose with connected with Printer and Scanner.

- All the tools are equipped with process technologies from 350nm to the latest 45nm node.

- With a full-time lab Technicians are taking care of the tools and servers, students can get easy access to any tool through proper set procedures.

Major Equipments & Softwares in the Lab

- **ALDEC ACTIVE HDL Software with an advanced FPGA Kit** : Software with 10 user license for five years. Purchased from ATS Techsoft Solutions, India.

- **FPGA Kit:** FPGA kit with Spartan II with 100K Gates with WebPack V4.2 software. Purchased from Core Technologies, India

- **Embedded System Kit:** Micro Controller Module for FPGA. Purchased from Core Technologies, India.

- **CPLD Kit:** Altera's MAX II CPLD EPM240T100CS Kit with Quartus II Software and 10 numbers of development boards. Purchased from Micro System Foundations, India.

- **TSPICE:** Total 15 users floating perpetual license with TSPICE Pro, L-Edit, S-Edit, W-Edit,LVS Bundle. Purchased from Integrated Micro System, India

- **P4 Computers**: IBM computers of 1GB RAM with LAN Connection. Purchased from Software Consultancy Pvt. Ltd. India.

- **DELL Work Station**: Working as a server of this Lab. Purchased from Bard Roy Infotech Pvt. Ltd. India.

General information about the laboratories:

- The VLSI/EDA lab of ECE Department, Narula Institute of Technology is a state of the art

lab equipped with the most up-to-date, industry standard VLSI EDA tools and hardware resources.

- Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.
- Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.
- Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
- Most of the technical staffs have undergone first aid and fire fighting training.

ELECTRONICS CIRCUIT DESIGN LAB

Objectives:

The laboratory serve the students to impart their essential knowledge of electronic circuit design and fault analysis.This laboratory enhance hands on experience of the students to design different electrinic circuits with brade boards and with differnt active & passive components. Students can learn the specifications of different analog and digital IC's and their applications. This laboratory encourage innovativeness of the students as they can constuuct a particular circuit with different parameter values and compare their results.

Experiments:

1. Design of a Rectifier circuit and study its performance.
   (To design a rectifier for a given average output dc voltage and a given load resistance, compare between the theoretical values of Vdc, Vrms, RF, HD, output regulation, transformer utility factor etc. with the measured values, and thus comprehend the relevance/effect of these various parameters.)

2. Design of DC power supplies regulation and protection circuits.
   (To learn designing a series transistor based output regulation circuit, an output current limiting circuit, fold back circuit needed for a given output parameters.)

3 Design of a single stage audio frequency voltage amplifier with BJT for a given Av, Zin and Zout and maximum symmetrical output swing.
   (To learn basic design principles, different methods of biasing, bias stability, selection of transistor from data manuals and effect of ac coupling on bandwidth.)

4. Design of a single stage audio frequency emitter follower with JFET for a given Av, Zin and Zout and maximum symmetrical output swing.
   (To learn the design principles and applications of an emitter follower.)

5. Complimentary symmetry power amplifier with pre amplifier, if necessary, for a given out put power to a given load with single ended power supply.
(To learn the distinction of a power amplifier over and above a voltage or current amplifier, itsdesign principles, issues like, efficiency, cross over distortion etc.)

6. RC phase shift Oscillator , Wien Bridge oscillator, Hartley and Colpitt oscillator
(To learn the design of oscillators and measuring the frequency and amplitude of oscillations)

7. Design of Inverting and non-inverting amplifier using OPAMP of given dc gain, input impedance and output impedance.
(To learn the basic design, inter relation between the dc gain and input/output impedances, offset balance and the relation between feedback and GBW.)

8. Design of Adder and subtractor circuit using OPAMP.
(To learn the basic design and function of a multi input adder/subtractor (with ac and dc inputs present simultaneously).

9. Design of Comparator/voltage level detector using OPAMP for a given upper threshold level and a given lower threshold level with facility of independent adjustment of hysteresis and center point.
(To learn the design and the technique of independent adjustment of both hysteresis and center point.)

10. Realization of active filters using OPAMP: - LP, BP, HP, 1st order, 2nd order.
(To learn the design of a filter and it's inherent phase shifting characteristics.)

11. Realization of IC-555 based monostable and astable multivibrator of duty cycle below and above 50%.
(To learn designing IC-555 based timer circuits.)

12. Design and implementation of a BCD to 7-segment decoder with basic and universal gates.
(To understand clearly the method of writing a truth table, use of K-map, simplifying a logic function and optimum design with minimum number of ICs and inputs.)

13. Design and implementation of a 4-digit frequency counter with a clock generator.

(To learn designing a digital circuit using available standard gate, FF, counter and display Ics.)

14. Designing logic circuits using multiplexers, demultiplexers and gates to implement logic functions.
    (To learn the use of multiplexers and demultiplexers)

15. Design and implementation of a sequence detector.
    (To learn designing a sequential circuit, whose output is 1 or 0 when any input bit is preceded or succeeded by a predefined binary sequence. To define the input & output sequence from a given physical problem, to prepare a state diagram, derive a minimal state table, to find the simplified state equation, to implement the same & verify the result)

16. Design and implementation of a combination of a logic circuit and a RAM in order to generate a 4-bit data after simplifying a logic expression, to store the output data at a predefined location in the RAM, to retrieve the same and verify.
    (To comprehend the structure and operating principle of memory devices.)

17. Design a Single-phase full & shaft controlled converter.
18. Design of Microprocessor based Triggering socket.

Facilities available:

In this laboratory there are sufficient number of working benches (more than 10), so that the students can work comfortably. Each of the benches are fully equipped with:

(i) Cathode Ray Oscilloscope – This is an essential measuring equipment which is used to observe the resultant waveform for a perticular design and to measure different parameters of waveform.
(ii) Function generator- This is an essential generating equipment which is used to produce different types of signals with different amplitudes and frequencies as per requirements.
(iii) DC Power Supply- This equipment fullfill the most basic requirement of any electronic circuit by providing DC voltage to bias different electronic devices.
(iv) Digital Multi meter- This is also an essential measuring equipment Which is extensively used in Electronic circuit design laboratory.

General information about the laboratory:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.

2. Students are intimated about the required specifications of a particular design before the performance of the experiments so that they can perform their own design.
3. Apart from the experiments as mentioned in the syllabus students can perform some additional experiments

   Such as

   (v) Realization of ADC and DAC with analog and Digital IC's and other required components.

   (vi) Realization of IC-555 using OPAMP ,FLIP-FLOP and other required components.

   (vii) Realization of DC power supply.

   (viii) Realization of Function Generator using IC-741 and other necessary components.
4. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.
5. Most of the technical staffs have undergone first aid and fire fighting training.

DESIGN AND SIMULATION LAB

Objectives:

This is a laboratory in which students are required to show their innovativeness and understanding of the subject through software based programming. The laboratory comprises of the application of four years of study of Electronics & Communication Engineering.

Experiments:

The list of experiments performed in this lab as below:

i) ADPCM – granular noise and quantization noise.

ii) Digital filters – ripples in pass band and stop band, slope in transition band ,poles and zeros.

iii) Optimum filter for receiving base band random binary data

iv) Throughput vs input density in different types of chip code.

v) Cellular architecture, WiFi, WiMAX using QUALNET.

vi) OFDM using QUALNET.

vii) Different routing algorithms and protocol.

viii) Any other

Facilities available:

1. In this laboratory there are sufficient number computers for the students and the ratio is 1:1 and hence they can work comfortably. Each of the systems is fully equipped with:

i) MATLAB 7.0.1

ii) QUALNET 5.0

iii) INTERNET

2. All the computers are facilitated with internet facility such that the students are able to surf for any information needed for developing and designing the experiments..

Major Equipment/Softwares in the Lab

- MATLAB 7.0.1 (Mathwork)
- QUALNET 5.0 (Scalable Network Technology, USA)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with the basic theory related to the experiments.
2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab for better understanding of the software. Since this is a software based lab no manual is issued for the experiments in the syllabus and the students are allowed to design them innovatively.
3. Laboratory is maintained and conducted by well trained faculty members.

ADVANCED COMMUNICATION LAB (M.TECH)

Objectives:

This is an Advance communication Laboratory in which the PG students get to study the latest advances in communication like the advance modulation techniques like QPSK, MPSK, MSK, optical communication and study the different antennas used for he purpose of communication. All these techniques facilitate long distance communication.

Experiments:

The Advance lab provides a wide range of experimental setup as follows

1. Measurement of numerical aperture of an Optical Fiber.

2. Measurement of Propagation loss, bending loss, and Connector loss in an Optical Fiber.

3. To determine the power budget in a fiber optic

4. Study of the receiver and transmitter parameters of a typical radio communication system: selectivity, sensitivity and fidelity

5. To generate a QPSK signal using the Agilent 89600 VSA software Agilent IO Libraries Suite software

6. To study sampling theorem and generate a Pulse code modulated signal

7. Important characteristics of a transmission line.

8. Impedance measurement by using Smith chart.

9. Microwave phase shifter – study

10. Study of different antennas– gain, radiation pattern.

Facilities available:

In this laboratory we have sophisticated equipment like Multipurpose Lab station, optical communication etc. The Multipurpose lab station is a high end equipment with programmable function generators. Using this we can perform and study advance modulation techniques like QPSK, MPSK, MSK, QAM etc. These modulation techniques can be analyzed by various parameters occupied bandwidth, eyepattern and constellation. We can generate I Q signal using Agilent IQG software, VEE pro and Agilent VSA software and programmmable function generator. This equipment can be used for various experiments as well as research purpose.So the students can

work comfortably and analyze the experiments. Each of the benches are fully equipped with:

1. Function generator
2. Optical power meters
3. C.R.O
4. Computer

Major Equipment in the Lab

1. Multi purpose Lab Station (Agilent)
   a. ME1100 Digital RF Communications Training Kit
   b. Agilent 20 MHz Function Generator
   c. Agilent Oscilloscope, 100 MHz
   d. Agilent IQ Signal Generator (IQG) software
   e. Agilent VSA software
   f. Agilent IO Libraries Suite software version 14.1
2. PAM and PCM trainer kit (Scientech)
3. Sampling and Reconstruction trainer kit (Scientech)
4. Optical fiber trainer kit (Scientech)
5. Optical fiber trainer kit for PC to PC communication (Scientech)
6. Transmission Line trainer kit (Lab Electronics)
7. Antenna Trainer kit (Scientech)
8. Microwave test bench (Vjhanthura/SICO)

General information about the laboratories:

1. Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.

2. Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

3. Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

4. Most of the technical staffs have undergone first aid and fire fighting training.

COMMUNICATION SYSTEMS LAB

Objectives:

This is Communication System Laboratory in which the PG students get to study the latest advances in communication like optical communication and wireless communication. In optical fiber communication technique we study how light s to transmit information from one place to another through optical fiber using the principle of total internal reflection and minimising the losses and defying the electromagnetic interference. And for communicating across the globe the satellite communication has become a boon for science. Satellite communication is where artificial satellites are launched in the orbit and are used for various applications of telecommunication. The First generation (1G) cellular systems in the U.S called the Advance Mobile Phone Service (AMPS), used FDMA and the second generation (2G) digital systems called GSM 1. The GSM standard uses a combination of TDMA and slow frequency hopping with frequency-shift keying for the voice modulation. The Advance lab provides a wide range of experimental setup as follows

Experiments:

i) Study of ISDN:

a) To set basic configuration of ISDN system using Emulator, ISDN Telephones, terminal Adapter and Analog Telephones.

b) To establish voice communication between two ISDN telephones, ISDN telephone and Analog telephone, two Analog telephones.

c) To analyze simple Trace using Protocol Analyzer after establishing voice communication between two ISDN telephones.

d) To Study Different types of Numbering in ISDN System.

ii) Studies of LASER Characteristic: A) Optical Power (Po)of a LASER Diode Vs LASER Diode Forward current(IF). B)Monitor Photo Diode Current (Im) vs LASER Optical Power output.

iii) Studies of Frequency division Multiplexing and Demultiplexing.

iv) PC to PC communication link using Optical Fiber.

v) Studies On satellite communication System:

a) To setup Active and passive Satellite Communication Link.

b) To communicate Voice signal through Satellite link.

c) To Transmit and Receive Various Wave from a function Generator through a satellite link. using different combination of uplink and down link

d) To Transmit and Receive PC to PC Data through Satellite link.

vi) Studies on cellular mobile communication System : Working principle, input /output Signal of different sections, Transmitter and Receiver section. Study of SIM Card and its Detection, SIM reset, SIM Clock, SIM Data, SIM Supply.

vii) Studies on GSM: Understanding of GSM Technology Signal like its network, network commands: Modem Commands

Simcard hardware commands

Network registration commands

Call control commands

Phone book commands

Message handling commands

viii) Study of GPS system and determine the current location of the GPS receiver.

Facilities available:

In this laboratory we have the sophisticated equipment for Satellite communication, mobile communication and optical communication, ISDN etc. So the students can work on the latest developments in the feild of communication . Each of the benches are fully equipped with:

1. Function generator (Scientech)
2. Optical power meters (Scientech)
3. C.R.O (Scientech)
4. Computer

Major Equipment in the Lab

- ISDN (Falcon)
- Satellite Communication Trainer kit (Scientech)
- GSM trainer kit (Scientech)

- Mobile phone trainer kit (Scientech)
- Time division multiplexer and Demultiplexer (Scientech)
- Optical fiber trainer kit (Scientech)
- Optical fiber trainer kit for PC to PC communication (Scientech)
- Global Positioning system (Scientech)
- LASER Trainer kit (Scientech)

General information about the laboratories:

- Before starting of the laboratory the students are instructed with necessary safety and precautionary measures that has to be adopted in any electrical laboratory.

- Well designed laboratory manual / instruction sheets are provided to students at the beginning of the session for a particular lab.

- Laboratory is maintained and conducted by well trained technical supporting staff under the supervision of the faculty members.

- Most of the technical staffs have undergone first aid and fire fighting training.

SERVICING OF LAB EQUIPMENTS

In the department we have dedicated servicing unit where servicing is done within our limitations. The equipments that are already serviced are as below:

- CROs
- Transistor trainer kit
- Op-amp kit
- Power supply
- Zener diode kit
- FET test kit
- Microprocessor kit
- CROs
- Microstrip patch antenna trainer kit

Training based on major equipments

It is very necessary for a student to know the working principles of laboratory equipments which they are using frequently during their laboratory classes. On basis of that department has organised a training session for the students in regular basis. Students will learn the following.

- **S**tudents will learn to use laboratory equipment carefully.
- They can learn function of each switch or knob connected to a equipment.
- They will be aware about the internal circuitry and their operation for particular equipment.
- They can match their theoretical understanding to its practical applications as a readymade electronic product.